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Article Title: The Soviet military-economic effort during the second five-year plan (1933-1937)

Year of publication: 1997

Link to published version: <http://dx.doi.org/10.1080/09668139708412447>  
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Publisher statement: None

# The Soviet military-economic effort during the second five-year plan (1933-1937)\*

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In our paper we aim to show the changing economic significance of defence outlays in the period of the second five-year plan (1933-7).<sup>1</sup> This period emerges as a time of transition. Rapid rearmament had been begun during the first five-year plan (1928-32), but from a very low base. In terms of the rising volume of activity, the following period was less hectic. However, it was a period of exceptionally rapid change in military technology and the technological level of defence industry products. It was followed by a third period (the third five-year plan of 1938-42, interrupted by war) in which the pace of rearmament was again exceptionally rapid and from a much higher initial base than before. Moreover the renewed acceleration of defence mobilisation began in 1936, when the second five-year plan was still under way.

Central to our conventional picture of the Soviet economy in the second five-year plan are what Naum Jasny called the 'three good years' of 1934-6. These were years of good harvests, rapidly rising production, de-rationing of consumer markets, and rising wages and farm incomes. For the defence sector, in contrast, these emerge as years of struggle and tribulation.

## What the budget figures show

### *(A) Reliability of defence data*

Between 1931 and 1934, the published Soviet figures for defence expenditure were considerably underestimated. In 1933, the first year of the second five-year plan, the published figure for the expenditure of the People's Commissariat for Military and Naval Affairs (NKVM, renamed People's Commissariat for Defence - NKO - in 1934) was 1421 million rubles but the true figure was 4299 millions.<sup>2</sup>

In the 1934 budget the deception continued. The published estimate was 1665 million rubles while the true estimate was 5800 millions.<sup>3</sup> But in September 1934 the

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\* Published in *Europe-Asia Studies* 49:3 (1997), pp. 369-406.

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Soviet Union joined the League of Nations; and in November of that year the Permanent Commission on Disarmament at Geneva prepared to adopt a far-reaching document on the publication of military budgets. In November and December Litvinov, the People's Commissar for International Affairs, sent memoranda to Voroshilov asking for new instructions about the data to be submitted to the League; Voroshilov was head of the People's Commissariat for Defence (NKO), into which the People's Commissariat for Military and Naval Affairs (NKVM) had been reorganised in the previous June. In Litvinov's memorandum of December 21, having received no instructions from Moscow, he pointed out that eight countries, including Britain and France, had already submitted budget documents to the League. Litvinov emphasised that the new procedures would involve 'the publication and submission of far more detailed and full information than we submitted in 1932-3 and require a fundamental change of all our system of publishing data on military expenditure'.<sup>4</sup>

On January 4, 1935, a laconic Politburo decision ruled that in the published report on the 1934 budget 'expenditure on the NKO shall be shown in the sum of 5 billion rubles' and that the estimate for NKO in the 1935 budget should be given as 6.5 billions. This decision was formally confirmed by the Council of People's Commissars, Sovnarkom, three days later.<sup>5</sup> The Politburo evidently decided that no useful purpose would be served by continuing the gross concealment of defence expenditure practised in the previous three years. Soviet fears of Japanese aggression in the Far East, with which the United States strongly sympathised, and the victory of Hitler and the National Socialists in Germany, provided adequate justification for the substantial military expenditure, and made it necessary to portray the Soviet Union as a formidable military power.

But this was not yet the full truth. The Soviet authorities were anxious to cover up the fact that they had falsified past published figures for defence expenditure. In a memorandum to Litvinov on March 11, 1935, Voroshilov rejected the proposal from the League that expenditure for the previous three years should be recorded.<sup>6</sup> Moreover, the data now published for 1934 and 1935 were not the whole truth. A memorandum sent to Molotov from the secret department of Narkomfin, the People's Commissariat for Finance, in January 1935 revealed that the actual expenditure in 1934 amounted to 5355 million rubles not 5000 millions, and that the estimate for NKO for 1935 was 7492 not 6500 million rubles.<sup>7</sup>

Publication and reality finally coincided in the 1936 budget. On December 15, 1935, the Politburo resolved that 'expenditure for NKO shall be shown in the budget in full'.<sup>8</sup> The same figure for 1936 appears both in the published budget and in the archives - 14800 million rubles.<sup>9</sup>

A separate issue is the coverage of the defence budget administered by NKVM-NKO. The NKO budget figure, even when truthfully published, did not cover all defence-related expenditure. In all years, separate allocations in the budget covered expenditures on special, convoy and NKVD armies, on strategic stockpiles, and defence-related expenditures in civilian commissariats and in local soviets (for example, on mobilisation planning, civil defence, and military R&D). And the substantial expenditure on investment, working capital and subsidies in the armaments industries continued to appear under the 'national economy' heading in the state budget. On March 25, 1935, a Politburo resolution on 'openness (*glasnost*' - yes, the same word) in military expenditure' agreed that the military expenditures of the civilian People's

Commissariats and local agencies could be reported to the League. But it also insisted that information on investment in the armaments industries should not be provided, except in the case of subsidies to armaments factories in the narrow sense. This was on the plausible grounds that in Western countries private investment in the private armaments industry was not reported.<sup>10</sup> Thus investment in armaments industries (table 10 below) does not form part of the expenditure of the NKO.

So far only patchy information has been traced on defence expenditure under other budget headings. In the 1933 budget, the NKVM appropriation amounted to 4.7 billion rubles, but to this figure may be added other outlays on defence-related items as follows: internal and frontier troops - 560 million rubles, defence industry investment and subsidies - 630 million rubles, and defence-related outlays by civilian agencies - 720 million rubles. Thus the broader defence-related total of 6.6 billion rubles was 40 per cent in excess of the NKVM subtotal.<sup>11</sup>

Too much should not be made of this point. Except in the years 1931-5, Soviet interwar defence budgets corresponded roughly with a modern western definition of 'defence consumption', and with the measures of defence outlays used in other countries. Other outlays in the broader 'defence-related' category either contributed more to other goals than to defence (for example, the maintenance of large internal security forces the primary task of which was defence of the regime against its internal enemies), or else added to society's ability to sustain a larger military burden in the future through accumulation of fixed assets and the stock of knowledge, rather than contributing to defence in the present. Therefore both consistency and comparability direct our attention first and foremost to the defence budget itself, and only secondarily to wider concepts of defence-related expenditure.

### *(B) The long-run context*

Table 1 shows the evolution of defence budget outlays from 1928/29 to 1940. In the first five-year plan period, nominal outlays on defence rose from 880 million rubles in 1928/29 to 4,034 million rubles in 1932. At the same time total government spending rose roughly in proportion, so that the defence share, which fell at first, had returned to about 10 per cent by the end of the period. The low point marked in 1931 should not be neglected - the 7 per cent which our table shows for that year, although much higher than the false figure given out in public, was still the lowest percentage of the whole interwar period. Still, the relative decline of 1930-1 was only temporary, and says more about the growth of government administration and public investment than any absolute decline in the defence sector.

In the early years of the second five-year plan, the proportion of one tenth was maintained. In 1936, however, there was a very sharp increase in the budget share of defence, which rose in one year from 11 to 16 per cent; by 1940, almost one third of the state budget was being allocated to defence, which was now consuming more rubles than the entire state budget of 1934.

The nominal value of defence outlays at currently prevailing ruble prices is not, on its own, particularly interesting (on the other hand, as students of Soviet defence outlays in the 1960s and 1970s are all too well aware, it is certainly a useful start). Knowing how many millions of rubles were expended on defence merely invites the question 'how much is a lot?' The ruble figures give us little impression of underlying change in the scale and cost of defence activity. Nominal values were affected by

abrupt changes in the price of goods and services in general and of defence goods in particular. There are various ways of standardising the ruble figures, each of which has its own advantages and difficulties. One obvious method commonly adopted in official documents, already shown in table 1, is to compute the defence share of the state budget. But the defence share of the budget requires much interpretation, given the profound changes affecting the role of state finance in the economy as a whole. The share of the state budget in overall economic activity was changing from year to year, and was expanding violently in the first five-year plan period. There are various alternative approaches to the measurement of defence activity in its wider context, each with its own advantages and difficulties.

## The real growth of defence outlays (1): an overview

### *(A) Physical indicators*

An impressionistic overview of the growth of real resources commanded by the defence budget is provided by tables 2 and 3. In the 1920s the Soviet Union maintained a regular army and navy of 586,000 (table 2). This was a small army, being less than one in a hundred of the potential labour force (the demographic cohort of working age).<sup>12</sup> There may be some under-counting in so far as these figures do not include the internal security troops of the OGPU-NKVD. Nor do they count the part-time personnel of the territorial army, conscripts engaged in nonmilitary service, or those undergoing military training prior to call-up. In 1926/27 these together would have added 842,000 to the published figure.<sup>13</sup> Of course the military value of these additional numbers was far less than that of the 586,000 regular soldiers. As far as later years are concerned, it is important also to bear in mind that the territorial army units were absorbed into the regular army in 1939. In the case of series A it is not clear whether established or actual strength is intended; the shortfall of series A in 1937 below the census figure of that year shown in series B may reflect recruitment above establishment (it is unlikely to be due to the date of the census, which took place at the beginning of the year).

As table 2 shows, the size of the regular armed forces began to grow rapidly after 1931, and numbers more than doubled under the second five-year plan. By 1937 up to 1.7 million men and women were in the ranks (col. 2), almost one in 50 of the labour force. Even so, the rate of growth was about to accelerate again; between 1937 and 1940, the number of regular forces personnel trebled, reaching 4.2 million and one in 25 of the labour force. However, part of the exceptional growth of 1939 and 1940 is explained by absorption of the territorial units into the regular army.

What matters from an economic standpoint is not just the number of soldiers, but the value of the military services which they supplied. This question is usually answered with reference to their opportunity cost, i.e. the wage incomes which armed forces personnel would have attracted in a civilian occupation. In other words, the real value of military services provided by a given number of soldiers tended to rise through time.

At the same time as numbers of service personnel expanded, so too did the supply of weapons and other military stores with which they were equipped. Figures for annual NKO procurement of ground and air weapons from 1930 onwards are now available in somewhat more detail than previously published series, in 18 separate lines

of defence products (the raw figures are presented in the appendix, tables A-1 to A-4). These figures are combined into an index of the number of weapons supplied to the armed forces, valued at 1937 unit prices, which suggests an increase of more than 20-fold between 1930 and 1940 (table 3, col. 1).

It is important to understand the peculiarities of this measure. First, it is an index of defence procurement, not production. The two could differ significantly. Defence procurement was usually less than production by the value of deliveries to industrial stocks of work in progress and finished goods, to industrial testing and experimentation facilities, to the armed forces of the NKVD, and to net exports (e.g. supplies of weapons to Spain in the civil war there, less supplies of warships and other weapons acquired from foreign firms). Because of these factors the relative levels of production and procurement could vary from year to year. However, their long-run trends were unlikely to diverge by much.

Second, as a measure of procurement our index is a short cut at best. It is based on crude numbers more than real values. It combines numbers of fighters, bombers, heavy and light tanks, large- and small-calibre guns, and so on, weighted roughly by relative 1937 unit values. This short cut takes no account of the changing technical level and performance of a fighter aircraft, medium tank, or large-calibre gun (in precisely the same sense as numbers of soldiers tell us nothing about their skills and training). Given that these things generally improved during the period, a number-of-weapons index puts a *lower bound* on our estimate of real growth in munitions procurement. It also omits warships, and so neglects the shipbuilding dimension of interwar rearmament altogether.

Warship construction presents many problems. Available series (gathered from published sources) are reported in table 4. They show a more than 40-fold increase in crude tonnage of ships entering service in 1940 compared with 1930 (col. 8). But the series are severely affected by qualitative change, especially the shift in favour of capital warship construction under the third five-year plan, as the striking change in average tonnage of surface ships entering service from 1938 onwards reveals (col. 2). Tonnage entering service was generally highly volatile; for example, more than 40 per cent of deliveries under the whole second five-year plan entered service in a single year, 1936. This reflected in part the construction period required for finished warships, which was both long and variable, resulting in year-to-year fluctuations in work in progress which were large relative to annual value added. A measure of naval shipyard production or value added in shipbuilding would presumably rise much more smoothly. For these reasons we do not try to incorporate shipbuilding into our aggregate measure of munitions procurement.

