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THE PERFORMANCE OF THE SOVIET ECONOMY: PAST, PRESENT, AND FUTURE

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I. Some Highlights of the Past, 1928-1980

Introduction

The Soviet Union launched its First Five Year Plan on October 1, 1928. Its economic achievements over the next 10 years were nothing short of spectacular, particularly when viewed against the backdrop of a western industrialized world floundering in the Great Depression, experiencing unemployment, collapse of international trade, default on international debts, and the like. In this period, the USSR put its unemployed labor to work, invested massive amounts in heavy industry laying the basis for industrialization, largely wiped out illiteracy and significantly raised the educational as well as technical level of its population, and moved excess labor out of agriculture and into industry where it was now needed. All of these policies contributed to rapid economic growth, modernization and industrialization of the economy, and to providing the prerequisites for the military strength to stem the German invasion a few years later. The rates of growth of GNP and of industrial production over the first two Five Year Plans (1928-1937) were virtually unprecedented. GNP grew by between 6 and 11 percent a year (depending on whether one uses early or late year price weights) and industrial production by between 10 and 18 percent annually (depending again on price weights and on methodologies employed by different estimators). All was not rosy, however. Growth slowed significantly between 1938 and 1941 as prepara-

tions for war began and as the economy was disrupted by the political trials and imprisonment in forced labor camps of several millions of people, many with important management positions in the non-agricultural economy. Further, agricultural output stagnated under forced collectivization and the standard of living of the population was probably less in 1940 than it had been in 1928 or even 1913.

The USSR suffered enormous physical devastation during World War II and, in addition, ended the War with at least 20 million dead and a birth deficit of another 20 million. The War was hardly over before reconstruction was begun. Within 4 or 5 years, current output had regained prewar levels and the nation was off on a running start into the 1950s. Again economic progress was praiseworthy. GNP grew by about six percent and industrial production by 10 percent per annum between 1950 and 1960 (Tables one and two). Moreover, in comparison with the no-growth record of the 1930s, Soviet agricultural output rose annually by about five percent in the 1950s and per capita household consumption by almost the same amount. At this point in time, however, the Soviet performance was no longer unique. A number of nations in both Eastern and Western Europe were growing as fast, and some were growing even faster.

That all might not be well with the Soviet economic juggernaut was brought dramatically to the attention of the world by Khrushchev's decision in 1957 not to complete the Fifth Five Year Plan and to substitute for it a Seven Year Plan running from 1958 through 1965. At the same time, it was announced that the Soviet economy was to be completely reorganized. The reorganization didn't solve any problems and for the next seven years, a steady succession of minor changes were implemented. Moreover, Khrushchev considered the economy's problems of sufficient moment that he allowed a

debate on potential reforms to be published in the controlled Soviet press. In 1965, Khrushchev's successors completely undid his 1957 reform and introduced a new set of changes which came to be known as the Kosygin reforms. The Kosygin reforms were followed by a price reform in 1966-67[1] and then by what some have called a production association reform in 1973. Finally, in 1979, still another reform was introduced which dealt with, among other things, methods of planning.

While it is too soon to predict the impact of the 1979 reform, it is not too soon to predict that it will not be the last. As with previous reforms, it does not attack the Soviet economy's problems in a fundamental way. Further, despite the fact that reform has followed reform, Soviet economic performance has continued to deteriorate. This is quite obvious from the data. Growth of GNP has declined from approximately six percent annually in the 1950s to 3.8 percent over 1971-75 and to below that between 1977 and 1980 (Table 1). Industrial production has declined from an over 11 percent annual growth rate in the latter half of the 1950s to about one-third that rate in the second half of the 1970s (Table 2). Agricultural output has fallen also by about two-thirds, ending up in the 1970s with a growth rate of less than two percent per annum. Finally, growth in per capita consumption has declined from an almost 5-1/2 percent rate in the early 1950s to about half that rate in the second half of the 1970s (Table 4).

While these data capture much of the essence of the problem, they don't tell the whole story. For example, it is impossible to describe in quantitative terms, the relatively low quality of all kinds of products, the fact that consumers often have to waste hours in long queues in order to buy goods, or that it is often impossible to buy products which, presumably, should be available to everyone. Moreover the economic data cast no light

[1]The price reforms were meant to accompany the Kosygin reforms but could not be implemented on time.

on the low and declining levels of physical and mental health prevalent in the USSR as represented by the increases in alcoholism, abortions, and infant mortality, and in the recent decline in male life expectancy.

This brief history raises three questions. (1) What factors were responsible for the sterling performance of the Soviet economy between 1928 and 1960? (2) What has caused the slowdown over the past two decades? (3) What was the nature of the economic reforms and why did thay fail to stem the downturn? We turn now to examine these questions in the order presented.

The Economic Surge, 1928-1960

In the year 1928, at which time the First Five Year Plan was launched, the Soviet economy was some 30 to 50 years behind the advanced industrial nations of the West. Approximately 80 percent of the people still lived in rural areas; the population was poorly educated and 56 percent (in 1926) of those over 18 could neither read nor write; agriculture had been stagnating at a low level for a century; and the industry which existed was very backward technologically. In fact, because of the impact of World War I and the first four years of economic anarchy after the 1917 Revolution, the Soviet economy in 1928 had just about recovered to the level of the Tsarist economy in 1913, before the War broke out.

Into this situation, Stalin stepped with a firm and "visible" hand. He and his central planners were not inclined to rely on markets and "invisible" hands. They felt that rapid industrialization was essential for economic reasons but also for military reasons. The only communist nation in the world viewed itself as surrounded by hostile capitalist nations which, in fact, they were. It was essential that the nation build its defenses as rapidly as possible. To accomplish an industrialization as rapid as that

planned required relatively heroic measures--of the sort that most nations employ only in wartime or in other emergencies. The rate of investment was to be raised sharply at a time when the standard of living was no higher than in 1913, 15 years earlier; the peasants had to be forced to deliver more of their grain to the state to feed the enlarged labor force; labor had to be moved from rural to urban areas to man the new factories planned; massive imports of technology and equipment had to be accelerated to make the plans possible. All this, in turn, required exports of raw materials and food products, especially grain, in amounts which were bound to stir resentment and resistance in the population.

So authoritarian central planning with direct controls was introduced. The rate of investment was raised from less than 15 percent in 1928 to as high as 35-40 percent of GNP in some years of the early 1930s. Correspondingly, the rate of consumption was depressed from 80 percent of GNP in 1928 to probably less than 45 percent of GNP in the worst years of the early thirties and to a high of approximately 52 percent in the good crop year, 1937 (Gregory and Stuart, p. 83). Agriculture was forcibly collectivized and government procurements of grain and other products from the peasant sector almost doubled. Exports of grain were increased to unprecedented levels despite virtual starvation in the countryside in 1931-32. Workers were drawn out of agriculture and put into the new factories which were being built so the percentage of the labor force in agriculture declined from 71 percent to 51 percent between 1928 and 1940 (Cohn, p. 79). In addition, whereas 57 percent of the work-age population was employed in 1928, by 1937 the labor participation ratio had risen to 70 percent (Cohn, p. 66).

Labor was also better trained. The percentage of illiterates declined from 56 percent in 1926 to 20 percent by 1939; the number of persons completing

seven grades of school increased from six to 14 million; and the number of university graduates rose from about one-half million to over a million (Gregory and Stuart, p. 208).

Foreign trade was harnessed to the needs of industrialization. The volume of imports increased by about 60 percent from 1929 to 1931. Further, by 1931, 95 percent of imports were producers' goods designed to facilitate industrialization rather than to satisfy the immediate needs of the population. These imports were, of course, an important carrier of technology. Imports turned out to be more expensive than planned, however, because the onset of the Great Depression lowered the prices of Soviet exports much more than it did Soviet imports so that the commodity terms of trade declined by about 30 percent within a few years. This decline in terms of trade may have been one of the factors explaining Soviet retreat into autarky in the mid- and late 1930s--exports and imports each amounted to only about 0.5 percent of GNP by 1937.

As noted above, growth slowed significantly just before involvement in the War, in the course of which the USSR suffered great damage. Recovery was rapid, however, and the 1950s were in many ways a replica of the 1930s. The model developed by Stalin was applied, in the form it had reached in 1937, to the Soviet economy of the 1950s. The economy was no longer being drastically restructured--it just continued along the routes worked out in the first few five year plans. The rate of investment remained at around 25 percent, the rate of consumption at 50 percent. Labor continued to leave agriculture to meet the needs of a growing non-agricultural sector, the share of agricultural labor declining from 51 percent in 1940 to 41 percent in 1958 (Cohn, 79). By 1959, 40 percent of the working age population or roughly 60 million persons had received education beyond the seventh grade

in contrast to only 14 million in 1939 (Gregory and Stuart, 383). By 1958, the USSR had 6.7 university enrollments per 1000 population, more than Germany, France and the UK, but less than Japan and U.S. (Cohn, 77). In the three decades ending in 1959, the USSR graduated 2.4 million engineers, doctors, agronomists and science majors from institutions of higher learning in comparison with 1.7 million for the United States. The U.S., on the other hand, graduated 5.2 million in the humanities, social sciences, and other non-technical disciplines in comparison with 1.8 million for the USSR (Easton, 63). The degree to which the Soviets have tied their educational system to the needs of the economy is obvious from these figures.

While the similarities between the 1930s and 1950s are most striking, some differences must also be noted. For one thing, the Soviet Union was no longer totally isolated but had a bloc of "fraternal" nations in its camp: Eastern Europe and the Peoples Republic of China. Some division of labor and trade developed between these nations although for all of them it was certainly less satisfactory than trade with the West would have been, politics permitting. A second difference was the concern to raise the standard of living of the population. This was especially true after Stalin died. Both Malenkov and Khrushchev, after taking power, took measures to divert resources to consumption, both out of concern with the harsh lot of the population but also to generate support for their leaderships. This emphasis on so-called "consumerism" in the USSR had its counterparts in several other of the Eastern European countries and has become a stronger force, as time has passed, in the determination of the allocation of resources in all of the communist nations.

A third difference was in the treatment of agriculture. Stalin exploited agriculture mercilessly in a fashion closely linked with his neglect of

household consumption. Attempts were made to rationalize agriculture by paying the peasants more, as well as paying them in ways that encouraged effort, by eliminating the state-owned machine tractor stations, and by improving somewhat agricultural pricing.