The number-of-weapons index shown in table 3 (col. 1) suggests that the real procurement of munitions nearly doubled from the end of the first to the end of the second five-year plan (1932-7). The pace of change was slow, however, compared with the rates of expansion recorded before and after, when munitions output measured in this way quadrupled in two years (1930-2), and nearly trebled in three (1937-40).

The usefulness of the number-of-weapons index can be pursued in two confrontations. One is with an index of defence procurements originally computed by Moorsteen and Powell using a variety of indirect evidence to fill the gaps in Bergson's series; the other comparison is with available budget series for defence procurements at currently prevailing prices. In table 3 our present estimate (col. 1) is contrasted with

the index of Moorsteen and Powell (col. 2). The Moorsteen/Powell index suggests that munitions procurement grew 14 times over the period from 1930-2 to 1937, and 40 times over the decade. It contains a lot of interpolation, so its precise year-to-year movement is not particularly significant, but its level in the early 1930s is very clearly understated because its authors did not know about the official concealment of weapon procurements in those years. Our index shows more modest growth comparing 1937 with 1930, with a far higher proportion of this growth taking place in the early 1930s under the cloak of secrecy. On the other hand, it should be born in mind that our own figures certainly understate the long-run growth of real procurements. Comparing 1940 with 1937 the two indexes are roughly in agreement.

The second confrontation is between volumes and values. In table 5 the number-of-weapons index (col. 1) is compared with an index of defence procurements (col. 2) at currently prevailing prices. When real outlays are divided by nominal outlays, an implicit unit price deflator is the product (col 3). The comparison suggests that from 1930 through to 1933 the unit price of a typical weapon was probably falling; this is consistent with the available evidence of official estimates, and also of heavy downward administrative pressure on industry. After 1933 unit prices began to rise, a trend which persisted until the outbreak of the second world war.<sup>14</sup> Again, we know of particular cases where the prices of existing weapons rose markedly in the mid-1930s, and we can also presume that the price of the typical weapon was rising because the assortment of weapons was shifting rapidly towards much more complicated, costly items. If we take into account the improvement in product technology and complexity over this period, however, the quality-adjusted price level may have been rising more slowly, stable, or even falling.

However it is measured, the volume of defence products grew far more rapidly than either GNP or civilian industry. Between 1930 and 1940, the supply of munitions grew many times - 20-fold or more. Over a slightly longer period, 1928-40, civilian industry value added grew by two and a half times, and GNP doubled.<sup>15</sup> If we confine our attention to the second five-year plan (i.e. comparing 1937 with 1932), the development of these different branches was somewhat more in proportion. The number of weapons supplied doubled, while civilian industry value added, and GNP as a whole, both grew by roughly two thirds.

Official documents also reveal that the main increase in the number of the defence industry's plants and innovation facilities took place between 1927/28 and 1936. At the end of the 1920s a mere 45 establishments were counted in the secret core of the defence industry complex.<sup>16</sup> At the moment of handover from Narkomtiazhprom to the new Narkomoboronprom in December 1936 their number had grown to 183 - a fourfold increase. There was little further increase in their numbers before the second world war; when Narkomoboronprom was broken up in 1939, 218 factories were transferred to the specialised defence industry commissariats.<sup>17</sup>

This picture, too, may be somewhat understated. First, the typical defence establishment of 1936 was certainly much larger and better equipped than its equivalent from the end of the 1920s. What pointed in this direction was not only the normal processes of industrial growth, but also the changing composition of the defence industry, and especially the rise of huge, vertically integrated aircraft production complexes. Second, the growth of the defence industry after 1936 may be understated by the number of factories because the increase of defence orders for

weapons and military equipment was so rapid that it could not be met by existing specialised defence producers and resulted in a great increase in subcontracting of defence orders to civilian industry.<sup>18</sup>

All such figures neglect the great qualitative transformation of the defence industry in the period. But they do tend to confirm the idea of a break in the pace of defence mobilisation in 1935, when the numbers produced of many important types of weapons fell, e.g. rifles, medium and large-calibre artillery, medium tanks, and all aircraft other than fighters. The two issues - the qualitative transformation of the mid-1930s, and the break in 1935 - are closely related. The assortment of weapons and the techniques of production were both in a state of flux.

As far as the product assortment is concerned, fighter aircraft can serve as an example. In 1933 the number of fighter aircraft ordered was 360, of which 321 (90 per cent) were I-5s. By 1935 fighter production had risen to 839, but I-5s had been completely phased out, and now 800 (95 per cent) of the 839 ordered were I-15s and I-16s, none of which were being produced in 1933.<sup>19</sup> The I-5 was a biplane with a maximum airspeed of 286kph. The I-15, also a biplane, could attain a maximum of 360kph, while the top speed of the I-16, a monoplane, was faster still at 454kph.<sup>20</sup> The introduction of newer, more sophisticated models of aircraft and tanks with more demanding production requirements goes a long way towards explaining the sudden dip in the number of weapons being produced in 1935 - partly because of the sharp increase in the value of each weapon, partly because of the disruptive influence of widespread technological restructuring of the production process. To give a single, but not in the least untypical example, in 1935 and 1936, when the old TB-3 bomber was being replaced by the new SB and DB-3, planned procurement of bombers was fulfilled by just 26 and 36 per cent in each year respectively.<sup>21</sup>

In other branches of defence industry the pace of product modernisation was less hectic, but there was still rapid change in process technologies. In 1933 a broad subsector of the defence industry comprising artillery, small arms, ammunition, tank armament, and optical equipment began a changeover to 'production according to Type "B" specifications' (*chertezhi lit. "B"*), with the aim of setting higher standards of adherence to specifications, uniformity of measures and materials across the range of producers of identical or related products, and interchangeability of parts. Two main benefits were expected to flow from widespread adoption of Type "B" specifications. One was a great reduction in unit costs. The other was much easier enforcement of product quality standards. The changeover was supposed to be completed in 1935, but in practice was accompanied by much disruption, footdragging from the side of industry, and delay.<sup>22</sup>

### *(B) Deflating the value of outlays*

Table 6 shows alternative estimates of real defence outlays provided by Abram Bergson. He estimated that, if defence outlays are deflated to constant prices of 1937 (col. 1), then by 1937 the real volume of defence activity was 10 times the level of 1928, and that between 1937 and 1940 there was a 2.7-fold further increase. This estimate confirms striking real growth, although not on the scale of the nominal budget figures - over the same subperiods, the ruble value of defence outlays at current prices rose 20 times and 3 times respectively. However, a Gerschenkron effect is present. Bergson also calculated the series up to 1937 in 1928 prices (col. 3). In 1928, capital was scarce and



capital-intensive machinery expensive relative to later years. Since machinery was substituted for labour-intensive goods and services as it became relatively cheaper during the 1930s, series for real outlays based on early-year weights grow more rapidly than the same weighted by late-year prices.

The principles of Bergson's methodology were sound. He attempted to break down nominal defence outlays into their separate components (maintenance of personnel and facilities, the purchase of weapons and military equipment, defence construction costs, and so on), and compiled separate price deflators for each component in order to reevaluate them in prices or costs of a given year. From our point of view one significant disadvantage of Bergson's series is that it was computed only for periodic benchmark years, with no figure for the early 1930s, and did not capture the turning points which would be revealed by annual series.<sup>23</sup> It made careful and fruitful use of the data available at the time, but has not proved particularly robust in the light of the archival evidence. This point is best illustrated by the example of defence orders for weapons and military equipment.

Table 7 presents the series now available for budget defence outlays over the second five-year plan, distributed among military equipment (weapons and other military stores), construction (barracks and other troop facilities, fortifications, airfields and so on), and maintenance (the the running costs of the armed forces: the pay and subsistence of troops, their personal kit, the costs of military transport, operations, and equipment repairs). This table confirms a near fourfold increase in ruble outlays on the procurement of weaponry between 1932 and 1937, the final years of the first and second five-year plan periods. The figures also show that military equipment was a sizeable proportion of the defence total, usually around one third, but less in particular years such as 1935, and tending to fall towards the end of the period as the demands of modernisation began to yield to the growing urgency of numerical expansion of military personnel.

The deflators which Bergson applied to his estimate of munitions outlays were based on what he thought was happening to input costs and the prices of comparable goods. He used a freehand average of prices for civilian machinery and related material inputs (high-grade steel, rolled nonferrous metal products, and inorganic chemicals), and wages of public sector industrial workers. On this basis, Bergson suggested, munitions prices must have risen by roughly two thirds between 1928 and 1937, and by another one fifth up to 1940.

The evidence of official documents suggests that price trends affecting munitions were at best highly volatile, and at worst virtually impossible to pin down into a quantitative overall measure. Superficial indications are that they fell from the late 1920s through to 1932 or 1933, and thereafter rose. Thus, for their own purposes defence officials often calculated the cost of the current year's procurements at prices of the previous year to illustrate how much of the change was attributable to price inflation or deflation. The price changes taken into account probably only covered the subset of products procured in both years, and therefore could either overstate or (more likely) understate the underlying change. These calculations suggested a price level which fell continuously from 1928/29 through to 1933.<sup>24</sup>

For the mid-1930s we depend on available documentation of the changing prices of individual weapons, which is necessarily anecdotal in character. Thus between 1932 and 1935 there is fragmentary evidence of substantial inflation in the prices of

particular weapons.<sup>25</sup> The same kind of incomplete evidence may suggest some reversal of the upward trend in 1936 and 1937.<sup>26</sup> However, more general indications are that the inflation continued. In November 1936 the chief of the General Staff complained that 'there is no military item for which we have not had a price increase by 10, 20, 30 or more per cent' during the year.<sup>27</sup> A Gosplan document, however, put the increase in armament prices at 8.6 per cent in 1936 compared with 1935.<sup>28</sup>

All these indications suffer from a common defect. To what extent may the prices of goods which remained in serial production from one year to another be thought of as proxies for the prices of all goods? They were only a part of the overall product assortment, a highly variable part, sometimes only a small part. New products ought to be incorporated into any measure of overall price change at prices 'comparable' with existing products, but what comparability means in practice may be difficult if not impossible to determine. For overall price stability, the same proportionality between price and user quality for new as for existing products is required; products introduced at higher price/quality ratios may have contributed to price inflation even if the prices of defence products already in serial production were being held stable from year to year or forced down.

Above, we gave the example of the wholesale conversion of the aircraft industry in 1933-5 from I-5 fighters to a new generation of I-15s and I-16s. As it happens, the factory price of an I-16 in 1936 was 86,000 rubles, whereas the price of an I-5 in 1934 had been 56,400 rubles.<sup>29</sup> Thus, in two years the price of a 'typical' fighter aircraft rose by one half. However, what should matter to us is not the increase in the ruble price, but the proportion between the prices of the two aircraft and their real production requirements in plywood and metallic sheets and spars, instruments and controls, machining, assembly, spares, and so forth. Whether this proportion rose or fell cannot be judged on present information.

## Real growth of defence outlays (2): period by period

Below we take a more pragmatic approach to evaluation of real growth of defence outlays over relatively short sub-periods, using a variety of direct and indirect evidence of relevant trends. The main point is that, whatever our uncertainty over exact figures and longer periods, it remains the case that the figures in current rubles during both the first and second five-year plans, both for defence outlays under the NKVM-NKO budget and for other kinds of defence-related expenditure, greatly exaggerate real growth, as they do not allow for price increases in these years.

### *(A) 1933 compared with 1928/29*

During the first five-year plan, price inflation was already very considerable. The NKVM budget in current prices increased by over 450 per cent; what was the increase in real terms? (Here we compare 1933, nominally the first year of the second five-year plan, with 1928/29, as the data for 1933 are fuller; expenditure in current prices in 1932 and 1933 was almost the same).

The three main headings in the defence budget covered *military equipment*, *construction*, and *maintenance*. In the cases of military equipment and construction prices appear to have been stable or rising gently, but in the case of maintenance price increases were very large.