Most dramatic of all was Khrushchev's virgin lands program. In an effort to raise agricultural output, 100 million acres of marginal land in Western Siberia and Kazakhstan were put into cultivation over a 2-3 year period. While the productivity of these areas was low, and many think that the costs were not worth the benefits, grain output was indeed increased.

Fourth, Stalin had neglected housing; war destruction made the problem so serious that a major construction effort could no longer be avoided. The problem with housing is that it has a very high capital-output ratio--it takes an enormous amount of capital and provides very little increment to output each year. That housing is durable and provides output for very long periods was little consolation to capital-short Soviet planners. Finally, while defense spending reached 15 percent of GNP at the end of the 1930s as the warclouds gathered, between 1928 and 1937 it rose slowly from 2-1/2 to eight percent. It is estimated that during the whole of the 1950s, defense took approximately 13 percent of GNP (Cohn, 71), a much bigger chunk than before.

In aggregate terms, Soviet economic performance in the second half of the 1950s represented a slowdown relative to the first half in the important areas of industry and per capita consumption even though the high rate of overall economic growth continued. The decline in growth accelerated in the first half of the 1960s and was reflected in a significant drop in the rate of growth of GNP as a whole. Industry was now growing at half of the rate achieved in the 1930s, and 60 percent of the 1951-55 rate. The economic

performance was still respectable, of course, but the downward trend no doubt was cause for considerable concern. The Soviets truly believed that central planning with direct controls was superior to the market yet, at 1961-65 growth rates, their economic growth performance was no longer extraordinary when judged by those of the nations of Western Europe and Japan. Moreover, now that there were cracks in the iron curtain, it was quite obvious to the Soviet population as well as to western tourists, that the quality of civilian products and quality of life in general seemed to be below that of many western nations at similar levels of development.

Factors Behind the Economic Slowdown after 1960

What was wrong? What could be done about it? These were the big questions facing first Khrushchev and then Brezhnev and Kosygin. There is no single or simple answer to the first question but several factors do stand out.

The most general statement that can be made is that many of the conditions and problems which faced Stalin, and to which Stalin applied the central planning with direct controls model, no longer existed to the same degree in the early 1960s. As we have seen, the direct controls model was quite successful in achieving the planners' goals, if not those of the households, in the 1930s and 1950s. Today, economists in both East and West refer to Soviet growth over this period as "extensive." Extensive growth refers to growth which is achieved as the result of rapidly mobilizing "quantities" of resources; by eliminating unemployment, reducing disguised unemployment in agriculture to the benefit of industry, increasing the rate of investment and growth of capital stock, increasing the labor participation ratio, instituting crash programs to educate the labor force,[2] increasing the exploitation of natural resources, and so forth. Such massive restructuring of an economy can be

[2]The result of this, of course, is to improve the "quality" of labor.

achieved very rapidly by controls, more rapidly than by reliance on market measures.

In many ways, the Soviet direct control model is similar to that employed by capitalist nations during wartime. The United States did not rely on markets during World War II to raise an army or to insure that steel and many other essential materials be shifted from civilian to military uses; rather it relied on many of the same techniques that the Soviet planners have used during peacetime. But like the USSR in peacetime, the US in wartime had urgent goals which had to be achieved rapidly. While the rapid achievement of goals and restructuring by such means can be said to be "dynamically" efficient, they are certainly accompanied by a considerable loss in static efficiency. Essentially, the direct control techniques required to implement rapid structural changes are blunt instruments and, like all blunt instruments, have dysfunctional spinoffs and externalities. Now, while the static efficiencies may be viewed as worth tolerating initially, once rapid mobilization and restructuring of resources has been achieved, the gains from continuing the use of the direct control model are sharply reduced and the static efficiencies become burdensome. Further, as explained directly below, substitute strategies for maintaining high growth rates must be found. Upon brief consideration, it becomes clear that the sources of extensive growth are exhaustible resources that have largely been drawn down. Once full employment has been achieved, the labor force has been educated, low productivity agriculture has been reduced in size, the economy has been provided with a sizeable capital stock through massive investment, and so forth, then further large gains from such economic shifts are no longer possible.

What is the alternative to extensive growth? The answer to this question

is: "intensive" growth. By intensive growth is meant growth which proceeds not by increasing the quantity of the factors of production, but rather their quality. Since the Soviet growth model of the 1930s and 1950s involved improving the "quality" as well as quantity of labor force, "intensive" here involves primarily raising the technological level (i.e. quality) of the capital stock. Evidence that absence of changes in the quality of capital and of labor played an important role in the growth slowdown in industry and GNP are provided by the factor input and factor productivity columns of Tables one and two. Looking at GNP for 1951-55, for example, we see that the six percent rate of growth is explained by a 4.5 percent rate of growth in the quantity of factor inputs (labor, capital, and land) and the remaining 1.5 percent is explained by what is called an increase in factor productivity. Since the 1.5 percent is a residual, it includes all factors other than changes in the quantity of factors which might have affected GNP growth. Generally, it is assumed that improvements in technology and labor skills are the major factors, but others such as economies of scale, changes in climate, economic organization and reforms, terms of trade, and so forth could have an influence. The striking thing about the Soviet experience is that in comparison with other rapidly growing nations, it has relied (statistically speaking) more on increases in quantity of factors than on improvements in technology, etc. So, for example, growth in the total factor productivities of selected Western European nations for the years 1950-1962 were: France - 3.7 percent; Germany - 4.5 percent; Italy - 4.7 percent; Norway - 2.7 percent; and Netherlands - 2.8 percent (Gregory and Stuart, p. 389).

Related to the above analysis is the fact that a relatively large part of the increase in quantity of factors of production has been represented by

increases in the quantity of capital. The capital stock has been increasing four or five times more rapidly than the labor force and, in the view of some observers, too rapidly for best results. One indicator that this may be the case is the fact that between 1928 and 1940, the incremental capital-labor ratio was less then 3.0 whereas from 1950 to 1960, it had risen to 6.4 and from 1960 to 1965 was 4.3 (Cohn in Bornstein, fourth ed., p. 256). Another set of indicators are the strongly negative capital productivity figures generated throughout the postwar period (Tables one and two). Now, these negative productivity figures are certainly attributable in part to the slow improvement in technology. An additional and alternative explanation proposed by Marty Weitzman (1970) is that there is, in the Soviet economy, a low (less than unity) elasticity of substitution between labor and capital and that this has led to rapidly diminishing returns to capital as a by-product of the more rapid increase in capital than of labor. This explanation, if true, has profound implications for the 1980s because of the sharply declining rate of increase of labor force to be expected (below).

Several other factors responsible for growing economic troubles need to be mentioned. Central planning of the Soviet economy in the 1930s and 1950s, while complex, was nevertheless much simpler than in later years. The priorities and needs in those days were clearcut. Produce more steel, coal, tractors, shoes, radios and the like. As the economy developed and became more affluent, and basic needs were all taken care of, the choices both in industry and consumption became more varied and complicated. This multiplied, on a grand scale, the problems of the central planners, which were further complicated by the absence of a rational price system upon which to base their economic decisions.

The rise in the military share of the GNP also had negative spinoffs on

the rest of the economy. Not only did it siphon off more labor from the civilian economy, but because of its priority position with central planners, it tended to get the best materials, equipment, and highly skilled personnel. The siphoning off from the civilian economy of many of the best scientists and engineers to work in military R&D undoubtedly reduced the rate at which the Soviets were themselves able to develop new civilian technology which would have raised productivity and growth.

The comparatively poor quality of goods has been a function of at least two factors. First, under central planning with direct controls, a large percentage of the important intermediate and final products which are produced are allocated directly under the central plan. There is no need for the plant manager to "market" his product or to search in the market for his inputs--the supply plan does the allocating or, as it might be called, rationing. Under these circumstances, there is, in effect, no competition and therefore little economic incentive to provide a superior product. In fact, there may well be an incentive to provide an inferior product if, by doing so, the plant manager is thereby enabled to meet quantity of output targets demanded of him by the plan. The second factor is the prevalence what has been called "overfull employment" or "taut" planning. Central planning has always involved setting targets which, in aggregate, have been too high to be achievable. This manifests itself in practice in widespread shortages and a prevalence of "sellers' markets," which generally lead to quality deterioration, since the sellers know they can sell their products despite poor quality.

Some Features of Soviet Central Planning

In order to understand the nature of the economic reforms and why they

have been inadequate, it is necessary to provide a brief sketch of the Soviet non-agricultural planning and management system. Under Soviet central planning by direct controls, the central planners set the output goals for the economy every year in great detail and also establish supply plans in which the output of major commodities (numbering several thousand) are directly allocated (rationed). This, as noted, is an enormously complex task and is done very imperfectly. So imperfectly, that the authorities tolerate widespread black markets in which expediters (tolkachi) hunt for inputs which their enterprises need and haven't been allocated or have been allocated but haven't received.

The planners also set prices, approximately 20 million of them. The complexity of this task is so great that, with minor exceptions, prices have remained unchanged between the Reform of 1967 and the new Reform instituted in January 1982. Before that, prices had been last changed in 1955. Prices which remain stable for so long do not, of course, reflect accurately either supply or demand nor do they therefore provide planners with useful information. Moreover, even when prices are set by the planners, they are not necessarily set at proper levels because most Soviet markets are not free and because, following Marxian ideology, rent, interest and profits have not always been properly included in price.

The economy is organized into some 40 industries or groups of industries, each of which is headed by a ministry. The central planners deal with the ministries, and before the 1973 Reform, the ministries dealt with the hundreds and thousands of enterprises under them.

Each enterprise is run by a state-appointed manager, whose major goal is to fulfill his planned output or sales target. Because of overfull employment planning, output and sales are usually one and the same amount.

Why is output (sales) the major target of enterprises? Primarily because the central planners operate in terms of quantities of output. Outputs of intermediate products are programmed to be sent to other enterprises. To the extent that enterprise A fails to achieve its output target, it cannot fulfill its commitment to ship to enterprise B which, in turn, may fail to honor its commitment to enterprise C, and so forth. Under central planning by direct controls, there are no other mechanisms (like changes in prices) for adjusting supply and demand. Failure to meet an output target may cause bottlenecks which have repercussions that are several times more costly to the economy than the value of the original shortfall.