1. *Military equipment.* The prices of armaments' orders were controlled, and cost increases were subsidised, though hidden inflation no doubt occurred in fixing the prices of new products. In 1933 the value of military orders in current prices was 77 per cent greater than in 1931, while gross output of military products by the armaments industries at 'unchanged' 1926/27 prices increased by 85 per cent.<sup>30</sup> This suggests a moderate price deflation.
2. *Construction* costs were fairly stable in 1928-31, but increased in civilian construction by over 30 per cent in 1931-2, and the cost of military construction may have increased similarly.
3. *Maintenance.* In 1928/29-1933 the size of the armed forces increased from about 550,000 to 885,000 men (table 2), or by about 60 per cent, and the real cost of maintenance probably increased by a similar percentage. In current prices the cost increased by more than 300 per cent, so the price level of goods and services for maintenance in 1933 was perhaps 2.5 times the 1928/29 level.

Overall, prices for the defence budget probably increased by over 75 per cent in 1928/29-1933. But even after these adjustments are made, real defence expenditure in 1932 and 1933 was over three times the 1928/29 level.<sup>31</sup>

### *(B) 1937 compared with 1932*

Between 1932 and 1937 the defence budget increased by 340 per cent (tables 1, 7). We can evaluate the real growth of its components as follows:

1. *Military equipment.* The most difficult problem is to estimate the real value of military orders. Four series are available:
  - a) NKO budget outlays on equipment (*zakazy vooruzheniia i boevoi tekhniki*) (table 7). These are in current prices, and therefore exaggerate real growth.
  - b) military production by the armaments industries in 'unchanged' 1926/27 prices (table 8). Here there are various difficulties, and three different series are available. All the figures exclude arms production by civilian industry. The degree of coverage of military industry varied over the period. The coverage of series A was wider in 1937 than in 1932 because of the intervening transfer of factories from the civilian to the military sector. The subsequently compiled series B, which apparently attempts comparable coverage between 1937 and 1932, shows a lower rate of growth. Series C looks consistent with series B, but is deficient in information about arms (as opposed to total) production of military industry. In any case the data in 1926/27 prices, for well-known reasons, may exaggerate the rate of growth because of hidden inflation - though this is less likely with armaments, as with machinebuilding generally, than with other products.
  - c) the number of workers in the armaments industries (table 9, col. 3). This underestimates the growth of armaments production both because labour productivity certainly rose during the second five-year plan and because the workers in the defence industry were producing goods for civilian consumption as well as defence, and the proportion of military production in the total production of the armaments industries

undoubtedly increased in this period. On the other hand, the coverage of this figure increased during the second five-year plan as in (b) above.

- d) our number-of-weapons index (table 3), based on 1937 prices of products of which the output in physical terms is known, underestimates the rate of growth, as it does not take account of the large technical changes during the period.

In our estimate of the defence budget in real terms, we take as alternatives the lowest index (number of weapons and number of workers) and the highest index (nominal outlays on military equipment orders); the comparison is made in table 9.

2. *Construction.* This has been deflated by the Moorsteen-Powell index of materials input prices.<sup>32</sup> The index has certain well-known weaknesses, but is the best available.
3. *Maintenance.* As with the first five-year plan, we assume that maintenance in real terms grew in proportion to the number in the armed services. We have taken this as about 1,750,000 in 1937 (table 2). This implies that the prices of goods and services for maintenance more than trebled in 1932-7.

Expenditure on the defence budget in real terms thus increased as follows (1937, per cent of 1932):

Military equipment	198%-369%
Construction	141%
Maintenance	191%

Using 1932 weights for the three items (military equipment - 38 per cent, construction - 22 per cent, and maintenance - 40 per cent) puts the overall 1937 defence budget in real terms within an upper bound of 247 per cent and a lower bound of 184 per cent of 1932.<sup>33</sup>

The main additional defence-related item was investment in the armaments industries (table 10). In current prices, this increased from 778 million rubles in 1932 to 1,467 million rubles in 1936 (the 1937 fulfilment figure has not been available), or by 89 per cent. According to Moorsteen and Powell, investment prices increased by about 17 per cent between 1932 and 1937.<sup>34</sup> So on this basis investment in the armaments industries in this period increased by some 62 per cent.

The growth of both the defence budget and defence-related investment in the armaments industries was considerably slower during the second than during the first five-year plan, when both the defence budget and defence-industry investment more than doubled.<sup>35</sup> But the second five-year plan was a period of slower growth generally. The share of defence in the state budget, and the share of the armaments industries in total investment, both increased (tables 1, 11).

As in the first five-year plan, the second five-year plan falls into two quite distinct periods: slower growth in the first two years, much more rapid growth in 1936-7 (though growth is less rapid in 1937 than in 1936, following recovery from the 1935 crisis).

### *(C) Slower growth, 1933-5*

The number-of-weapons index (table 3) shows a rapid increase in military orders in 1933, no growth in 1934, and a substantial decline in 1935. The extent of these annual variations is implausible, and no doubt results from the insufficient representativeness

of the index, and the pace of technical change in 1934 and 1935 as compared with 1933. However, there is no doubt that 1935 was a troubled year.

### 1933

This was a year of economic crisis. From August 1932 large cuts were made in capital investment plans; the cuts for the armaments industries were larger than for investment as a whole, following the enormous increases in 1931 and the first half of 1932. The plans for military equipment orders were also systematically reduced during 1932. In July 1932, they had been planned at 3030 million rubles in 1933, nearly 50 per cent above the planned amount for 1932.<sup>36</sup> In August, the plan was reduced to 2620 million rubles.<sup>37</sup> Then on December 3 the Politburo ruled that the defence budget for 1933 should not exceed 5000 million rubles, including military equipment orders to industry not exceeding 1800 millions (less than the 1932 plan).<sup>38</sup> The final plan was still smaller (table 7).

In the outcome, investment in the economy as a whole in 1933, measured in current prices, fell slightly; and investment in the armaments industries declined by 22 per cent (table 10). Defence construction by the NKVM (the 'construction' item of the defence budget, see tables 7, 11) declined even more rapidly, after increasing precipitately in 1931-2.

While armaments production and military equipment orders did not increase to the extent shown by the number-of-weapons index (table 3), military production of the armaments industries measured in 1926/27 prices increased by 15.6 per cent (table 8). This increase is compatible with the slight decline in the nominal value of military equipment orders in the defence budget; an archival document presents quite detailed data claiming that the cost of comparable production in the armaments industries declined by 13.3 per cent in 1933.<sup>39</sup>

All the increase in production measured in 1926/27 prices, and in military orders measured in current prices, took place in the aircraft and tank industries.<sup>40</sup> Military orders and production in the shipbuilding, artillery and ammunition, and chemical industries declined (table 12).

### The effect of the 1932-3 crisis on longer-term planning

During 1931, following the appointment of Tukhachevskii as the deputy to Voroshilov responsible for armaments, the Soviet government approved a series of plans for the production of major weapons covering a period of three or four years. These plans were less ambitious than Tukhachevskii's notorious memorandum of January 1930; but, like the revisions of the first five-year plan in force in 1930 and 1931, they proved extremely over-optimistic. The drafts of the second five-year plan prepared in the spring and summer of 1933 were much less unrealistic. The debate centred on the feasible level of capital investment in 1933-7.<sup>41</sup> In the spring of 1933 alternative figures for investment in the armaments industries were proposed by the Commission for Defence and by Gosplan. Each of them assumed that this investment would be a higher proportion of total investment than during the first five-year plan;<sup>42</sup> but each of them also clearly implied that the weapons plans for 1933 and 1934 could not be achieved until the end of 1937 or later.<sup>43</sup>

In the summer and autumn of 1933, following the improvement in industrial performance and the more stable situation in agriculture, the authorities quickly began

to consider more ambitious defence plans. A commission headed by Ordzhonikidze proposed that as much as 3650 million rubles should be invested in the armaments industries, and in civilian industries producing armaments, in 1934 and 1935 alone.<sup>44</sup> This implied in 1934 these investments would be at least treble the 1933 level.

This incident proved to be the last death-throe of ambitious planning. The defence budget for the second five-year plan was finalised by the Gosplan defence sector at the time of the XVII party congress in January 1934, when the main features of the five-year plan were more or less finalised (table 13). While it envisaged a large expansion as compared with the first five-year plan as a whole, its proposals for military equipment orders and construction in the NKVM were not wildly optimistic if compared with 1932, the last year of the first five-year plan. The average annual order in 1933-7 was planned at 2600 million rubles, as compared with 1532 millions in 1932; average annual construction amounted to 900 million rubles, the same amount as in 1932. A large expansion was envisaged in maintenance expenditure, from 1600 million rubles in 1932 to 2600 million in 1933-7 (average); this implied a substantial increase in the size of the armed forces. The defence budget over the five years, 31,500 million rubles, was 780 per cent of the 1932 defence budget (4034 million); in the economy as a whole, expenditure in 1933-7 (342 billions) was planned at 765 per cent of the 1932 level.<sup>45</sup> The five-year plan as envisaged at the beginning of 1934 all assumed that defence expenditure and armaments production would advance at a moderately more rapid rate than the economy as a whole.

## 1934

The defence budget for 1934 was predicated on similar lines. It was planned to amount to 12.3 per cent of the total budget as compared with 12.0 per cent in 1933.<sup>46</sup> Within this total military equipment orders were to increase by 65 per cent as compared with 1933, and construction by 31 per cent (table 7).

The plan for investment in the armaments industries in 1934 envisaged an increase by as much as 64 per cent as compared with the expected level in 1933.<sup>47</sup> This was far lower than the proposal of the Ordzhonikidze commission, but far more rapid than the planned increase for industry as a whole.

In civilian industry, 1934 was the first of the 'three good years' of rapid expansion of production following the large investments of previous years. The armaments industries expanded at approximately the same rate as industry as a whole. According to official figures in 1926/27 prices, all large-scale industrial production increased by 20 per cent, while military production by the armaments industry increased by 12 per cent (table 8). However, this figure excludes shipbuilding, in which gross output increased by 53 per cent;<sup>48</sup> if shipbuilding is included, the armaments industries also increased by 20 per cent. Military equipment orders in current prices increased by 29 per cent (table 7).

Investment in the armament industries increased by 26 per cent, considerably less than planned. Taken together, construction by NKO and investment in the armaments industries increased a little more rapidly than investment more generally, by 29 per cent (tables 7, 10, and 11), as compared with 26 per cent for the economy as a whole.<sup>49</sup>

## 1935

In 1935 gross industrial production as a whole, as measured in 1926/27 prices, increased by 23 per cent and - an extremely rare occurrence - substantially exceeded the plan in both the consumer goods and the capital goods industries.

In the 1935 plan the armaments industries had a higher priority than in the previous two years. In the state budget at the beginning of the year military equipment orders were planned at 2662 million rubles, an increase of 37 per cent above actual expenditure in the previous year.<sup>50</sup> A series of supplementary allocations for additional armaments eventually increased planned military equipment orders to 3450 million rubles, an immense figure.<sup>51</sup>

These allocations were intended to enable a revolutionary modernisation of the armaments industries in two major respects. First, in the course of 1935 'the backward, semi-artisan method of work' would be replaced by 'the contemporary method of mass production'. After largely unsuccessful efforts to improve the production process in the previous two years, at the beginning of 1935 Voroshilov and Ordzhonikidze agreed to a firm programme for the transfer of the 67 main armaments factories in the course of 1935 to new sets of drawings (Type "B" specifications). This would facilitate the compatibility of parts between different weapons and factories and the wider use of state standards; and it would reduce the dependence of the industries on highly skilled and experienced workers.<sup>52</sup>

Secondly, the 1935 weapons programme envisaged major changes in the types and grades of armaments. The head of the aircraft industry reported that thirteen new types of aircraft were being introduced in 1934 and 1935, involving 'huge technical difficulties';<sup>53</sup> his critics acknowledged that the changes required were 'very complicated'.<sup>54</sup>

This vast programme soon got into trouble. By September 5 only 29 out of 139 items in the artillery and ammunitions industries had been transferred to Type "B" specifications, and these not completely.<sup>55</sup> The industry urgently demanded that the transfer should be delayed; otherwise factories would have to temporarily cease production.<sup>56</sup> The military objected. On behalf of NKO, Gamarnik triumphantly sent Molotov a copy of a telegram he had acquired in which the head of the armaments industry illegitimately instructed a factory director to violate the planned transfer to Type "B" specifications:

The main programme must be fulfilled...If you don't prepare Type "B", use drawings of current production.<sup>57</sup>

The difficulties were compounded by the switch to new types of armaments. In the aircraft industry, as late as October 1935 some factories were still struggling with the orders for 1934. Then in November, Voroshilov complained to Molotov and Stalin that only 859 of the 1334 aircraft planned for January-October had been delivered; and this included only one single aircraft out of the three key new types scheduled to be produced in 1935.<sup>58</sup> In 1935 the expenditure of NKO on orders from the aviation industry was actually lower than in 1934 (table 12). The Commission for Defence, on Stalin's proposal, replaced the head of the aircraft industry by M.M. Kaganovich, with Tupolev as chief engineer.<sup>59</sup>

Armaments production as a whole was also unsatisfactory. The production of the armaments industries as a whole, measured in 1926/27 prices, including civilian production, greatly increased (table 8), but this was largely a result of the expansion of

civilian production by these industries, not of armaments. Even shipbuilding, a success story in 1934, increased production by only 12 per cent.<sup>60</sup> Total military equipment orders measured in current prices increased by only 14 per cent (table 7); and the number-of-weapons index (table 3) shows a substantial decline in the number of weapons purchased by NKO.