The manager also has other targets, like profits, cost reduction, labor productivity, and many others, but the bonus he gets for achieving his output target is sufficiently high as to lead him to ignore other targets when they are in conflict with the output target. Achieving the output target is not usually easy because of overfull employment planning, so the conflict of other goals with the output target does in fact often lead to ignoring the former.

One major consequence of this system, as noted earlier, has been lack of concern with quality of output and, in many instances, deliberate sacrifice of quality to insure achievement of quantity goals. Another consequence--one of great importance--has been the resistance of plant managers to technological change. There are at least three reasons for this. First, the introduction of a new technology often involves sufficient disruption in the factory routine to cause a loss of bonuses for several months. Since bonuses for just achieving target typically amount to from 20 to 30 percent of base pay, this would involve a sizeable financial loss. Second, because of deficiencies in planning and "tautness," managers work hard to find reliable sources of supply

and to insure that these sources are always reserved for them in the supply plan. A change in technology may necessarily involve changes in suppliers, thereby introducing further uncertainty into the possibilities of achieving output plans and bonuses. Finally, to the extent that new technology increases productivity and facilitates the achievement of output targets, one might think that this would encourage managers to have an incentive to introduce it. In practice, it doesn't work out this way. Once an enterprise is able to fulfill its output target more easily because of changes in technology, the state raises its target so that it is no better off than before.

The Economic Reforms of 1958 and 1965

The first reform was introduced in 1958 by Nikita Khrushchev, and it may well have been introduced as much for political as economic reasons. Essentially, it changed the administrative structure of the economy and the government by jettisoning the 30 or so industrial ministries and substituting 105 regions. From a political standpoint, it is often argued, the reorganization enabled Khrushchev to replace a number of powerful ministers with regional supporters. Economically, the reform was designed to eliminate three problems which had developed under central planning. Because of the uncertainties of getting deliveries and services under the supply planning system, ministries engaged in two forms of uneconomic behavior. First, each ministry built for itself various kinds of auxiliary plants so that they wouldn't have to depend on other ministries for parts, for repairs, and so forth. Second, ministries found it so difficult to get from other ministries the supplies which had not been delivered to one or another of their enterprises, that they engaged in the practice

of crosshauling such supplies between their own enterprises, a practice which apparently resulted in unacceptable waste in the transportation system. Finally, it was hoped that the reform would eliminate the need for the tolkach or expediter.

In fact, the reform was administrative, not economic, and changed the symptoms rather than eliminating the root causes. Imperfect, overfull employment planning remained. The need to eliminate uncertainty by becoming self-sufficient remained, exhibiting itself in the form of regional autarky. Deliveries to enterprises were as imperfect as ever and the tolkach remained. Instead of going to Moscow, however, he was more likely to go to the capital city of the region.

The experiment with regions was abandoned and ministries were restored in 1965, in the so-called Kosygin Reforms, which attempted to remedy other defects of central planning by improving the pricing mechanism, introducing some decentralization, getting away from purely quantitative goals, and the deterioration of quality that these encouraged. Interest and rent charges were to be included in price. But there was no reason to believe that these charges approximated their market values. Further, since product prices continue to remain fixed for at least a decade, this part of the Reform couldn't have much impact. Sales and profits were introduced as enterprise goals to substitute for output. Without rational prices, profits made little sense. Further, the bonuses from meeting the profits target continued to be much less than from the sales target, so that it never took effect. As long as the Soviets continued to guide the flows of inputs through the supply plan, they couldn't shift to profits since profit-motivated enterprises might well not produce outputs in the quantities required. The substitution of sales

for output undoubtedly improved the incentive to produce quality products. However, given overfull employment planning and sellers' markets, the effect must have been slight. Finally, plant managers were supposed to have more power (1) to invest out of profits and through bank loans for projects not specified in the plan, and (2) to choose the type of employees they wished to hire and fire subject only to a payroll constraint. It turned out to be quite impossible to implement (1) since supply deliveries were almost all centrally planned; and it was difficult to implement (2) because, as is true in many countries, eastern and western, de facto job tenure is so widespread.

To sum up: the two reforms described above were not fundamental reforms but rather efforts to improve central planning with direct controls. The result was that either the symptoms showed up in other forms or that the reforms were vitiated by the fact that they tended to conflict with central planning.

Although the Kosygin Reforms were typically judged to have had almost no impact on the long term operation of the Soviet economy, the fact of the matter is that the data show that Soviet performance in the late 1960s improved somewhat from the downturn of the early 1960s. This may have been due to the particularly anarchic situation in planning which prevailed in the first half of the 1960s as Khrushchev tinkered and tailored with the system; it became clear (almost immediately) that the regional administrative setup was ill-adapted to planning in terms of industries and commodities. The second half of the 1960s may also have benefited from the rapid expansion of trade, especially with Western Europe.

The Slowdown of the 1970s

The downward trend resumed in the 1970s, as all of the factors mentioned

earlier continued to take their toll on the growth rate, while several new factors entered the picture as well. To begin with, the 1970s mark a turning point in the Soviet battle with agriculture. Although due to the very poor crop of 1962, the USSR was forced to import grain from the West, for the rest of the decade it was able to supply its own needs as well as meet the import requirements of its Eastern European allies. During the 1970s, reliance on imports from the West became what now appears to be a permanent part of the Soviet foreign trade picture. Admittedly, there were four years per decade, rather than the usual two, with very poor climatic conditions and big crop shortfalls. Nevertheless, the upward secular trend in output has not been large enough to support the growing population and the goals, particularly of rising meat consumption, that is so important to the population and to the authorities.

The inability of the Soviets to achieve self-sufficiency in agriculture has not been for lack of trying. Over the ninth Five Year Plan (1971-1975), productive investment in agriculture grew at an annual rate of over 9-1/2 percent, faster than in any other sector and amounted to about 20 percent ot total investment over the five year period. Inclusion of investment for non-productive purposes like housing raises agriculture's direct share of investment to 26 percent. Including investment in industries supporting agriculture (e.g. fertilizers) raises agriculture's total share for the five years to over 34 percent (Carey, pp. 585-6), or almost five times the comparable U.S. share. This is an enormous share of investment for a sector with a high capital-output ratio and certainly explains, in part, the Soviet economic slowdown of the 1970s. To this might be added the large amounts of gold and hard currency used to pay for imported grain and meat during the 1970s, funds which otherwise could have been used to purchase

about $10 billion in machinery and equipment. It should also be noted that about one out of every four workers is employed in agriculture, in stark contrast with the U.S. ratio of approximately one out of thirty workers in agriculture.

Before leaving agriculture, it is worth noting its importance to the growth of GNP as a whole. As the figures in Table three show, every rise and fall in agriculture's growth rate is reflected in the growth rate of GNP. The years of lowest growth in GNP are always years of crop failure, and the years of highest growth are good crop years.

Difficulties in agriculture, in particular, along with the general overall slowdown in GNP has had a further detrimental impact on the economy, particularly in the second half of the 1970s. I refer to the fact that the increase in per capita consumption was steadily declining, reaching less than two percent per year in 1978-79, and that repressed inflation appears to have been increasing as reflected in the steadily rising gap between state retail prices and the prices in the free collective farm markets where the peasants sell their excess supplies of agricultural products. Both developments are likely to affect the performance of the economy by reducing the population's incentive to work.

It is worth noting that, aside from those things in the standard of living which can be documented with statistics, there are some important facets of consumption which cannot. As the standard of living has risen, the people have become more and more discontented with the qualitative aspects of consumption. Once a person has two or three pairs of shoes, he is no longer satisfied with a fourth pair which has no style, which is of no better quality than previous pairs, which may not be always available because

of shortages, and for which he still has to stand in the queue for an hour or two. One might say that the income elasticity of demand for quality, style, and amenities in the market is high and steadily rising and that for this reason, hard data on quantities of goods overstate the rise in consumption.

A third factor which should be mentioned, one that is not new but is becoming an increasing burden, is the rising cost of raw materials, and in the case of petroleum, declining rates of growth and, potentially, absolute reductions in output in the 1980s, despite steadily increasing demand. The rising costs are due to the lower quality of the reserves of minerals which remain plus the fact that many of them are located in remote Siberia, very far from centers of use and in extremely inhospitable areas where exploitation is expensive. In 1979, for example, oil and gas were being transported three times as far, and coal 25 percent further, than was true in 1960 (CIA, 1980, p. 13).

The one bright spot in the economic picture of the 1970s was the rapid increase in international trade, particularly that with the West as a result of detente. Expanded trade with the West enabled the USSR to import grain to soften the blow of the decline in domestic agricultural performance brought on in part by the excessively bad weather decade. It also enabled the Russians to import large amounts of machinery and equipment to facilitate its investment plans and the introduction of new technology in backward industries. Very important, moreover, was the fact that the rise in the price of petroleum beginning in the fall of 1973, led to a change in the constellation of world prices which brought a big change in Soviet terms of trade and windfall gains from its sales of petroleum, gas, gold and arms. Generally speaking, Soviet exports to

the West approximately tripled in price (remember that over the last few years, petroleum exports brought in half of the Soviet earnings of hard currency) whereas the price of imports approximately doubled, for a 50 percent improvement in terms of trade. Rough estimates suggest that relative to 1970, the Soviets gained more than $15 billion from improved terms of trade (1971-1977) plus an additional $8 billion due to higher gold prices (1971-79).[3] Without these gains, their gross foreign convertible currency debt of some $17 billion would have been at least twice as high and/or imports from the West would have been more restrained. Another windfall due to inflation was the fact that while their hard currency borrowings bore reasonably high nominal interest rates, in real terms the charges were modest and borrowing was certainly very cheap.

The widening of foreign trade with the West during the 1970s, particularly under the very favorable conditions noted, must have had a salutary effect on the Soviet economy, though to what extent is difficult to say. It is worth noting, therefore, that despite the gains that must have accrued, the Soviet economy nevertheless suffered an accelerating decline in its economic performance. This suggests that Soviet problems are too profound to be totally offset through foreign trade. This is easy to understand when one considers that total trade is, as in the case of the U.S., a small percentage of GNP. It is also understandable in terms of the nature of the Soviet planning system as described above. That is to say, diffusion of new technology in the USSR is no easier when that technology is imported from abroad than when it is developed domestically.