While the armaments modernisation programme largely failed in 1935, defence investments reflect the intensification of the defence effort. The initial plan for the national economy as a whole proposed an absolute decline in investment; within this total the allocation to construction in NKO (628 million rubles) was also lower than actual expenditure in 1934. But during 1935 the allocation was increased to 1174 million;<sup>61</sup> and credits of 1186 million were eventually provided, of which 1086 were eventually utilised (table 7). Similarly the initial plan for investment in the armaments industries envisaged a sharp decline;<sup>62</sup> eventually, however, they received 19 per cent more than in 1934. Total investment in NKO and the armaments industries increased from 6.5 per cent of all investment in 1934 to 8.1 per cent in 1935 (table 11).

#### *(D) Rapid growth, 1936-7*

##### 1936

In the course of 1935 Nazi Germany adopted an increasingly aggressive stance, introducing conscription in March; Italy invaded Abyssinia in October; a Berlin-Tokyo axis loomed on the horizon. On March 31, 1935, Tukhachevskii published an article in *Pravda* entitled 'The war plans of contemporary Germany'. The article, corrected and endorsed by Stalin, attacked German 'plans of revanchism and conquest' and reported the state of German rearmament in alarming detail. A sentence written by Stalin warned that the German army was now almost as numerous as the Red Army, even though Germany had only 40 per cent of the Soviet population.<sup>63</sup> On December 3, 1935, Litvinov warned Stalin that Hjalmar Schacht, President of the Reichsbank and supreme Economics Minister, had privately told a French banker that Germany intended to divide up the Soviet Ukraine with Poland.<sup>64</sup>

Against this deteriorating background, the Politburo devoted increasing attention to the enhancement of Soviet military strength. In May 1935 it resolved that the armed forces under the NKO should be increased to 1,094,000 by July 1, 1936, 1,377,000 by January 1, 1937, and 1,513,000 by January 1, 1938.<sup>65</sup> A later resolution provided that 1½ age-groups should be called up in each of the four years 1936-9, so that the conscription age fell from 21 to 19.<sup>66</sup>

The capital investment plans for 1936 approved by Sovnarkom at the end of July 1935 envisaged that investment in the economy as a whole would increase by only 7 per cent as compared with the expected outturn in 1935, but NKO construction would double.<sup>67</sup> During the latter part of 1935, NKO proposed exceptionally high increases in its defence budget in the course of the negotiations about the 1936 plan. As table 14 indicates these proposals were sharply reduced, but the approved plan for military equipment orders provided for an increase of as much as 143 per cent as compared with actual expenditures on military procurement in 1935. The high figure for construction approved in July 1935 was only slightly reduced.<sup>68</sup> The approved plan for investment in the armaments industries was also unprecedentedly large; it amounted



to 1918 million rubles, more than double the 1935 level.<sup>69</sup> These already large plans were further increased in the course of 1936.<sup>70</sup>

Not surprisingly, these ambitious plans were not fulfilled. But in 1936, in contrast to 1935, a large increase in armaments production was achieved. Military equipment orders in current prices increased by 105 per cent (table 7); the orders achieved amounted to 77 per cent of the revised planned figure, as compared with only 70 per cent in the previous year. The increase in production in real terms was certainly less than 105 per cent. In 1936 subsidies for armaments, and privileged prices for inputs, were partially removed. There was a sharp inflation in the price of existing weapons, noted by both planners and the General Staff.<sup>71</sup> Price increases may also have occurred owing to the 'overpricing' of new types of production. But even our number-of-weapons index, which does not allow for technical improvements, shows a rise in production of 62 per cent (table 3).

In 1936 capital construction by NKO, measured in current prices, increased by as much as 114 per cent, and investment in the armaments industries by 62 per cent (tables 7 and 10). NKO and armaments investment taken together increased from 8.1 to 11.9 per cent of all investment (table 11). Thus 1936 was an important stage in the shift towards rapid rearmament.

### 1937

In the effort during 1935 and 1936 to reconcile the competing claims of industrial development, rearmament and the consumer, state expenditure rapidly increased, and inflationary pressures grew throughout the economy. In July 1936 the Politburo issued directives about the 1937 plan which sought to stem inflation by returning to a more moderate economic policy, in particular by curbing investment. The directives fixed total investment in 1937 at 28.6 billion rubles, as compared with about 32 billion rubles in the 1936 plan; as investment costs were planned to decline in 1937, the finance provided for investment would be 20 per cent less than in 1936. The proposed cut also affected defence: NKO construction was set at 2250 million rubles, with a financial allocation of 1950 million, 18 per cent less than the final 1936 plan.<sup>72</sup>

The Gosplan proposal later in the year for investment in the armaments industries involved an even greater cut, from 2718 million rubles in the final 1936 plan to 1750 million in 1937. On December 7 Sovnarkom, in a decree on investment in 1937, approved an allocation of 2150 million, an increase of 400 million over the original plan.<sup>73</sup> This was not the end of the story. In January 1937 the Politburo reconsidered the matter and approved an allocation of 3015 million; this was to be achieved partly by reducing other capital investment by 3 per cent, partly by transfer from the budget reserve.<sup>74</sup> Investment in the armaments industries would thus amount to 9.7 per cent of all investment as compared with 6.9 per cent in the original draft plan.

Military equipment orders and NKO construction were the subjects of a similar lengthy dispute. In August 1936 NKO proposed that defence orders should amount to the huge sum of 13301 million rubles, 225 per cent of the revised 1936 plan;<sup>75</sup> 7594 million was eventually agreed, an increase of 28 per cent (table 7). In a memorandum to Molotov on December 26 Voroshilov pointed out that this level of military equipment orders would involve a reduction in the production plan for ships, rifles, guns, tanks and aircraft.<sup>76</sup> Construction by NKO was eventually fixed at the modest figure of 1875 million, substantially less than in 1936 (table 7). The proposed allocation to NKO

construction was also the subject of a strong but unsuccessful complaint from Voroshilov to Molotov, while within NKO Voroshilov's deputies complained that even Voroshilov's rejected proposal (3025 million) would not be adequate to meet the essential needs of the Air Force and the Far East.<sup>77</sup>

Available data on the results of the 1937 plan are incomplete. The plan for investment in the armaments industries may have been fulfilled: in July-December 1937 the allocations amounted to over 1500 million.<sup>78</sup> The NKO allocation to construction was exceeded (table 7). While military equipment orders increased by 24 per cent, only 70 per cent of the revised plan for military orders was fulfilled, as compared with 77 per cent in 1936. How far was this relatively poor performance due to the chaos resulting from the large number of arrests in the army and in the armaments industries during the 1937 purges? This remains to be established.

## Trends in the defence burden

If the size of the armed forces grew more rapidly than overall labour resources, and if defence production grew more rapidly than total output, it follows that defence outlays as a whole probably grew more rapidly than national resources. From this an increase in the defence burden is inferred. Here we touch on another approach to measuring the economic impact of defence activities - a direct comparison of defence outlays with national income. This can be done using either the Soviet net material product (NMP) concept or a western gross national product (GNP) measure. It can also be done at either current or constant prices.

When budget defence spending is compared with NMP, it tells us something about the burden of defence upon the material production sphere. NMP measures the total value of final goods, including intermediate services (e.g. freight transport) but not final services (e.g. passenger transport). Part of the defence budget is expended on final services such as the military services provided by armed forces personnel, but servicemen are enabled to supply their services because they are supported by the material production sphere. On the other hand budget spending can also be compared with GNP, and shows how society allocates its total of resources available among civilian and defence tasks, without making arbitrary judgements as to whether services are more or less basic to economic life than goods.

The defence burden can be measured in current or constant prices, and a different meaning is implied in each case. When both defence spending and national income are valued at constant prices, their changing proportion shows the changing relative scales of defence production and total output. However, a rising defence share of GNP at constant prices need not necessarily mean rising civilian sacrifice. For example, if over time defence goods became relatively cheaper, then a larger volume of defence goods could be supplied without detracting from resources allocated to civilian objectives; on the other hand, if they became relatively more expensive, then the same volume of defence goods would involve a rising opportunity cost in terms of other goals. This is revealed when the defence burden is calculated at currently prevailing prices. In short, the defence burden at constant prices shows changing relative volumes of production, but the same ratio at current prices suggests the welfare implications.

### *(A) Defence and national income*

It is much harder to compare defence spending with national resources than with the resources in the hands of government, as was done in table 1. One reason is that our national income measures for the mid-1930s are highly imperfect. National income at prevailing prices may be readily compared with budget totals and subtotals, but the figures available contain huge gaps. The official (or at least, officially accepted) series for net material product at prevailing prices is broken for 1931 and 1933-6. Abram Bergson calculated GNP at prevailing prices, but only for the benchmark years 1928 and 1937. The feasible comparisons are presented in table 15. Official figures based on an NMP accountancy (col. 1) make possible the following observations: in the late 1920s the defence burden on welfare was relatively low at 3 per cent or so, by comparison with the prerevolutionary benchmark of 1913, but the latter had been exceeded by 1932, and in 1937-40 the burden climbed to a level unprecedented in peacetime. If it had taken 7 years to double the defence share of the budget between 1930 and 1937, it took only 3 years to double it again between 1937 and 1940, when almost 15 per cent of national income was being consumed by defence. The recasting of national income at prevailing prices to a GNP basis by Bergson (col. 2) does not significantly alter this view; since the ruble value of GNP was a little larger than NMP, the level of the defence burden appears slightly lower, and its dynamic is the same.

Comparisons may also be carried out in real terms (i.e. at constant prices or costs), but again there are fundamental difficulties. Official figures of NMP expressed in the 'unchanged' prices of 1926/27 are generally considered unreliable and are not considered here. Western estimates of real Soviet GNP are preferable on this and other grounds. However, for our purposes defence outlays must first be computed in the same prices or costs as GNP. Bergson estimated GNP by end-use (including defence outlays) at adjusted factor costs of both 1928 and 1937, but only for those years. Moorsteen and Powell estimated GNP by sector of origin for every year after 1928, but there was no annual series for overall real defence outlays (as distinct from the procurement of weapons) to be compared with GNP.

Bergson's figures for GNP and defence outlays at constant 1937 factor costs are shown in table 15 (col. 3). In comparison with the defence share at prevailing prices (col. 2), these suggest a lower defence burden (1.3 per cent) in 1928, and a greater subsequent increase in the real volume of defence goods and services relative to total real output. The comparison shows that the welfare impact of the increase in the relative volume of defence activity was softened by the relative cheapening of defence items.

### *(B) Defence and wage incomes*

In order to find annual series which will throw at least some light on the dynamic of the defence burden during the second five-year plan period, we make use of a compromise measure of the defence burden on welfare: the total defence budget, divided by total employment, expressed relative to public sector wage earnings. The advantage of these figures is that they are available in annual series, and each series is relatively robust, but their drawback is that they do not give a full picture, since overall economic welfare is only imperfectly associated with wage incomes, and besides not all employees received the public sector wage (collective farmers were the most numerous exception). The

percentages which are computed do not mean that defence outlays were paid out of wages, only that the ratio between them can be expressed numerically.

The results of this comparison are shown in table 16 (col. 3). They show clearly a doubling of the defence burden - but from a low level - in the course of the first five-year plan. In 1932-5 this burden remained roughly flat at 5 per cent or so. In 1936 a sharp increase was marked, and the level of the burden now rose continuously, if unsteadily, to the unprecedented 'peacetime' level of 18 per cent in 1940.