Economic Reforms in the 1970s

Before turning to the problems of the 1980s, we must ask what, if

[3]These figures were calculated by Edward Hewett and are included in an as yet unpublished paper.

anything, the Soviets did by way of economic reform in the 1970s to confront their problems. There were two economic reforms in this period, the first introduced in 1973 and close to completion now, the second begun in 1979.

The 1973 reform, known as the Production Association Reform (PAR), has two aspects. It largely eliminates the enterprise as the fundamental economic unit, primarily by integrating large numbers of enterprises under the domination of the PA. Most of these are comprised of vertically integrated enterprises, but some represent horizontal integration as well. By taking power away from the enterprise and giving it to the PA, the reform suggests that the authorities have more or less given up trying to get good performance out of the enterprise, beyond the bare fulfillment of quantity targets, through decentralized means. In effect, the PAs are in a position to tell one of their enterprises to ship the right quality product and one with the right specifications to another of its enterprises. In this sense, the reform represents an increase in centralization. The second aspect of the reform--perhaps its more important aspect--is that each of the R&D institutes that formerly served industry in a rather distant fashion was made a member of a PA. This side of the reform represents an attempt to unite the suppliers and users of new technology and thereby encourage practical innovation and its use. More profoundly, it indicates the planners' recognition of the fact that they have left the "extensive" phase of economic growth and that they must take measures to encourage "intensive" growth. Presumably, once a new technology is made practical, the PAs are in a position to push the enterprises into adopting it.

The 1979 Reform also increases the power of planning and tries to

facilitate technological change. Planning is made much more detailed and long-run planning (5 to 10 years) is given considerably greater emphasis, by comparison with short-run annual planning. More emphasis on longer run planning makes it possible, of course, to build projected technological change into the plans.

While both of these reforms are designed to meet current Soviet economic problems, there is no evidence yet that either has had a discernible impact on performance.

II. Problems and Prospects for the 1980s

As the USSR moves into the 1980s, the big question is whether it can stabilize its economic growth at the relatively low but still respectable levels of the second half of the 1970s or even reverse the downward trend; or whether its economic performance will continue to deteriorate. As an economy which faces severe economic problems, and is, in effect, "stretched tight" it has to make difficult decisions regarding the allocation of its scarce resources to major sectors--consumption, investment and the military. To some extent, these decisions may be partly beyond its control and constrained by, for example, NATO military policies or by the extent to which the Soviet population is willing to sit back silently while its economic expectations and aspirations go unrealized. Overall performance in the 1980s will also be conditioned by trends or potential trends in several areas and sectors and it is to these that we now turn.

Demographic Trends

We have already noted that one of the problems facing the USSR is

a decline in the rate of growth of the population, hence labor force. The nature of the problem is contained, statistically, in Tables 5 and 6. The data and projections in Table 5 demonstrate that the natural increase in population between 1980 and 1990 will fall to less than one-half the levels of the 1950s and early 1960s. According to these data, the problem arises as a result both of a decline in birth rates and increase in death rates. The shift in the structure of the population to constantly larger proportions of older persons and smaller proportions in the child-bearing ages is partly responsible for both of these trends. In addition, those in the child-bearing ages are having fewer children than they used to have. Further insight into the problem can be gained from Table 6. Column 3 shows that the number of persons becoming 16 years of age has been declining steadily and rapidly since 1977 and will continue to do so. (The enormous drop that occurs in the late-1950s and early 1960s is due to the huge birth deficits experienced during, immediately before, and immediately after World War II, as a result of disruption of family life.) Column 4 shows the impact of rising death rate trends and Column 6 the sharp increase in annual departures from "population of working age" as larger proportions of the population become "old." The results of these three trends are shown in Columns 1 and 2. The increments to population of working age in the mid-1980s are miniscule. At its minimum in 1986, the 300 thousand increment expected that year amounts to less than a .2 percent increase. In contrast, the increment in 1976 amounted to 1.9 percent. To the picture painted by the aggregate figures on population and labor force must be added the fact that, from the standpoint of the planners, a regional disequilibrium between supply and demand for labor is developing. Most of Soviet projected investment is scheduled for European Russia or Siberia.

The natural increases per 1,000 population in these areas is estimated for 1980 at around 6. On the other hand, much of the increase in population and labor force in the future will come from the Transcaucasian Republics, Kazakhstan and Central Asia, with natural increases of 18, 19 and 30 per 1000 respecively. Characteristically, there has been almost no outmigration by ethnic residents of these areas and the percentage who are not competent in Russian is large and has been rising (Feshbach and Rapawy, 122-128).

Another constraint. In the past, the more productive sectors of the economy (e.g. industry) have gotten part of their increases in labor supplies by drawing off underemployed workers from agriculture. In light of the present plight of agriculture, it seems dubious that such redistributions can continue, at least as rapidly as in the past, even though Soviet agriculture is still more labor intensive than agriculture in comparable countries.

One final point. The effectiveness of labor on the job depends importantly on the morale and health of the population. There is considerable anecdotal evidence that in these respects conditions have deteriorated. While one is inclined to be suspicious of anecdotal evidence since it so often reflects the biases of the observers, it does receive support from available data. For example, while infant mortality rates declined steadily after World War II, they rose abruptly between 1971 and 1976 from 22.9 to an estimated 31.1 deaths per thousand (Davis and Feshbach, p. 1). This was probably due to a number of factors, one of which is the very high level of induced abortion because of inadequacies and unavailability of Soviet contraceptives (op. cit., p. 13). Apparently frequent abortions negatively affect infant mortality and it has been estimated that Soviet women have a lifetime average of 6 abortions, an extremely high figure.

Another unexpected demographic development has been the decline in adult life expectancy, especially of males in the working ages, from 66 years in 1965/66 to an estimated 62-63 years a decade later (Feshbach, p. 31). One cause of this is, of course, the rise in infant mortality. Another is the much publicized increase in alcoholism. While total Soviet consumption of alcohol is not much greater than that in some other nations, most of it, in contrast with other nations, is in the form of hard liquor (spirits) rather than in wines and beers. In 1976, expenditures on spirits comprised 68.6 percent of total Soviet expenditures on alcoholic beverages in contrast with 26.3 percent in the U.S. and 13.8 percent in France (JEC, 1981, p. 24). Apparently the number of deaths in the USSR from acute alcoholism is many times higher than in other nations (Feshbach, p. 31). Alcoholism on such a scale must be taken as a primary indicator of low morale.

The very small increase in labor force expected in the course of the 1980s has serious implications for economic growth. Since labor along with capital and technology are the major sources of economic growth, this puts a heavier burden on increases in capital and technology. Further, if Weitzman's model is correct, then still greater diminishing returns to capital will be experienced and growth will be slowed additionally for this reason. Under the circumstances, it appears that if economic growth is to be maintained or increased, the burden must fall on technology (on which, more below).

What possibilities, if any, are available to the Soviet planners to increase the labor input during the 1980s? There are several possibilities, some of which have already been tapped. First, the authorities have amended the law to make it legally possible for workers to delay retirement which previously had been mandatory at 55 for women and 60 for men. A considerable percentage of pensioners have taken advantage of this possibility already,

mostly on a part-time basis; their participation in the labor force is already included in the figures presented in Table 6. Much more is not expected on a voluntary basis. One reason may be that limited availability and poor quality of consumers' goods serves as a significant disincentive. The authorities could, of course, force elderly people into the labor force by raising the minimum retirement age. At present levels of household dissatisfaction, such a step is probably politically impossible.

A second possibility is to encourage an increase in the labor force participation ratio, difficult as this would be. At present, the ratio has reached 88 percent, an almost unprecedented level for any country. For reasons mentioned in the previous paragraph, those voluntarily unemployed are unlikely to have a strong incentive to work. However, it is worth noting that just a 1 percent increase in the ratio would increase the labor force by 1-1/2 million workers, although such workers would undoubtedly be marginal.

A third possibility would be lengthening the work week, although it could not be done on a voluntary basis and seems to be less politically palatable than the previous two proposals.

Fourth, if labor could be more rationally allocated throughout the economy, undoubtedly productivity could be raised to the equivalent of adding millions of workers to the labor force. Some feeble attempts have been made to effect changes of this sort. However, as in many other nations, it appears almost impossible for institutional reasons to fire or relocate workers, particularly those which ought to be so dealt with. In any event, without a radical economic reform (below), very little change in this area can be expected.

Finally, a potentially important source of additional civilian labor is the Soviet armed forces, which number approximately 4-1/2 million men.

A sharp reduction in international tensions would allow the Soviets to divert these men into productive work. In addition, there are probably millions of civilians working on products and R&D destined for military use who could also be reallocated. While shifting such workers from military- to civilian-oriented jobs in the event of a relaxation of tensions would not increase the rate of growth directly, it would indirectly reduce the tensions and tautness in the economy by increasing the output going to the civilian sector and reducing the excess demands being made on the resources of the nation. Undoubtedly these possibilities must provide the Soviets with a motive to arms control, détente, and so forth. This scenario is discussed further below.

Agriculture

The importance of agriculture to aggregate Soviet performance is by definition considerable, since the contribution of agricultural output to GNP is around 15 - 20 percent. Furthermore, good and bad years in agriculture also have an impact on other sectors, especially on trade, but also on industry and transportation, since agriculture provides both inputs to, and demand for, the services of these sectors. Just a glance at Table 3 is sufficient to verify that GNP and trade each fluctuate with agriculture. In fact, most of the variability in the GNP series appears to reflect the great variability in agricultural performance, due primarily to sharp changes in temperature and precipitation. This variability has been superimposed on an upward secular trend in agricultural output. The upward trend is increasing at a decreasing rate, however, despite the very large investment of capital resources, as noted above. The large capital investment is offset in part by a decline in quantity and quality of labor resources in

agriculture, difficulties in meeting fertilizer goals, and the fact that additional applications of fertilizer are meeting with diminishing returns.

The following recently published figures provide dramatic evidence of the downward trend in growth of agricultural output:

Annual Average Growth in:	1951-60	1961-70	1971-77
Output	4.8	3.0	2.0
Inputs	2.7	2.1	1.6
Total Productivity	2.1	1.0	.4

Source: Diamond and Davis, p. 32.

The estimates in this table suggest that decline in growth has been due to both declines in the growth of inputs and in productivity. In 1971-77, the decline in growth of inputs was due to a much more rapid exodus than usual of workers out of agriculture, as well as a slowdown in the rate of increase in fertilizer supply. In addition to other factors, the decline in total productivity in 1971-77 reflects the unusually bad weather over this period.

Perhaps the most important subgoal in agriculture is the target for meat consumption. Rising meat consumption has become one of the centerpieces of the regime's promise to the consumer of a better quality of life. Per capita meat consumption in the USSR has been significantly below that of most other Eastern European nations and about 15 years behind that of Poland. Raising the level of meat output and consumption, however, is demanding on Soviet agriculture for several reasons. First, as is well-known, it takes many kilograms of feed to generate a kilogram of meat. Under Soviet conditions, the ratios are, roughly, 13 to one for beef, nine to one for pork, and six to one for poultry. Second, while the Soviets are much more

deficient in producing feed grains than they are in producing food grain, almost the entire need for expansion of grain output over the past 20 years has been for feed. Because of this disequilibrium between demand and supply, the Soviets have fed wheat to the animals. Their imports from the West have naturally been concentrated on feed grains. Third, harvest fluctuations due to weather variability create serious problems in the management of the livestock economy. When there are feed shortfalls, livestock have to be slaughtered. This creates a temporary surplus of meat but, by reducing the livestock herds which are the "capital stock" from which the regular output of meat is derived, domestic consumption is reduced for several years until the herds have been built up again. This one reason why the Soviet authorities have been since the 1962 crop failure, so quick to import grain in bad crop years. The losses in livestock capital are sufficiently costly to make importing feed worthwhile even if it has to be paid for in dollars. Some scholars have claimed that one dollar spent for imported feed averts a loss of approximately five-six dollars in livestock capital and its forgone output of meat. A study by Daniel Bond and Herbert Levine (1979) has demonstrated the important fact that while weather variability in itself causes sharp fluctuations in output of grain (and presumably other agricultural products), it does not affect the secular upward trend; in the case of meat output, weather variability produces smaller shortrun fluctuations in output but significantly slows the upward secular trend.

In assessing the future, one has to contend with climate, among other things. The only weather projections known to this writer are those by the CIA (1976), in which CIA climatologists claim to have detected a weather cycle in the USSR. They argued that the disastrous crop of 1975 represented the beginning of a new downturn in the cycle and they certainly seem to have been correct so far as the data in Table eight suggest. In another document (CIA, Long-Term Outlook, 1979, p. 71), the CIA has used these weather projections to predict grain shortfalls of 27 million tons in 1980 and from

16 to 26 million in 1985, given bad weather. This is in contrast with only a five million ton deficit in 1980 and a two million ton deficit to eight million ton surplus in 1985, given favorable weather. In fact, bad weather over the years 1979-82 led to grain imports of more than 30 million tons a year for the period, a substantial drain on hard currency reserves. Further, to the extent that grain imports have not been adequate to supply domestic needs, the costs of meat and other food imports have also risen. Food imports cost the USSR more than $11 billion in 1979.

Aside from climatological problems, the prospects for agriculture do not appear bright and it is not clear that the Soviets can do much to change them. In a peaceful world, it seems clear that the USSR long ago would have abandoned the goal of remaining self-sufficient in agriculture, not to mention helping Eastern Europe meet its shortfalls (as they seem to be doing now), and would have relied on imports for a significant portion of their domestic needs. Given the political climate of the past 30 years, it seems clear that the Soviets will continue to strive for as much agricultural self-sufficiency as possible. Further, for political reasons, they may continue to try to export as much as they can to Eastern Europe.

In their attempts to increase agricultural output, it is unlikely that much assistance will be garnered from raising the rate of increase of factor inputs. Difficulties already noted in supplying increasing amounts of fertilizer, plus diminishing returns to that input, are not encouraging. Furthermore, the enormous proportion of the nation's annual investment already going to agriculture, with the low rate of return on such investments, suggests no further increases from this source. Finally, given the nation's labor shortage, and in view of the lack of amenities in rural areas, it

seems reasonable to predict a continuation of the steady net outflow of young workers from agriculture.

The situation might be ameliorated by allowing the peasants working on collective and state farms to have larger private plots. On just the small percentage of the land that the private plots occupy, the peasants have been able to produce approximately one-fifth of the nation's crops and about one-third of its livestock products. Why not turn them loose on even larger plots than they have? (We assume it is politically impossible to change over to completely private enterprise agriculture!) The problem that arises is that the peasants work their little plots very intensively and, to cultivate still larger plots, it might be necessary for them to reduce substantially the work time they put in on the collective and state farms. This would be difficult to allow, given the steadily declining size of the agricultural work force and the decline in its quality as the younger and better educated workers leave.

The only remaining possibility would seem to lie in increasing agricultural efficiency and thereby raising "total productivity." Western scholars have often pointed to the low level of Soviet agrotechnology as an important reason for poor performance. Much could be done by using better breeds of livestock, improved varieties of crops, improved cultivation practices, and the like. But this has been known for years and progress has been slow--as it has in other sectors where a shiftover from "extensive" to "intensive" methods has been in order. It is difficult to predict whether the current exigencies will pressure the Soviets into making a change.

One final point on agriculture. The USSR, like many other Eastern European nations, heavily subsidizes agriculture, with the consequence that prices are lower then they otherwise would be. This, of course, encourages

the demand for food and, under present conditions, creates additional dissatisfaction by increasing the gap between demand and supply. That food prices have been raised so little in the USSR is probable due to the political risks entailed by such a policy. The recent Polish experience will undoubtedly serve as a deterrent to Soviet planners, should they have been thinking of reducing or eliminating food subsidies.

Petroleum

As is true of most advanced western nations, Soviet future economic prospects will be strongly influenced by prospects in its petroleum industry. The USSR, however, stands in a somewhat different position at present from other advanced nations. It is the world's largest producer of petroleum and exports about one-fourth of its output, second in value only to Saudi Arabia (excl. Iran). About half of its exports are sold to the West for hard currency, the other half to Eastern Europe. Petroleum and petroleum product exports have accounted for half of the USSR's hard currency earnings from commercial sources (excl. exports of military equipment and gold) over the past few years and have been, therefore, of enormous importance. Although energy exports have grown at about 10 percent a year over the past 20 years, it is unlikely that the trend in petroleum can be maintained.

Until recently, Soviet petroleum output has increased by leaps and bounds: from 30 million tons in 1950 to 350 million in 1970 to 603 million in 1980 and 609 million in 1981. Over most of the postwar period, growth of output has been centered in the Urals-Volga region which replaced the Baku-Grozny fields that dominated prewar output. As one large field in the Urals-Volga region became exhausted, another took its place. In the late sixties and seventies, as output in the Urals-Volga region topped out, rich new fields in Western Siberia began to pick up the slack. In particular, the giant Samotlor

field, which all by itself produced almost 150 million tons, has been the major source of increase from the late 1960s until very recently. Samotlor now appears to have peaked and, for the first time in the postwar period, there do not appear to be any large fields to take its place.

Soviet petroleum output problems were dramatically highlighted in two 1977 reports by the CIA, in which the CIA predicted that not only would Soviet and East European demands outrun Soviet supply, but that Soviet output would peak around 1980, decline thereafter for most of the decade and that by 1985 or so, the USSR would enter the petroleum market as a net importer. More recently, in a revised estimate, the CIA sees output declining more slowly and the USSR not becoming a new importer until close to 1990. No other expert has been this pessimistic.

Some of the other output predictions made over the past few years are presented in Table 9. The wide divergence of estimates reflects the uncertainties in the Soviet petroleum picture. Nevertheless, even the most recent official estimate (H) projects a slower rate of growth than in the past and one which would not keep up with domestic requirements. In fact, the 11th Five Year Plan target for 1985 of 620-645 mmt is virtually identical to the 10th Five Year Plan target for 1980 of 620-640 mmt. This official overestimate leads us to believe that the low end of the official target for 1985 may well be the practical possible maxumum. In light of all the information available to me at the moment, the J estimates appear the most realistic.*

What are some of the factors underlying these estimates? First, as noted earlier, there do not appear to be any giant fields to replace Samotlor in the next decade. Others may be found in the future--if not in Western Siberia, at least in Eastern Siberia. The Soviets have enormous petroleum reserves and it is a matter of time before output rises again. Even the CIA predicts a rise in output in the 1990s. However, if the locus of new petroleum activity is

*This was written in early 1982. I now feel the H estimate is more realistic for 1985 and that the J estimate is quite overpessimistic for 1990.

in Eastern Siberia, extraction and transportation costs are going to be a lot higher. Conditions in Eastern Siberia are much harsher, the region lacks infrastructure and is much further from consumption centers.

Another factor handicapping production, particularly in Western Siberia, is that in order to get a more rapid flow of oil through the wells, the Soviets have injected water under pressure into the reservoirs. While this has minimized the number of wells that had to be dug and increased flows in the early stages, more recently the pumps have been removing as much water as oil from the ground, which has meant less oil, a need for more pumps and new wells, and lower productivity.

Another ominous indicator has been the fact that exploratory drilling in recent years (1976) has led to only 40 percent of the increase in output that resulted from comparable levels of drilling 10 years earlier (Goldman, p. 122). Further, much of the exploratory drilling has been for new wells in old areas rather than for new wells in new areas like Eastern Siberia, where a find would be much more likely to result in the discovery of a new giant. Such cautiousness has probably been dictated by reluctance to go into these remote areas, for reasons noted. Nor have the Russians been able to produce high quality drill bits and advanced seismic technology. Not only do the drill bits wear out quickly but they cannot be used to the same depth as US bits. And lack of first class seismic technology has handicapped the search for new fields.

On the positive side, many Soviet difficulties can be partly or fully overcome by importing foreign technology. Between 1971 and 1976, for example, the USSR imported $3 billion worth of oil and gas equipment and $4 billion worth of steel pipe. And though the US has embargoed the export of some equipment to the USSR, the Russians have been able to purchase adequate

substitutes for most of the embargoed products. Western observers, except the most pessimistic, feel that it is just a matter of time before the Soviets are caught up technologically and find large new sources of petroleum.