## Conclusion

### *(A) The results of the second five-year plan*

Table 13 showed that defence expenditure in 1933-7 greatly exceeded the initial plan. It is difficult to establish whether the plan was overfulfilled in real terms; price increases which had not been anticipated took place during the last four years of the plan, and affected the different items of the defence budget in different ways. Construction by NKO amounted to a substantially higher proportion of total investment than originally planned, 5.1 per cent as compared with 3.4 per cent.<sup>79</sup>

In January 1937 the Politburo adopted a schedule of expected production capacities on January 1, 1938. In some cases capacities equal those which had been proposed for January 1, 1938, in the variants of the five-year plan discussed in the spring of 1933; in other cases there is a substantial gap.<sup>80</sup> As table 17 confirms, the large investments during 1933-7 certainly resulted in greatly increased production capacities, even in the crude terms of number of weapons. At the beginning of 1934 Voroshilov claimed that as a result of the developments during the first five-year plan mechanical horse-power per soldier was higher than in the armies of the main capitalist powers.<sup>81</sup> World rearmament proceeded rapidly in 1934-7. On the basis of the above figures the defence sector of Gosplan concluded in May 1937 that the Soviet Union lagged in the availability of tractors and vehicles, but it now had a capacity to provide more tanks per soldier than Germany and the United States, and greater fire-power per soldier per minute than any other power.<sup>82</sup> Ironically, this memorandum was completed at a time when the defence sector was being devastated by the arrest of Tukhachevskii and other senior soldiers, and of many leading personnel in the armaments industries.

### *(B) The second five-year plan in a long view*

The evolution of Soviet interwar defence spending can be divided into three phases. The first phase was one of economic demobilisation after the Civil War. After the immediate post-Civil War cutbacks defence outlays tended to drift upwards, but with economic recovery and the growth of the public sector the burden of defence on both national income and fiscal revenues tended to go on falling. This phase lasted until 1930.

In the second phase, which began in 1931, there was rapid rearmament and the real burden of defence outlays on national resources shifted to a higher level. The burden on government resources did not grow, because the government's share in national resources was now far larger than before. At the same time the change in pace of defence activity was greater than might appear on the surface from purely

quantitative measures. There was an increased rate of military-technical innovation, and obsolete weaponry was phased out, so that rearmament in the third phase would be based on new weapons of a much higher technical level.

Thus the second phase was no more than a brief transition to the third phase which began in 1936. In the third phase the growth of real defence spending accelerated sharply. Its relative burden also grew markedly and became unprecedentedly heavy by peacetime standards. Rapid rearmament gave way to intense mobilisation.

The period of the second five year plan must therefore be seen in its context. It began with rapid rearmament already under way. Before it was over, it also witnessed the transition from rapid rearmament to intense mobilisation, which came in 1936. This transition was one of considerable difficulty for the defence sector. The years 1934-6 were 'three good years' for production and living standards generally, but the armed forces struggled to achieve their programmes, lurching from setback to crisis before successfully forcing defence activity to a higher level in both quantity and quality.

Table 1. Budget outlays, total and on defence, 1928/29-1940 (million rubles and per cent)

	Budget total, million rubles	Defence outlays	
	1	million rubles 2	per cent of budget 3
1928/29	8784	880	10.0%
1929/30	13322	1046	7.9%
1930(4)	5038	434	8.6%
1931	25097	1790	7.1%
1932	37995	4034	10.6%
1933	42081	4299	10.2%
1934	55445	5393	9.7%
1935	73572	8174	11.1%
1936	92480	14858	16.1%
1937	106238	17481	16.5%
1938	124039	23200	18.7%
1939	153299	39200	25.6%
1940	174350	56752	32.6%

**Sources**

Plotnikov (1955), pp. 92, 132, 206, 215, 255, 261, 324, 423, 433, except 1931 from Davies (1993), p. 593, and 1932-6 for which see archival figures in table 7 (col. 4). Differences between archival and published figures are trivial for 1935 and 1936, and for 1937 the two coincide.

Table 2. Personnel of the  
Soviet regular armed forces  
(thousands)

	Series A	Series B
	1	2
1926/27	586	..
1928	..	..
1929	..	..
1930	..	..
1931	562	..
1932	638	..
1933	885	..
1934	940	..
1935	1067	..
1936	1300	..
1937	1433	1683
1938	1513	..
1939	..	2099
1940	4207	..

**Sources**

Series A: Hunter, Szyrmer (1992), p. 138.

Series B, 1937: AN SSSR (1991), p. 164; 1939: RAN (1992), pp. 241, 244.

Table 3. Alternative measures of the real growth of munitions procurement, 1928-1940 (1937 prices and per cent of 1937)

	Number of weapons procured (present estimate)	Munitions procure- ment from Moorsteen and Powell
	1	2
1928	..	4.5%
1929	..	5%
1930	13.7%	7%
1931	25.0%	7%
1932	53.5%	7%
1933	80.5%	7%
1934	80.8%	30%
1935	58.0%	50%
1936	94.2%	90%
1937	100.0%	100%
1938	171.4%	135%
1939	246.0%	200%
1940	287.8%	282%

**Sources**

- 1 Table A-7.
- 2 Moorsteen, Powell (1966), p. 629.



Table 4. Ships entering service with the Soviet Navy, 1930-41 (units and tons)

	Surface ships:			Submarines:			Combined tonnage:	
	units	tons total	per ship	units	tons total	per ship	total	per cent of 1937
	1	2	3	4	5	6	7	8
1930	1	600	600	1	934	934	1534	22%
1931	1	600	600	5	4690	938	5290	75%
1932	5	3000	600	..	..	..	3000	43%
1933	1	600	600	15	10845	723	11445	163%
1934	3	1452	484	34	7828	230	9280	132%
1935	3	1463	488	32	13777	431	15240	217%
1936	13	7360	566	46	25110	546	32470	462%
1937	6	2156	359	9	4869	541	7025	100%
1938	16	40474	2530	14	8800	629	49274	701%
1939	14	32048	2289	14	8845	632	40893	582%
1940	8	45058	5632	24	16390	683	61448	875%
1941 (Jan.-Jun.)	2	23230	11615	7	3980	569	27210	387%

**Sources**

Calculated from Korabli (1988), Dmitriev (1990) (figures supplied to the authors by Julian Cooper). Surface ships were light cruisers, battleships, destroyers, patrol boats, minesweepers, and gunboats.

Table 5. Nominal NKO outlays on military equipment compared with the number of weapons procured, 1930-40 (per cent of 1937)

	Number of weapons procured (present estimate)	Nominal NKO outlays on military equip- ment	'Typical unit' price index (col. 2 divided by col. 1)
	1	2	3
1930	14%	6-9%	44-66%
1931	25%	15%	60%
1932	53%	27%	51%
1933	80%	27%	33%
1934	81%	34%	43%
1935	58%	39%	68%
1936	94%	81%	86%
1937	100%	100%	100%
1940	288%	345%	120%

**Sources**

1 Table A-7.

2 1930-1: as Davies (1993), p. 594; 1932-7: table 7; 1940: Harrison (1996), p. 284.

3 Col. 2 divided by col. 1.

Table 6. Real defence outlays according to Bergson, 1928-40 (billion rubles and per cent of 1937)

	At 1937 prices:		At 1928 prices:	
	billion rubles	per cent of 1937	billion rubles	per cent of 1937
	1	2	3	4
1928	1.7	10%	.74	7%
1937	17.0	100%	10.60	100%
1940	45.2	266%	..	..

**Source**

Bergson (1961), pp. 128, 153.

Table 7. State budget appropriations to the NKVM/NKO (the defence budget), 1932-7 (million rubles at current prices and percent)

	Military equip- ment	Constr- uction	Main- tenance	Total	of which, per cent on equip- ment
	1	2	3	4	5
<b>1932</b>					
Actual	1532	900	1602	4034	38%
<b>1933</b>					
Budget	..	..	..	..	
amended	1753	678	2307	4738	
Actual	1506	620	2173	4299	35%
<b>1934</b>					
Budget	2494	812	2494	5800	
amended	2292	745	2764	5801	
Actual	1948	717	2729	5393	36%
<b>1935</b>					
Budget	2662	628	4202	7492	
amended	3194	1108	4983	9285	
Actual	2226	1186	4762	8174	27%
<b>1936</b>					
Budget	5420	2036	7349	14805	
amended	5914	2428	8180	16522	
Actual	4558	2518	7782	14858	31%
<b>1937</b>					
Budget	7594	1875	10569	20038	
amended	8108	1925	10588	20621	
Actual	5658	1936	10472	18066	31%

**Sources**

- 1932 Military equipment is from RGVA, 4/14/1667, 20 (dated January 10, 1936). For construction see Davies (1993), p. 593 - this is probably a planned figure, and therefore too high. The total figure is from GARF, 8418/10/148, 5 (report from the secret department of Narkomfin to Molotov, January 1935).
- 1933-5 For the amended budget and actual figures see RGAE, 4372/91/3217, 4 (report from the defence sector of Gosplan, dated May 11, 1937).

- 1934 The budget figure is from RGAE, 4372/91/1824, 56-5 (Gosplan report, dated January 31, 1934); ruble sums for separate items are calculated by us from percentages given in the source.
- 1935 The budget figure is from RGVA, 4/14/1667, 16 (report dated December 26, 1935). Another report in this file (dated January 3, 1936) (l. 17) gives the final budget as 9635 million rubles.
- 1936 RGVA, 51/2/444, 2-12 (report of the financial department of NKO, dated February 26, 1937); we have estimated actual outlays as credits opened less those unutilised. These figures *exclude* foreign currency outlays (11 million rubles in the original budget; 43 million as amended, and 24 million actually spent).
- 1937 For the original and amended budgets, see RGVA, 51/2/445, 1, 11, and for actual outlays *ibid.*, 13-14 (report of the financial department of NKO, dated June 13, 1938). These figures *include* foreign currency outlays (17 million in the original and revised budgets, and 11 million actually spent)

**Note**

Construction expenditure is given as credits *opened* for construction. Credits *utilised* were lower (from RGAE, 4372/91/3217, 3) (million rubles):

1933	532
1934	704
1935	1086
1936	2323

Table 8. Gross production of armament industries, 1932-7  
(million rubles at 'unchanged' 1926/27 prices)

	Series A		Series B		Series C	
	arma- ment	total	arma- ment	total	arma- ment	total
	1	2	3	4	5	6
1932	1500	2900	..	..	..	..
1932	..	..	1094	2084	..	2795
1933	..	..	1265	2083	..	2387
1934	..	..	1414	2742	..	3015
1935	..	..	..	..	..	4319
1936	..	..	..	..	3846	6620
1937 plan	6550	9140	..	..	6558	9054

**Sources**

Series A: RGAE, 4372/91/ 3217, 114-3 (report from the defence sector of Gosplan to the head of Gosplan, dated May 20, 1937).

Series B: GARF, 8418/10/148, 13 (report to Molotov, dated January 11, 1935); 1934 is preliminary.

Series C: RGAE, 4372/91/3217, 118-6 (May 20, 1937).

Table 9. Alternative measures of armament growth, 1933-7 (per cent of 1932)

	Military equipment orders (current prices)	Armament production (1926/27 prices)	Number of workers	Number of weapons (1937 prices)
	1	2	3	4
1933	98%	116%	91%	151%
1934	127%	129%	102%	151%
1935	145%	..	..	108%
1936	298%	256%	..	176%
1937	369%	437%	198%	187%

**Sources**

- 1 Calculated from table 7.
- 2 Table 8; 1937 is calculated as the planned figure compared with 1932 under series A, and those for 1933 and 1934 are compared with 1932 under series B.
- 3 Calculated from figures for defence industry employment in GARF, 8418/10/148, 13 (report to Molotov, dated January 11, 1935) and for 1937 RGAE 4372/91/3217, 114-3 (report from the defence sector of Gosplan to head of Gosplan, dated May 20, 1937), given as follows (thousands):

1932	324
1933	294
1934	331
1937 (expected)	643
- 4 Calculated from table 3, col. 1.

Table 10. Capital investment  
in armament industries, 1932-  
7 (million rubles at current  
prices)

	Plan	Fulfil- ment
	1	2
1932	702	778
1933	560	604
1934	874	761
1935	..	905
1936	1918	1467
1937	2972	..