Another "potentially" positive factor is that, so far, the Soviet "elasticity of energy consumption" has been around unity and not declining in comparison, for example, with that of the U.S. which has declined to approximately 0.6. Presumably, the Soviets will attempt to reduce petroleum consumption and to substitute other fuels for it so that, in the future, each percentage increase in GNP will no longer be matched by a one percent increase in petroleum consumption. Soviet lag along these lines may reflect the lesser urgency of their situation and only recent realization that a crisis might be approaching. Soviet conservation efforts will have to be concentrated on industry since they have so many fewer automobiles than most western nations. While there would seem to be plenty of room for conservation, one must raise questions regarding the effectiveness with which conservation measures can be implemented, given the poor incentive structure in Soviet industry.

Still another positive element in the Soviet picture is the fact that the output of natural gas is rising rapidly and can substitute to some extent for petroleum both domestically and as a hard currency export. The USSR should eventually be the largest producer of natural gas in the world. The much publicized pipeline from the Urengoi-Yamburg deposits to Western Europe is one major channel for converting this expanding output into hard currency earnings.

Still another encouragement to energy conservation comes from the otherwise negative fact of slower economic growth in general. While slower economic growth reduces the demand for petroleum, the relative shortage of petroleum, in turn, serves to constrain economic growth in several related ways.

First, it raises the direct costs of producing energy. Second, it diverts investment from other sectors, thereby reducing growth in these sectors. Third, to the extent that hard currency exports are reduced and/or hard currency has to be spent for imports of petroleum, imports of other products, especially those embodying advanced technology, are reduced. By how many percentage points growth might be reduced by these factors is anyone's guess.

Estimates of the impact of different petroleum output scenarios on petroleum trade are worked out in Tables 9 and 10. In Table 9, domestic requirements are subtracted from the various output projections to arrive at net exports or imports (-), as the case may be. Two estimates of domestic requirements are used. The first (a) optimistically assumes that the Soviets are able to reduce their use of petroleum per dollar of output produced. The second (b) is more pessimistic and assumes that the Soviets cannot get their elasticity of energy demand much below unity, the present level. If we take estimate J to be the most probable, then the Soviets will continue to have a substantial exportable surplus in 1985, a surplus which is eroded somewhat or lost and turned into an import surplus by 1990, under the pessimistic assumption (b) regarding conservation efforts.*

Estimates of potential exports for hard currency are presented in the first four columns of Table 10. They have been arrived at by assuming that the USSR will continue to export 70 mmt a year to CMEA and deducting this amount from total exports in Table nine. Under these assumptions, the J estimate forecasts a substantial shrinkage of the quantity of exports by 1985, except under the more optimistic variant and a large drop in exports or shift to imports by 1990. These changes in the quantities of exports (imports) are put into value terms in the last four columns of Table 10 by using forecasts of petroleum prices for 1985 and 1990 (see the balance of

*This was written in the spring of 1982. At present, one year later, I consider these estimates overpessimistic. Certainly the lower H estimate is more probably for 1985 and there will not be an import surplus in 1990.

payments section below).

Forecasts such as those presented in Tables 9 and 10 are bound to be less than perfectly satisfactory. Perhaps more than anything else, they reveal the extent of our ignorance and uncertainty regarding the performances of key variables in the petroleum picture. There are a great many possible outcomes regarding output, domestic petroleum requirements, and policy with regard to future exports to CMEA and/or the West. Given the different assumptions that various individuals or groups have made, almost any set of outcomes is possible.

Two further issues need to be touched upon. First, it is worth considering briefly whether or not the USSR would be likely to continue to meet Eastern Europe's shortfalls in petroleum and grain, particularly under some of the more dismal scenarios presented above. That the Soviets give very high priority to supplying Eastern Europe with grain and petroleum became quite obvious in the 1970s. Despite its rising hard currency debt, the Soviets have continued to export grain to Eastern Europe even after it had become necessary to import that grain from hard currency sources; and they have continued to supply Eastern Europe with petroleum even after the fall of 1973, at which time the opportunity costs of such exports skyrocketed. True, since 1973, the USSR has encouraged Eastern Europe to procure part of its import requirements from the Middle East and elsewhere, and they have also raised the price they have charged Easter Europe for petroleum, although not by as much as world prices have risen. These latter actions do not mean the Soviets are reneging as a supplier but simply that the costs of performing that role had risen too high (below). But some of the costs of trading with Eastern Europe they are willing to bear and, in fact, have been doing so since the late 1950s, prior to which the USSR exploited Eastern Europe in

their mutual trade relations. It was during the Khrushchev era that the picture changed and an attempt was made to use trade to enhance intrabloc political relationships. The USSR stopped exploiting Eastern Europe and, in effect, accepted smaller economic gains, or even losses, in exchange for political good will. These political factors appear to explain recent Soviet behavior in grain and petroleum. In the case of some of the Eastern European nations, a slightly different twist could be added to the explanation: the USSR might, in fact, worry that without secure supplies of petroleum available through barter (soft currency), economic performance might deteriorate in some Bloc nations to intolerable levels. This could lead to more troubles of the sort presently being encountered in Poland and thus to an economic, political and military weakening of the Bloc. Further discussion of these matters is contained below in the Polish Crisis section.

What course of action the Soviets will take in the 1980s should some of the less favorable scenarios materialize is impossible to predict and will depend, among other things, on the economic and political situations in the USSR and nations of Eastern Europe, respectively. But the history of the past 20 years suggests that unless the USSR is itself in desperate economic straits, it will continue to supply at least part of Eastern Europe's petroleum requirements. For trade in petroleum and grain provides one of the strongest ties between the USSR and its satellites and without it Comecon would be a much hollower institution.

The second issue which must be considered is whether a forthcoming oil shortage would motivate the USSR to attempt a forceful expansion into the Middle East; the probability of such a solution has been increased, in the minds of some, by the Soviet invasion of Afghanistan. I think that the probability is very low for at least two reasons. First, I believe that it is

clear to Soviet leaders, particularly with Ronald Reagan in the White House, that any military action taken by them that threatened our (and NATO's) oil supplies would involve military retaliation, i.e. would start a war. Sudden deprivation of oil imports could cripple the US and other NATO countries and would not be tolerated. They would, in my opinion, be unwilling to risk such an action. Second, their willingness to risk starting a war for petroleum has to be thought of in terms of the potential economic gains to them. If for purposes of discussion we discard the extremely pessimistic scenarios A, B, and C, then the maximum hard currency expenditures for petroleum are in 1985 and 1990, respectively, $10 and $27 billion (Table 10). In today's prices, these figures amount to approximately $7 and $14 billion respectively. Also consider that under these circumstances, there would undoubtedly be some reduction of sales to CMEA and that these estimates are based on the highly pessimistic assumption "b" regarding domestic Soviet requirements for petroleum. In light of these caveats, the USSR probably faces a maximum import burden for petroleum in today's prices of, say, $5 billion by 1985 and $15 billion by 1990.* For comparison, Soviet GNP in 1980 is estimated by the CIA at $1.4 trillion. Even if an invasion of the Middle East enabled the USSR to avoid costs of this magnitude, one would have to weigh in the balance the costs of invasion, occupation, etc. But would an occupation save them the costs of imported petroleum? It seems very unlikely. Only in the event that the captured nation were absorbed into the USSR--made part of the Soviet Union--would it be possible to avoid a good part of the costs of importing the oil. And such a takeover would seem most improbable. So long as the oil exporting nation maintains its identity, the Soviets would continue to have to pay for the oil they take from it. They might well receive preferential treatment, of course. But even with preferential treatment, Soviet savings from occupation would be small. It seems much more probable that, if forced to import petroleum in

*To reiterate, I think it is improbable that the Soviets will have to import petroleum by 1990.

the 1980s, the USSR will either simply enter the market and bid competitively for oil or will attempt, through diplomatic activity, for example, to get Western Europe to join with them in guaranteeing oil deliveries.

Military Expenditures

The USSR is one of the two leading military powers in the world. The United States is the other. Mutual mistrust and the struggle for military superiority have led these two nations into a ruinous arms race, which has been more difficult for the Russians than for the US because the US is so much wealthier and more advanced technologically. So, for example, while military expenditures take approximately five to six percent of our GNP, they are estimated by the CIA to take from 12 to 14 percent of Soviet GNP. It is difficult to know how accurate this latter figure is since the CIA provides almost no information by which outsiders can check its estimates. However, it is probably in the right ballpark, if perhaps a little high (Holzman, 1982).

The CIA estimate of current military expenditures is less than reliable. The CIA claims that the USSR has been outspending the US since 1971 and by increasing amounts every year. At present, they say, Soviet military expenditures are 50 percent greater than our own and between 1971 and 1980 a Soviet surplus of $420 billion in current prices has accumulated. These data presumably explain how the Russians were able to catch up with, even overtake us, militarily. This interpretation, accepted by the Carter and Reagan administrations, is one basis underlying current administration plans to step up U.S. defense spending.

Unfortunately, the CIA estimates are flawed in several respects, each of which leads to an overestimation of Soviet relative to U.S. defense expenditures (cf. Holzman, 1980 and 1982). The most important flaw and the

only one which is spelled out here, is that the CIA compares the two nations' expenditures in dollar prices and this is the comparison that everyone quotes. It is well-known and readily admitted by the CIA that international comparisons in one nation's prices always make the other nation look larger, due to the so-called index number problem. So, for example, when the CIA recently published a comparison of Soviet and U.S. GNPs for 1976, the Soviet GNP was 49.5 percent of ours in ruble prices but much higher--73.5 percent in dollar prices, a spread of 1.49 (73.5/49.5). The spread in consumption was 1.54, in education 1.33, and in machinery and equipment, 1.63. Clearly, if the dollar comparison of military expenditures has the Russians outspending us by 50 percent, a properly constructed ruble comparison would probably put the two nations at or near parity. And in earlier years of the decade when the dollar gap was much less than 50 percent, the U.S. was undoubtedly outspending the USSR, measured in rubles.

The proper method of comparing the military expenditures of two nations is, as in the examples just cited, to present the comparison in both dollars and rubles, these two measures representing the outer limits within which the comparison must fall. Usually, in order to represent the spending comparison with a single figure, an average of the two or geometric means -- is used. This is the way the CIA handles most other comparisons between the two nations. The geometric mean would probably put the Russians ahead of us currently, but not by much and probably not ahead at all in a comparison over the course of the decade.