**Sources**

1932 plan: GARF, 5446/57/16, 157 ('other', Sovnarkom decree dated December 13, 1931).

1932-6 fulfilment, 1937 plan: RGAE, 4372/91/3217, 115 (report of defence sector of Gosplan to head of Gosplan, dated May 20, 1937).

1933 plan: GARF, 5446/1/71, 63 ('other', Sovnarkom decree dated January 5, 1933).

1934 plan: GARF, 8418/9/200, 1-2 (appendix, dated February 16, 1934, to Sovnarkom decree, dated January 2, 1934)

1936 plan: GARF, 5446/57/40, 139-41 (Sovnarkom decree, dated February 8, 1936).

**Note**

1937 plan: on January 17, 1937, the Politburo approved 3,015 million rubles (see text of this paper).



Table 11. The share of defence in investment, 1932-1937 (per cent)

	Per cent of total investment			Per cent of industrial investment
	by NKO	by armament industries	by both	by armament industries
	1	2	3	4
<b>1932</b>				
plan	..	..	..	..
fulfilment	4.4%	3.8%	8.2%	7.5%
<b>1933</b>				
plan	3.8%	3.1%	6.9%	5.5%
fulfilment	3.0%	3.4%	6.4%	6.0%
<b>1934</b>				
plan	3.2%	3.5%	6.7%	6.8%
fulfilment	3.1%	3.4%	6.5%	6.5%
<b>1935</b>				
plan	3.0%	..	..	..
fulfilment	4.4%	3.7%	8.1%	7.2%
<b>1936</b>				
plan	6.3%	8.4%	14.7%	13.7%
fulfilment	7.3%	4.6%	11.9%	10.3%
<b>1937</b>				
plan	5.6%	9.1%	14.8%	21.3%
fulfilment	6.4%	..	..	..

**Sources**

Defence construction: table 7 (credits actually utilised).

Defence industry investment: table 10.

Total and industrial investment, 1932: Davies (1996), 506; 1933-7: Zaleski (1980), 647-58.

Table 12. Military equipment orders of NKVM-NKO, 1932-1937 (million rubles at current prices)

	Aircraft	Vehicles and tanks	Artillery stores	Chemical stores	Ship- building and naval aviation
	1	2	3	4	5
<b>1932</b>					
Plan	312	428	791	74	322
Actual	246	229	580	58	316
<b>1933</b>					
Plan	417	341	500	48	351
Actual	347	279	448	39	275
<b>1934</b>					
Plan	510	345	568	49	565
Actual	440	354	470	30	544
<b>1935</b>					
Plan	611	475	956	62	881
Actual	427	448	563	44	591
<b>1936</b>					
Plan	1608	1085	1391	87	1332
Actual	1104	937	1102	49	1000
<b>1937</b>					
Plan	2740	1037	2093	106	2194
Actual	1816	871	1403	75	1114

Continued.

Table 12 (continued)

	Railways	Exper- imental	Com- muni- cations and technical property	Engin- eering property	Total
	6	7	8	9	10
<b>1932</b>					
Plan	4	..	88	37	2057
Actual	3	..	64	35	1532
<b>1933</b>					
Plan	6	..	67	55	1784
Actual	5	..	62	43	1498
<b>1934</b>					
Plan	15	..	92	49	2184
Actual	7	..	56	46	1948
<b>1935</b>					
Plan	14	..	77+26	55	3158
Actual	13	..	73+12	56	2228
<b>1936</b>					
Plan	46	119	116+32	96	5914
Actual	39	88	112+33	92	4588
<b>1937</b>					
Plan	38	136	149+23	118	8274
Actual	30	67	134+30	92	5657

**Sources**

1932-5: RGVA, 4/14/1667, 20 (report of the financial department of NKO, dated January 10, 1936)

1936: RGVA: 51/2/444, 2ob-4 (report of the financial department of NKO, dated February 26, 1937)

1937: RGVA, 51/2/445, 66ob-68 (report of the financial department of NKO, dated June 13, 1938); includes small sums received for 'restoration of credits'. In addition to sums listed, 41 million rubles was allocated to 'packing for fuel', and 27 million rubles spent. The plan was cut by 400 million rubles (from 8674 to 8274 million) on account of planned price reductions.

Table 13. State budget appropriations to NKVM-NKO (the defence budget) in the first and second five-year plans (Oct. 1928-1932 and 1933-1937) (million rubles at current prices)

	Military equip- ment	Constr- uction	Main- tenance	Total
	1	2	3	4
<b>First five-year plan</b>				
Plan	1683	466	3386	5535
Actual	3919	1342	2683	7944
<b>Second five-year plan</b>				
Plan	13000	4480	14020	31500
Revised	20745	6924	28775	56444
Actual	15896	6977	27918	50791

**Sources**

First five-year plan: all figures, RGAE, 4372/91/1824, 53 (report by Gosplan, dated January 31, 1934).

Second five-year plan: original plan, as first five-year plan. Revised figures: RGAE, 4372/91/3217, 10 (report by defence sector of Gosplan, dated May 11, 1937); note that this figure approximately equals the sum of the annual budget plans. Actual figures: calculated from annual data in table 7.

Table 14. The defence budget for 1936  
(million rubles)

	NKO claim	Approved budget
	1	2
Military equipment	7735	5412
Construction	2108	2036
Maintenance	8163	7368
Total	18006	14816

**Sources**

- 1 RGVA, 4/14/1667, 1, 1ob, 2. The claim is said to be in 1935 prices, and therefore liable to be increased owing to the planned increase in metal and coal prices and the intended abolition of privileged prices for fuel.
- 2 RGVA, 4/14/1667, 16 (dated December 26, 1935); the figure for maintenance includes 866 million rubles for the increased price of fodder and food and 436 million rubles for increased servicemen's pay (consequent upon the increase of prices following the abolition of rationing).

Table 15. The defence burden, from TsSU and Bergson, 1928-40 (per cent)

	TsSU, per cent of NMP at prevailing prices	Bergson, per cent of GNP: at prevailing prices		at factor costs of 1937
	1	2	3	3
1913	4.5%	..	..	..
1928	3.0%	2.4%	1.3%	
1929	3.1%	..	..	
1930	3.2%	..	..	
1931	..	..	..	
1932	4.5-4.8%	..	..	
1933	..	..	..	
1934	..	..	..	
1935	..	..	..	
1936	..	..	..	
1937	7.2%	6.2%	7.9%	
1938	9.0%	..	..	
1939	11.9%	..	..	
1940	14.7%	13.0%	17.3%	

**Sources**

- 1 The defence share in 1913, from Davies (1993), p. 000. NMP in 1928-30 from Wheatcroft, Davies (1985), p. 127; in 1932 from Davies (1996), p. 505; in 1937-45 from RGAE, 4372/95/168, 79-80. Defence outlays in 1913 from Davies (1958), p. 65; other years from table 1, cols 2, 3, adjusted to calendar year.
- 2, 3 Calculated from Bergson (1961), pp. 46, 128.

Table 16. The defence burden in proportion to labour incomes, 1928-40

	Public sector annual earnings, rubles	Total employment, thou.	Defence outlays per person in employment, full time equivalent	
	1	2	rubles	per cent of earnings
	1	2	3	4
1929	800	51100	19.66	2.5%
1930	936	51500	23.65	2.5%
1931	1127	52800	33.90	3.0%
1932	1427	53400	75.54	5.3%
1933	1566	54200	79.32	5.1%
1934	1858	57700	93.47	5.0%
1935	2274	62800	130.35	5.7%
1936	2770	62300	238.89	8.6%
1937	3047	66000	264.86	8.7%
1938	3467	69100	335.75	9.7%
1939	3867	71600	..	..
1940	3972	79100	717.47	18.1%

**Sources**

- 1 Zaleski (1971) pp. 344-5; Zaleski (1980), pp. 562-3, 592-3.
- 2 Total employment (full time equivalents) from Moorsteen, Powell (1966), p. 643.
- 3 Defence outlays from table 1, cols 2, 3, adjusted to calendar year, divided by col. 2.
- 4 Col. 3, divided by col. 1.

Table 17. The output of weapons, 1933 and expected for 1938 in 1937 (units)

	January 1, 1933	Expected Jan. 1, 1938, on Jan. 17, 1937
	1	2
Guns (thou.)	11.2	38.5
Shells (million)	45.5	100
Rifles (million)	1.4	..
Machineguns (thou.)	114	250
Aircraft (thou.)	7.5	20.5
Aeroengines (thou.)	15.4	42.3
Tanks (thou.)	10.5	35.4
Gunpowder (thou. tons)	43	139

**Sources**

- 1 RGAE, 4372/91/1445, 181-80 (memorandum from the defence sector of Gosplan, dated April 4, 1933).
- 2 RTsKhIDNI, 17/162/20, 193-4 (Politburo decision, dated January 17, 1937).



## Appendix: the number of weapons, 1930-40

In this appendix we ask how the sheer number of weapons available for acquisition by the Soviet armed forces changed over the 1930s. The 'number of weapons' means numbers of fighters, bombers, heavy and light tanks, large- and small-calibre guns, and so on, weighted by relative 1937 values. This takes no account of the changing technical level and performance of a fighter aircraft, medium tank, large-calibre gun, and so on, but is still better than nothing. It relies on series chiefly (not exclusively) for NKO procurement of 18 separate lines of defence output, roughly priced from NKO files for 1937 as follows:

table A-1: NKO procurement of *armament* (4 series: small-, medium-, large-calibre artillery, mortars), and *small arms* (2 series: rifles, machine guns)

table A-2: NKO procurement of *ammunition* (4 series: shells, mortar shells, bombs, rifle cartridges)

table A-3: Gosplan figures for production of *tanks* (3 series: heavy, medium, light)

table A-4: NKO procurement of *aircraft* (5 series: fighters, bombers, reconnaissance, trainers, passenger etc.), partly from NKO files, partly from published sources).

In tables A-5 and A-6 these series are compared with previously published figures for defence output. They show clearly that the latter figures were really figures for procurement, not production. Evidence of discrepancies between production and procurements is confined to tanks and aircraft. In the case of tanks divergences are small: it is apparent from table A-5 (cols 2, 3) that production and procurement coincided closely in most years. Therefore, in computing an overall procurements index, in the case of tanks I substitute production figures for the sake of their greater detail. Larger discrepancies arise in the case of aircraft (table A-6). Procurements fell substantially below the quite detailed production figures recently published by Gennadii Kostyrchenko in all years (it appears on the surface that the latter had more in common with procurement plans than with outcomes). Probably civilian procurement was an important factor, but direct evidence is lacking.

In table A-7 the representativeness of the series used is considered, and a summation is carried out. The first step is to calculate series for each group of weapons separately using the constant 1937 prices shown in each table (A-1 to A-4). This yields the figures shown in columns 2-5 of table A-7.

Next is to ascertain the representativeness of the figures used compared with total NKO procurements in 1937. The last rows of table A-7 show that the product series underlying the table accounted for roughly half the total of defence procurement in 1937, including three quarters of aircraft purchases, but only one eighth of ammunition. Lack of representativeness is to be explained partly by deficient coverage of product series, partly by understatement of typical procurement costs in 1937. Some account must be taken of these factors, because otherwise our measure would be excessively dominated by aircraft, which represented only 45 per cent of the value of military equipment orders in 1937 (1,803/4,014 million rubles), compared with two thirds of the 1937 value of the product series used in our calculations (1,348/2,020 million rubles). To compensate for this, each series (cols 2-5) is divided by its percentage of representativeness in 1937 before summing across the columns to arrive at the total (col. 1).

The series shown in table A-7 under col. 1 is therefore the final result. Perhaps it is worth reminding the reader how the ruble values should be interpreted; they indicate the crude *number of weapons* procured in any given year, valued *as if they were typical weapon units of 1937*, not taking into account the changing technical and quality characteristics of each weapon series.

Table A-1. NKO procurement of armament and small arms, 1930-1940  
(physical units)

	Artillery (calibre)			Mortars	Rifles (thou.)	Machine guns (thou.)
	small	medium	large			
	1	2	3	4	5	6
Rubles per unit	20000	70000	240000	5000	150	500
1930	344	600	8	..	126	9.6
1931	1040	870	1	55	174	40.9
1932	972	1576	26	..	224	45
1933	2884	1703	51	..	241	32.6
1934	2521	1527	75	..	303	29.2
1935	3395	974	14	..	221	31.8
1936	3695	1513	27	..	403	31.1
1937	3738	1656	49	1587	567	74.6
1938	7300	5262	125	377	1171	112
1939	8965	7224	270	4457	1497	96.4
1940	7063	6437	224	38349	1461	..

**Source**

Procurement figures are from GARF, 8418/25/14, 2-3, cited by Simonov (1996), pp. 84, 91, 92, 112, 129. Typical unit prices are estimated freehand from sources listed above and other evidence, direct and indirect.

Table A-2. NKO procurement of ammunition, 1930-1940  
(physical units)

	Shells (thou.)	Mortar shells (thou.)	Bombs (thou.)	Rifle cartridges (thou.)
	1	2	3	4
Rubles per unit	10	5	10	0.04
1930	790	..	14	235
1931	751	..	316	234
1932	1224	..	147	260
1933	2135	..	317	311
1934	1504	..	369	191
1935	1578	..	154	612
1936	5200	..	..	722
1937	4924	..	795	1015
1938	12426	603	1728	1848
1939	18099	2741	2834	2194
1940	14921	18285	7691	2820

**Source**

As table A-1.

Table A-3. Tank production from  
Gosplan, 1930-1940 (physical units)

	Heavy 1	Medium 2	Light 3
Rubles per unit	500000	200000	100000
1930	..	..	170
1931	..	247	493
1932	..	396	2643
1933	2	1046	2771
1934	10	1155	2394
1935	7	532	2455
1936	15	1150	2770
1937	10	816	732
1938	11	1198	1061
1939	6	1472	1508
1940	243	833	1620

**Sources**

Production figures are from RGAE, 4372/99/1001, 20-21, except 1930 for which we use NKO procurement (as table A-1), and 1931 for which the figure of 247 medium tanks procured is calculated as a total NKO procurement of 740 (as table A-1), minus 493 light tanks (as col. 3). Typical unit prices are estimated freehand as table A-1.

Table A-4. NKO procurement of aircraft, 1930-1940 (physical units)

	Fighters	Bombers	Recon- naissance	Trainers	Passenger and other
	1	2	3	4	5
Rubles per unit	150000	700000	150000	60000	500000
1930	326	52	328	160	32
1931	120	100	389	172	79
1932	74	72	659	700	229
1933	336	291	1083	951	291
1934	570	392	1172	674	301
1935	776	59	416	163	198
1936	938	341	553	470	386
1937	2129	1303	277	655	71
1938	2016	2017	197	1111	128
1939	4150	2744	586	2997	281
1940	4657	3674	122	1891	221

**Sources**

The source for table A-1 gives figures only for the total of units procured, and for fighters and bombers separately (cols 1 and 2 above) for years after 1930. The division of the total for 1930, and of all aircraft other than fighters and bombers for years after 1930 among relatively inexpensive reconnaissance and trainer aircraft (cols 3 and 4) and much more costly passenger and transport aircraft (col. 5) is estimated on the basis of the proportions suggested by Kostyrchenko (1992), pp. 432-3. Typical unit prices are estimated freehand as table A-1.

Table A-5. Tank and armament production and procurement, 1930-1940: alternative figures (physical units)

	Tanks product- ion pre- viously published	product- ion from Gosplan	procure- ment by NKO	Guns product- ion pre- viously published	procure- ment by NKO	Rifles product- ion pre- viously published	procure- ment by NKO
	1	2	3	4	5	6	7
1930	170	..	170	952	952	126	126
1931	740	493	740	1966	1911	174	174
1932	3038	3039	3038	2574	2574	224	224
1933	3509	3819	3509	4638	4638	241	241
1934	3565	3559	3565	4123	4123	303	303
1935	3055	2994	3055	4383	4383	222	221
1936	4800	3935	4804	4324	5235	403	403
1937	1559	1558	1559	5473	5443	578	567
1938	2271	2270	2271	12340	12687	1175	1171
1939	2950	2986	2986	17348	16459	1503	1497
1940	2794	2696	2790	15300	13724	1461	1461

**Sources**

1, 4, 6 Harrison (1985), p. 250.

2 RGAE, 4372/99/1001, 20-21.

3, 5, 7 As table A-1.

Table A-6. Aircraft production and procurement, 1930-1940: alternative figures (units)

	Production previously published	NKO procurement		Production from Kostyrchenko	
	1	realised 2	planned 3	series A 4	series B 5
1930	899	899	1232	1149	1138
1931	860	860	2024	1489	1348
1932	1734	1734	3496	2509	2460
1933	2952	2952	3332	4115	4093
1934	3109	3109	3595	4455	4453
1935	2529	1612	2337	2529	2521
1936	3770	2688	4169	4270	4274
1937	4435	4435	4896	6039	6033
1938	5467	5469	7500	7727	7690
1939	10382	10758	9091	..	10336
1940	10565	10565	13864	..	9776

**Sources**

- 1 Harrison (1985), p. 250.
- 2, 3 As table A-1.
- 4 Kostyrchenko (1992), p. 431.
- 5 Kostyrchenko (1992), pp. 432-3.



Table A-7. The number of weapons in military procurement, 1930-1940, valued as typical weapons of 1937 (million rubles and per cent)

	Total	Arma- ment	Ammun- ition	Tanks	Aircraft
	1	2	3	4	5
<b>Value (million rubles)</b>					
1930	551	75	17	17	160
1931	1002	129	20	99	196
1932	2145	192	24	344	317
1933	3230	242	37	487	619
1934	3241	235	26	475	727
1935	2327	188	42	355	329
1936	3779	262	81	515	684
1937	4014	333	98	241	1348
1938	6881	778	218	351	1874
1939	9873	1045	311	448	2952
1940	11552	1057	430	450	3512
<b>Representativeness in 1937</b>					
Value of units procured (million rubles)					
	2020	333	98	241	1348
Equipment outlays in budget (million rubles)					
	4014	661	735	814	1803
Representativeness of units (per cent)					
	50%	50%	13%	30%	75%

**Source**

Values of units procured are estimated from tables A-1 to A-4.

Representativeness is calculated as estimated values of units procured in 1937 divided by nominal outlays in budget (from RGVA, 51/2/445, 5-6, 67-8).

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## Endnotes

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<sup>1</sup> An earlier draft of this paper was presented to the Soviet Industrialisation Project seminar at the Centre for Russian and East European Studies, University of Birmingham. We are grateful to the participants for valuable discussion, and especially to Julian Cooper and Lennart Samuelson for comments and other assistance acknowledged below. We wish to thank staff and researchers at the various Russian archives listed at the end of the paper. Finally, we thank the ESRC for financial support of our projects on “The Soviet defence industry complex from Lenin to Khrushchev” (grant no. R000221176) and “Economic development and centre-local relations in the Soviet command economy” (grant no. R000235636).

<sup>2</sup> See Cooper (1976), p. 35 and table 1 below. The figure given for 1933 as the actual expenditure in Davies (1993), p. 593, was evidently the planned estimate, though this was not stated in the archival source.

<sup>3</sup> See Cooper (1976), p. 35, and table 1 below.

<sup>4</sup> For these memoranda see *Vestnik MID*, no. 3 (61), 1990, pp. 70-1.

<sup>5</sup> RTsKhIDNI, 17/162/17, 119; GARF, 5446/57/35, art. 23/6ss. The Politburo decision was taken by correspondence. A further Politburo decision by correspondence on February 19 resolved that NKO should prepare data on military expenditure for the League of Nations Yearbook and submit it to the Politburo for approval (RTsKhIDNI, 17/162/17, 104). These documents were not available for the account in Davies (1993), pp. 581-2.

<sup>6</sup> *Vestnik MID*, no. 3 (61), 1990, p. 76, and the further memorandum from the NKO of April 4 (*ibid.* p. 79 - clause 6).

<sup>7</sup> GARF, 8418/10/148, 5.

<sup>8</sup> RTsKhIDNI, 17/162/19, 16 (decision by correspondence); the same decision was adopted as a Sovnarkom decree on the following day (GARF 5446/57/38, 183 - art. 2673/441s).

<sup>9</sup> See Cooper (1976), p. 35 and table 1 below.

<sup>10</sup> RTsKhIDNI, 17/162/17, 159-60 (decision by correspondence).

<sup>11</sup> GARF, 8418/8/137, 11-12 (appendix to Sovnarkom decree dated January 5, 1933).

Figures cited by Davies (1993), p. 593, similarly showed that in January-March 1933 the total allocation to defence purposes was 39.8 per cent greater than the allocation to NKVM. The 1935 budget showed an even higher proportion of non-NKO defence expenditure: GARF, 8418/10/129, 1-2 (decree of Commission of Defence dated April 2, 1935, which does not, however reveal a figure for internal and security troops).

<sup>12</sup> For numbers in the labour force (1926/27 - 83.7m, 1932 - 88.6m, 1937 - 89.6m, 1940 - 100.8m), see Eason (1963), p. 77.

<sup>13</sup> RGVA, 33988/3/81, 39 (Red Army staff memorandum, August 5, 1927); the authors are grateful to Lennart Samuelson for this reference.

<sup>14</sup> The result is notably in agreement with the index of munitions procurement prices computed independently by Bergson (1961), 72, which showed 1928 as 60 per cent of 1937, and 1940 as 120 per cent.

<sup>15</sup> Moorsteen, Powell (1966), pp. 622-3.

<sup>16</sup> RGAE, 2097/1/1051, 17-18 (November 15, 1929).

<sup>17</sup> For further detail see Simonov (1996), pp. 38-41.

<sup>18</sup> Tupper (1982).

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<sup>19</sup> Kostyrchenko (1992), pp. 432-3. Kostyrchenko's figures for total output differ somewhat from the procurement figures used in table A-4 (for further discussion see the appendix).

<sup>20</sup> Iakovlev (1979), pp. 24, 32.

<sup>21</sup> Simonov (1996), pp. 91-2.

<sup>22</sup> These difficulties are attested by a variety of reports and memoranda in RGVA, 4/14/1298, 140-44 (Efimov to Voroshilov, September 9, 1935), 145 (Voroshilov to Piatakov, December 2, 1935), 147 (Kaganovich to Molotov), 150 (Gamarnik to Molotov, October 1935), 151-2 (Efimov to Tukhachevskii and Pavlunovskii, January 31, 1935); RGVA, 4/14/1315, 198-201 (Pavlunovskii to Voroshilov, November 4, 1935).

<sup>23</sup> Holland Hunter and Janusz M. Szyrmer have recently produced a new estimate of real defence outlays estimate in annual series between 1928 and 1940 (Hunter, Szyrmer (1992), pp. 41). This estimate therefore fills in the gaps between benchmark years left by Bergson, but contains several disadvantages. Calculated in 'balanced' 1928 prices, it generally confirms a picture of rapid growth (the prices are described as 'balanced' because they are derived from an input/output table after balancing). It shows somewhat less real growth than either of Bergson's (an 8-fold increase over 1928-37, and a 2.3-fold further increase to 1940). This reverse Gerschenkron effect is surprising and implausible. Unlike Bergson, Hunter and Szyrmer did not disaggregate defence outlays and deflate the components independently. Instead, they simply deflated total nominal defence outlays by an index of wages of engineering workers, with the intention 'to capture at least most of the inflation in the cost of military equipment' (Hunter, Szyrmer (1992), p. 299). The wage index used ended in 1934 and Hunter and Szyrmer extended it to 1940 by guesswork. Regardless of the reliability of the wage index, this meant assuming in addition that wage earnings in engineering and the defence industry moved together, that unit total costs in the defence industry moved in proportion to wage earnings, and that the costs of maintenance and operation of the armed forces moved in line with weapon costs. It appears likely that Hunter and Szyrmer underestimated the true change in the volume of defence activity by understating productivity growth and cost reductions in the defence industry, if for no other reason. For the early 1930s the Hunter/Szyrmer series also suffers from the official concealment of rearmament: there is therefore a false break in the series in 1934, when official distortion ended. It appears, however, to confirm a true break in 1936, with a 60 per cent estimated increase in real defence spending in a single year.

<sup>24</sup> RGAE, 4372/91/2196, 1-2 (report from the head of the special sector of TsUNKhU to the head of the defence sector of Gosplan, January 4, 1934).

<sup>25</sup> This arises from a comparison of prices given in RGVA, 4/14/880, 13-14 (Khrulev to Voroshilov, January 17, 1933), with prices listed by sources given in footnote 25.