As noted above, the Reagan administration has indicated that it plans to step up military expenditures in response to the Soviet threat which is partly perceived in the CIA's above mentioned military spending comparisons in dollars. It is also perceived in several other ways. The U.S. defense establishment regularly testifies to the substantial buildup in Soviet weapons

procurements which is presumably made possible by the high level of Soviet defense spending. It is also widely believed that the Soviets are catching up to us in the level of technology embodied in their newer weapons. Moreover, Soviet actions in the world arena have not been such as to allay U.S. fears regarding their intentions. Their concentration of forces in Europe, the invasion of Afghanistan, activities in various third-world nations, and Soviet pressures in the Polish crisis all create apprehensions among U.S. policy-makers. U.S. assessments based on the sum of these factors plus the basically antagonistic ideology of the USSR provide an understandable basis for the actions being proposed by the Reagan administration. This should not be taken to imply that the Administration necessarily correctly assesses the present situation. There are many in this country and in allied nations who are less alarmed than we are by events and oppose the scale of the proposed U.S. build-up.

How the USSR will respond to our military build-up, should it materialize, will depend not on how the U.S. perceives the military balance but on how Soviet leaders perceive it and how they view our intentions. If, for example, they believe that they are up to or ahead of us, then they will be less likely to take heroic measures to match our buildup. If, on the other hand, they should view themselves as behind, then they will be more likely to tighten their belts and shift from butter to guns. With so much of their GNP already devoted to guns and with their economy dragging, this would be a hard decision, of course.

It is my belief that the Soviets do not take as optimistic view of their position as the U.S. Administration seems to think. First, they undoubtedly take a "rubles-eye view" of the world rather than one based on dollar prices. From a ruble price standpoint, the more technologically advanced U.S. arsenal of weapons is extremely costly and, therefore, U.S. military expenditures

appear very high. Former CIA Director Colby referred to the potential ruble prices of some of our advanced equipment that the Soviets cannot produce as "almost uncountable." Even the CIA ruble comparison, as deficient as it is, puts Soviet military spending relative to ours much lower than does their comparison in dollars.

Moreover, the Soviets also know that all of their military expenditures are not directed at the United States - they know they support an army of close to one million men in Siberia on the Chinese border, thousands of miles from all sources of supply. Referring to this, former Secretary of Defense Harold Brown said: "they [the USSR] have felt obliged to allocate up to 20 percent of their total defense effort to the Far East and Peoples Republic of China." Most of the funds to support this Far Eastern army are, of course, not available to build weapons to be used against the United States. Should the Sino-Soviet dispute be settled tomorrow, I wouldn't be surprised, in light of their severe labor shortage, if the Soviets demoblilized half a million men in short order. If we assume that 15 percent of Soviet defense expenditures are wasted (in terms of having no impact on the East-West conflict)* in China, this would reduce the CIA's 50 percent current dollar gap to 27-1/2 percent and would remove at least $250 billion from the decade spending gap (interpreting these gaps to refer to the confrontation between the U.S. and USSR).

From the United States, the Sino-Soviet confrontation may appear remote. However, it is a cold war with a history almost as long as that between the US and USSR and it may actually have been more bitter. Certainly, it has never been relieved by a detente.

Two aspects of this cold war are central. First, it represents an ideological dispute between major nations with different views regarding Marxism and communist society. Further, approximately one million square

*This would be consistent with the Department of Defense practice of removing as irrelevant Vietnam expenditures from U.S. military spending totals in its U.S.-U.S.S.R. comparisons as the attached chart shows (see below).

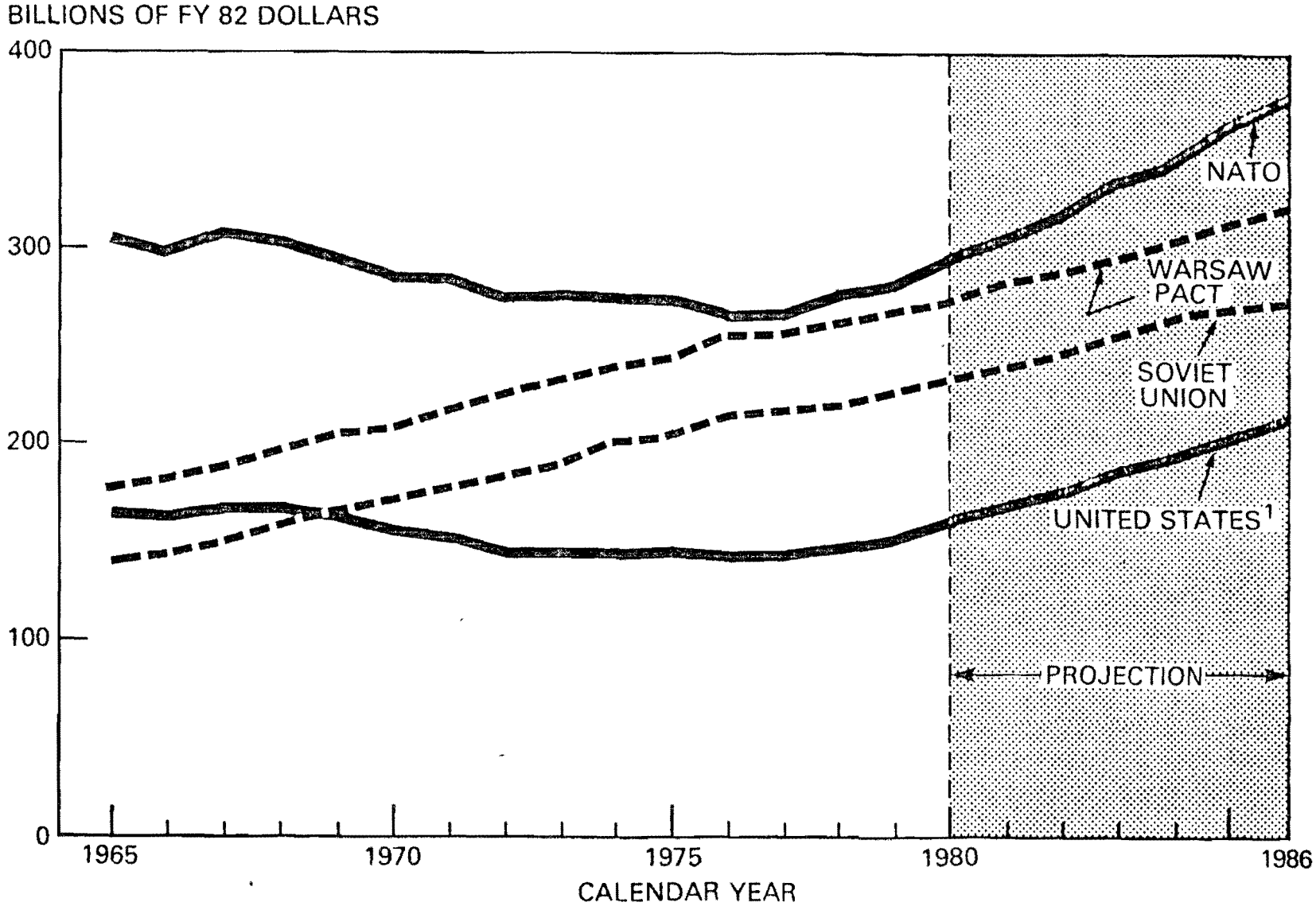
miles of territory within Soviet borders are claimed by the PRC. These areas the Chinese claim, were taken by force from China in the 19th century when China was very weak and the Chinese talk constantly about rectification of borders. And where the two nations' armies face each other, shooting incidents are often reported. Recently, as the PRC has cemented relations with Japan, the Russians have indicated concern over "being surrounded." Nixon's earlier rapprochement with the PRC must have had a similar effect on them. There is no sign of a detente on the Sino-Soviet horizion and this is due as much, if not more, to China's implacable hostility than to any position taken by the USSR.

Finally, even more serious to the Soviets in a military sense than their Eastern front, is their West European front where in a conflict, they would confront most of the remaining (after the U.S.) military-industrial powers of the world (after the United States). Of course, they would have the assistance of their Warsaw Pact allies. However, other-NATO is far more powerful than Eastern Europe and outspent it on defense in 1980 (for example) by $95 billion to $17 billion. In fact, other NATO military expenditures over the decade 1971-80 exceeded those of other-Warsaw Pact by so much more than the USSR outspent the US (per CIA estimates) that there is a total NATO - Warsaw Pact gap in NATO's favor of about $300 billion, as attested to by the attached Chart taken from the Secretary of Defense's Annual Report. The $300 billion gap takes no account of the huge Soviet expenditures directed at China nor does it take account of the differences between the dollar and ruble valuations of US and Soviet defense spending. Taking account of these, would put the East-West 10 year confrontation gap at about $600 billion in NATO's favor.

The above figures are not the whole story, of course, but they do suggest something of how the Soviets view the military situation. They know that they are ahead of the US and the West in some dimensions of the arms race. They suspect (and now know) that the West would not attempt to prevent them from invading Afghanistan, or Poland, if they choose to do so. They know that the

CHART C-12

COMPARISON OF NATO AND WARSAW PACT TOTAL DEFENSE COSTS



[1]SOUTHEAST ASIA INCREMENT EXCLUDED (I.E., VIETNAM COSTS)

Xeroxed from: Department of Defense, Annual Report, Fiscal Year 1982

NATO nations pull together very ineffectively as an alliance against them. But they also know that they are practically alone in confronting all of the major Western military-industrial nations as well as Japan and China. They also know that although they may be ahead of the West in selected important areas of the arms competition, there are many areas in which they are behind. How could they be outspent by so much and not be behind in some areas? They know how mired down they are in Afghanistan and that they don't want to involve Poland (as they did Hungary and Czechoslovakia, years back) for fear of an even worse fate. They are undoubtedly concerned, in case of hostilities, about the level and quality of support, if any, that they will get from the Warsaw Pact, especially Poland and Romania.