<sup>26</sup> RGVA, 4/14/1626, 9 (Red Army General Staff memorandum dated August 25, 1936); RGAE, 7733/36/40, 109 (appendix to Sovnarkom decree dated December 17, 1936); RGVA, 51/2/441, 62-3 (decree no. 108 of the Sovnarkom defence committee of September 3, 1937).

<sup>27</sup> RGVA, 4/14/1626, 15 (Egorov to Voroshilov, November 3, 1936).

<sup>28</sup> RGAE, 4372/91/3106, 94-3 (dated December 12, 1936) (510 million rubles out of a total of 5,912 million was attributed to price increases).

<sup>29</sup> For the I-16 in 1936 see Simonov (1996), p. 104, and for the I-5 in 1934, RGVA, 4/14/1287, 132-4 (undated memorandum) (according to RGVA, 4/14/880, 14, the 1932 price of an I-5 had been only 24,500 rubles).

<sup>30</sup> For 1931, see Davies (1993), pp. 594, 596; for 1933, see table 8 (figures corrected as compared with those in Davies (1993)).

<sup>31</sup> The NKVM budget (fulfilment) in current prices was (million rubles):

	1928/29	1933
Military equipment	291	1506
Construction	60	532 <sup>a</sup>
Maintenance	499	2173
Total	850	4211

<sup>a</sup> Credits actually used.

For 1928/29, see Davies (1993), p. 593 (table 2), and for 1933, see table 7. Expenditure in 1933 may be recalculated roughly as follows:

*Military equipment*: if prices remained roughly stable (to allow for falling prices of existing products, and hidden inflation in prices of new products), 1933 value in 1928/29 prices = 1500 million rubles.

*Construction*: if costs increased by one-third, 1933 value in 1928/29 prices = 400 million rubles.

*Maintenance*: the number of soldiers increased by 60 per cent. If real maintenance per head remained constant, the value of 1933 maintenance in 1928/29 prices would be maintenance in 1928/29 at current prices of 500 million rubles x 1.6 = 800 million rubles. Thus the total value of 1933 NKVM budget in 1928/29 prices was 2700 million rubles, or just over 300 per cent of 1928/29.

<sup>32</sup> Powell (1959), p. 465 (materials at destination).

<sup>33</sup> These figures are obtained as follows:

	Share of 1932 budget (% of total)		Real outlays, 1937 (% of 1932)		Real outlays, 1937 (% of total 1932 budget)
Military equipment					
higher	38	x	369	=	140
lower	38	x	198	=	75
Construction	22	x	141	=	31
Maintenance	40	x	191	=	76
Total					
higher	100		247		247
lower	100		182		182

<sup>34</sup> Gross investment in fixed capital in 1937 (per cent of 1932) was 183 in current prices and 156 in 1937 prices, indicating a price increase of 17 per cent (Moorsteen and Powell (1966), pp. 387, 391; these figures exclude capital repairs).

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<sup>35</sup> In current prices investment in the defence industries increased from 203 million rubles in 1929/30 to 758 or 778 million rubles in 1932 (see Davies (1993), p. 597, and table 10 below). According to Moorsteen and Powell, the cost of investment increased by about 65 per cent when measured in 1937 prices, about 26 per cent when measured in 1928 prices (compare data in Moorsteen and Powell (1966), pp. 388, 389-391). Using the higher cost index, defence industry investment in 1932 was at least 2.2 times the 1928 level in real terms.

<sup>36</sup> Decree of Revolutionary Military Council dated July 27, 1932 (RGVA, 4/18/22, 380).

<sup>37</sup> Memorandum dated August 31, 1932 (RGVA, 4/18/22, 461).

<sup>38</sup> Politburo resolution by correspondence (RTsKhIDNI, 17/162/14, 24), incorporated in Sovnarkom decree dated December 16, which also stated that Narkomfin, Gosplan and NKVM should consider a further reduction (GARF, 5446/57/21, 168, no. 1855/385ss). A decree of STO (Council of Labour and Defence) dated December 5, 1932, fixed a detailed plan for military equipment orders of 1858 million rubles (RGVA, 33988/3/231, 28).

<sup>39</sup> Report by Zhuravlev, head of the special sector of TsUNKhU, to Botner, head of the defence sector of Gosplan, dated January 4, 1934 (RGAE, 4372/91/2196, 1-2).

<sup>40</sup> See table 12, and for production in 1926/27 prices Davies (1993), p. 596, and the figures for the aircraft industry in a memorandum attached to a report on the military chemical industry (RGAE, 4372/91/2112, 37-6), which show an increase in military aircraft production from 262 million rubles in 1932 to 442 millions in 1933.

<sup>41</sup> See Khlevnyuk and Davies (1993), pp. 36-7, 72.

<sup>42</sup> During the first five-year plan investment in the armaments industries amounted to at most 1700 million rubles (see Davies (1993), p. 597 for 1929/30-1932; I have assumed that investment in 1928/29 was about 180 million rubles, which is probably too high), and total investment was 60 billion rubles. The alternative investment plans for 1933-7 were 4263 and 2925 million rubles, out of a total of about 100 billions (RGAE, 4372/91/1445, 181-174 (report to Kuibyshev and Mezhlauk in Gosplan from the head of its defence sector, dated April 4, 1933); and see Samuelson (1996), p. 214; for total investment planned see Khlevnyuk and Davies (1993), p. 72).

<sup>43</sup> See Samuelson (1996), p. 213; RGAE, 4372/91/1445, 181-179.

<sup>44</sup> See Samuelson (1996), p. 216, citing RGAE, 4372/91/1445, 43.

<sup>45</sup> For planned expenditure in the economy as a whole, see Gosplan (1934), vol. 1, p. 421. This document reported that 1933-7 expenditure on administration and defence taken together would be only 19 billion rubles; this was obviously the falsified figures for defence which prevailed until the end of 1934.

<sup>46</sup> For defence expenditure, see tables 1 and 7; for total budget expenditure, see Narkomfin (1935), p. 169.

<sup>47</sup> For the investment expected in 1933, 533 million rubles, see Davies (1993), p. 597 (from a document dated January 31, 1934). For the 1934 plan see also table 10.

<sup>48</sup> RGVA, 4/14/1883, 25 (report dated January 7, 1937).

<sup>49</sup> This is based on credits actually utilised in NKO construction (1933 - 532 million rubles, 1934 - 704 million rubles), as given in the note to table 6.

<sup>50</sup> RGVA, 4/14/1667, 16.

<sup>51</sup> RGVA, 4/14/1667, 16 (3144 million), 20 (3158 million), 1 (3450 million). The principal Politburo decisions authorising these increases were RTsKhIDNI, 17/162/18, 44 (May 22), and 75 (June 28).

<sup>52</sup> RGVA, 4/14/1298, 140-4 (report from Efimov, deputy head of armament of the Red Army, to Voroshilov, dated September 9, 1935), 4/14/1315, 198-208 (report from Pavlunovskii to Voroshilov, November 4, 1935).

<sup>53</sup> GARF, 8418/10/31, 52 (Korolev's report of October 14, 1935).

<sup>54</sup> GARF, 8418/10/31, 21 (report from Kakhianian and Berezin of the Commission of Party Control dated October 5, 1935).

<sup>55</sup> RGVA, 4/14/1298, 142 (memorandum by Efimov to Voroshilov, September 9, 1935).

<sup>56</sup> RGVA, 4/14/1298, 147 (M. Kaganovich, deputy people's commissar for heavy industry, to Molotov, September 9, 1935).

<sup>57</sup> RGVA, 4/14/1298, 149 (Pavlunovskii to Premudrov in Molotovo, August 12-13, 1935); for Gamarnik's letters of October 1935 see *ibid.* 148, 150.

<sup>58</sup> GARF, 8418/10/31, 65, 65ob, 66 (dated November 11).

<sup>59</sup> GARF, 8418/10/31, 9 (decision dated December 2, 1935).

<sup>60</sup> RGVA, 4/14/1883, 25 (report dated January 7, 1937).

<sup>61</sup> See RGVA, 4/14/1667, 11 (report to Voroshilov from the financial department of NKO, dated December 14, 1935).

<sup>62</sup> According to a decree of the Defence Committee dated April 2, 1935, it was planned at only 494 million rubles, a cut of 35 per cent (GARF, 8418/10/129, 1-2).

<sup>63</sup> For Stalin's corrections, see *Izvestiia TsK*, no. 1, 1990, pp. 160-70.

<sup>64</sup> *Izvestiia TsK*, no. 2, 1990, pp. 211-2; in his letter Litvinov criticised the Soviet press for its 'Tolstoian position of non-resistance to evil' in relation to Germany.

<sup>65</sup> RTsKhIDNI, 17/162/18, 24 and 35-7 (dated May 10).

<sup>66</sup> RTsKhIDNI, 17/162/18, 123 (dated August 28).

<sup>67</sup> The financial provision would increase from 1105 to 2208 million rubles; construction in real terms would increase more rapidly, as costs were planned to fall by 8 per cent (GARF, 5446/57/37, 92 - art. 1632/254s dated July 28).

<sup>68</sup> For the claim see RGVA, 4/14/1667, 1, 1ob, 2. The claim was said to be in 1935 prices, and therefore liable to be increased owing to the planned increase in metal and coal prices and the intended abolition of privileged prices for fuel. For the budget see RGVA, 4/14/1667, 16 (dated December 26, 1935); the figure for maintenance includes 866 million rubles for the increased price of fodder and food and 436 million rubles for increased servicemen's pay (consequent upon the increase of prices following the abolition of rationing). These budget estimates differ slightly from those cited in table 7.

<sup>69</sup> RTsKhIDNI, 17/162/19, 45 (Politburo resolution of February 8, 1936); GARF, 5446/57/40, 139-41 (Sovnarkom decree, art. 217, same date).

<sup>70</sup> RGAE, 4372/91/3217, 4 (report by the Gosplan defence sector to the head of Gosplan, dated May 11, 1937); planned military equipment orders were increased by 8 per cent and construction in NKO by 24 per cent. The final figure for investment in the armaments industry of Narkomtiazhprom was 2718 million, but the coverage of this figure may have been broader than that of the earlier plan.

<sup>71</sup> See notes 26 and 27 above.

<sup>72</sup> See Khlevnyuk and Davies (1993), p. 52; and GARF, 5446/57/42, 114-22 (decree of July 19, 1936 - art. 1282/226s).



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<sup>73</sup> GARF, 5446/57/43, 198-201 (art. 2075/413ss).

<sup>74</sup> RTsKhIDNI, 17/162/20, 162-3, 190-2 (decision of January 17); RGVA, 51/2/441, 48 (Sovnarkom decree of January 19, 1937. Of the total, 2254 million was allocated to the People's Commissariat for the Defence Industry, which was split off from Narkomtiashprom in December 1936, and the remainder to Narkomtiashprom.

<sup>75</sup> RGVA, 4/14/1626, 8 (memorandum of the acting head of the fifth department of the General Staff, dated August 25).

<sup>76</sup> RGVA, 4/14/1814, 12.

<sup>77</sup> RGVA, 4/14/1819, 1-6, 20, 33 (memoranda of October 7 and 29, and an unsigned, undated draft memorandum on Gamarnik's visit to the Far East, headed 'Budget of NKO'). A decree of Sovnarkom dated January 5, 1937, allocated 2132 million rubles to NKO construction (GARF, 5446/57/45, 2). But according to the report on the results of the 1937 budget the initial budget allocation was only 1875 million, plus 150 million advance credits already provided in 1936 (RGVA, 51/2/445, 1)

<sup>78</sup> GARF, 5446/57/48, 135 (June 28, 1937), 5446/57/50, 97-119 (September 27), 5446/57/51, 72 (October 25). By October 1, 2081 million rubles had been expended, and on October 25 a further 981 million were allocated for October-December.

<sup>79</sup> The plan was 4.5 out of 133.4 billion rubles; actual expenditure was 6.98 out of 137.5 million.

<sup>80</sup> For the variants in spring 1933 see Samuelson (1996), p. 213, citing RGAE, 4372/91/1445, 181-80.

<sup>81</sup> *XVII s"ezd* (1934), pp. 228-32.

<sup>82</sup> RGAE, 4372/91/3217, 131-28 (memorandum dated May 22, 1937).