Under the circumstances, I would think that it is highly probable that a military build-up by the US would lead the USSR to increase its rate of military spending however difficult for them to do so, given their domestic economic problems. The very perspective which has led the Reagan Administration to increase its military spending will also lead the Soviet leaders to increase theirs. Each nation sees the other as ahead or catching up and neither can be satisfied with second best. The apparent paradox is partly a matter of index numbers - dollars vs. rubles - but more importantly a matter of opposing "worst case assumptions." A further military buildup would worsen Soviet domestic economic problems by reducing investment for civilian purposes, diverting skilled labor and R&D from civilian to military tasks, and perhaps by reducing the inflow of young unskilled and semiskilled workers into the already tight civilian labor force. All of these changes would slow the growth rate and reduce the amount of goods a available for household.

One must also consider the possibility - a lesser one to my mind - that the Soviets won't respond with a further military buildup because of the serious state of their economy. A reduction in military expenditures is the one

measure that, in the short-run, might provide additional resources to prop up the overall performance of the rest of the economy. This possibility is enhanced by the fact that Brezhnev and some of those around him will very shortly be succeeded by a new generation of leaders. The three previous postwar successions -- those of Malenkov, Khrushchev, and Brezhnev -- each brought a more than normal increase in consumers' goods for a few years. Undoubtedly, the pressures to make a similar gesture will be present when the next succession takes place. In fact, the pressures may be somehwat greater this time than when Brezhnev and Khrushchev took over because of the deteriorating performance of the economy. It is possible, therefore, that a step-up in our military spending will not be matched by the Russians. In fact, given the state of the Soviet economy and the near proximity of a succession, it might be argued that the Soviets would be more receptive than ever before to proposals to end the arms race. On the other hand, it could also be argued that the U.S. should "rev up" the arms race in the knowledge that it will create hardships for the Soviet people and leadership.[4] There were some U.S. policy makers who favored this approach during the cold war of the 1950s.

Technology

The more rapid introduction of new technology into Soviet production processes constitutes a major potential solution to their growth problems. As noted earlier, Soviet growth in the past has owed more to increases in the quantity of factors of production than to changes in their quality. This has been particularly true of investment and capital stock and has been reflected in low total factor productivity (Tables 1 and 2) as well as in negative incremental capital productivity. Given sharply diminishing returns to capital as well as sharply reduced increments to labor force and to capital stock, (Tables 1 and 2) the Soviets must shift from "extensive"

[4]It is worth noting that the damage to the economy from diverting capital resources from civilian to military purposes is likely to be less than ordinarily expected because of the present low productivity of additions to capital stock. The greater damage may come from concentrating even more R&D on military objectives.

to "intensive" growth which means, primarily, speeding up the introduction and diffusion of new technology.

There are two ways to do this. One is by introducing economic reforms which provide the proper incentives. The 1973 Production Association Reform was an attempt along these lines - not apparently, very successful. Whether more profound reforms will encourage technological progress and whether they are in the cards will be discussed below.

A second approach is to import new technology, which of course has been tried already. Since the late 1960s, the Soviets have substantially expanded their purchases of machinery and equipment from the West, some of it relatively advanced technology. While this imported technology has undoubtedly had some positive effect on the economy, it has not had a discernible macro-effect; i.e., it has not been able to stem the downward rate of growth trend. Several reasons can be adduced why this has been the case. The Soviet industrial economy, to begin with, does not provide a very fertile soil in which to plant the seeds of new technology. It is difficult to get plant managers to introduce new methods of production and difficult to spread the technology to other plants. Even when new technology is introduced, its advantages are often vitiated by the manner in which the new machinery and equipment are adapted to Soviet conditions. For example, a number of years ago, the USSR imported six chemical plants. These plants were originally designed to employ a total of 91 auxiliary workers. In the Soviet adaptation of the plan, the number was expanded to 430. When the plants were finally in operation, 732 auxiliary workers were actually employed. Another example. In the early 1950s, the USSR began to introduce milking machines designed to replace milkmaids. Today this process is 95 percent completed--yet the number of milkmaids has declined ony from one per 15 to one per 18 cows!

Third, the magnitude of Soviet imports of products which might be considered

advanced technology has been relatively too small to have had a significant impact. Let us take the year 1976, for example. In that year Soviet imports from all sources totalled approximately $39 billion, of which less than $12 billion were from advanced industrial nations, including the U.S. Of these, approximately $9 billion worth were manufactured products, i.e., in SITC categories 5-8. However, SITC 7, which comprises machinery, amounted to only $4 billion of which, according to an unpublished estimate by John Young (Bureau of East-West Trade, Department of Commerce), only $1.6 billion represented "high technology." Even if we assume that all machinery imports carry new technology, the $4 billion worth must be put in the perspective of a gross investment for the year estimated by the CIA at approximately $350 billion and an investment in machinery and equipment of a little more than one-third of this amount, say $120 billion (CIA, Handbook, 1979, p. 63). In other words, machinery and equipment imports in 1976 amounted to around three percent of total investment in machinery and equipment. The significance of this percentage is further reduced in consideration of the fact that the 32 percent rate of investment in 1976 (Table seven) involved an increase in total capital stock of 7.2 percent and in industrial capital stock of 8.1 percent (Tables one and two). This implies that capital stock tends to be more than 10 times larger than the annual amount of investment and, therefore, that imports of machinery and equipment amount to a very tiny fraction indeed -- less than one percent-- of capital stock.

Reasoning along these quantitative lines, it becomes clear that the Soviet economy is just too large for imports of machinery and equipment on the present scale to have a serious impact on overall Soviet growth problems, even assuming that the economy were receptive to new technology.[6] This doesn't mean, of

[6]In contrast, it is worth noting that imports of machinery and equipment over the First Five Year Plan for Industrialization (1928-1932) amounted to almost 15% of gross investment in the whole economy. This much larger relative magnitude of imports relative to a smaller economy, plus the fact that the Soviet Union had, at that time, an enormous technological lag, created the possibility of using imports much more effectively to achieve industrialization and growth targets.

course, that in selected areas imports can't make a large contribution. Wherever there are bottlenecks, for example, the gains from breaking those bottlenecks may be many times the costs of the imports. Such large gains might be realized in the petroleum and natural gas industries, for example, from imports of advanced technology. But even if such gains should be five times that realized from normal investment, the volume of such imports would be too small to have a significant impact on overall economic growth.

To sum up: for a breakthrough on the technology front to solve the Soviet economic impasse, a radical economic reform and/or much larger imports of new technology would be required, two possibilities which I will discuss in the subsequent sections.

Problems in Eastern Europe: The Polish Crisis

If one wished to characterize in a sentence the trade between Eastern Europe and the USSR, one might say that the USSR supplies a good part of Eastern Europe's imported raw material requirements (especially fuels) and grains and receives in return machinery and equipment and other manufactured products. Over the past 10 years in particular, this exchange has become particularly burdensome to the USSR because the prices of raw materials, especially of petroleum, have risen substantially relative to the prices of machinery and equipment and other manufactured products in western markets, but much less rapidly in intraCMEA trade. So, for example, in 1980 the Poles imported petroleum from the USSR at approximately half the world price and exported to the USSR railroad cars and fishing trawlers at 12 and 149 percents, respectively, above world prices. (Marrese and Vanous, WSJ, p. 24). By continuing to export petroleum, etc. to the Bloc at lower than world prices, the Soviets are foregoing very large profits. This implicit Soviet subsidy has been estimated to have averaged "...$5.8 billion during 1974-1978, rising

to $10.4 billion in 1979, and a staggering $21.7 billion in 1980" (ibid.). To this implicit subsidy should be added the burden on the USSR of the fact that the manufactured products it imports from Eastern Europe are generally inferior to those which are available in the West.

One might well ask why the Soviet Union is willing to trade with the Bloc under such adverse terms? The answer is that in return for these economic benefits, the Bloc nations must reciprocate in various non-economic ways, military and political: by allowing Soviet troops and hardware to be stationed on their territories; by supporting the USSR in international forums; by accepting Soviet political ideology, Party domination, and the like. The subsidies can also be looked upon as payment, in part, for the fact that the Bloc nations have been forced, especially in the earlier years, to give up much more profitable trade opportunities with the rest of the world in favor of trade with each other. It is worth noting that the exceptionally high level of implicit subsidies at present is probably temporary and due (1) to the rapid increase in world raw materials prices relative to those of manufactured products and (2) to the fact that the CMEA pricing formula adjusts for such shifts in world prices rather slowly.

What would happen if the possibility suggested earlier materialized and Soviet output of petroleum failed to increase with domestic demand, causing a decline in the exportable surplus? One possibility is that the USSR might well reduce its deliveries to Eastern Europe as the least expensive way to balance supply and demand. If the opinions ventured in the preceding paragraphs are correct, there are obviously limits to the use of this alternative. Anything more than minor cutbacks in Soviet exports could have a very negative impact on the political and military solidarity of the bloc, particularly in the wake of the Solidarity crisis. Furthermore,

any significant weakening of the Eastern European economies due either to loss of Soviet raw materials or the need to spend hard currencies for such materials would also have a negative impact on the Soviet economy and the USSR would have to weigh this eventuality in the balance.

Whatever the burden on the USSR of trade with Eastern Europe (rather than with the West) prior to 1980, it has been increased by the Polish crisis which began in August of that year. The collapse of the Polish economy has been the most severe experienced by any nation in peacetime since the Great Depression 50 years ago. The economic crisis is, of course, partly a cause and partly a result of the socio-political crisis, which represents the most serious disturbance in Eastern Europe since Jugoslavia's defection more than 30 years ago. Some indication of the extent of the Polish economic problem as it has developed over the past decade is given by the fact that Poland is unable to even pay the current interest on its huge $28 billion hard currency foreign debt. Evidence of the severity of the collapse since the crisis developed is contained in official estimates and projections of GNP (Domestic Net Material Product):

	1978	1979	1980	1981 (July est.)	1982(plan)
Annual Rate of Growth (%)	3.0	-2.3	-5.4	-14.5	-1.4
Index (1978=100)	100.0	97.7	92.4	79.0	77.9

Source: Z. Fallenbuchl, "Poland: A Way Out?", presented at American Economic Association Meetings in Washington, D.C., Dec. 29, 1981 Table I (forthcoming). This official projection undoubtedly errs on the optimistic side.

The Polish crisis adversely affects the Soviet economy, not to mention those smaller Eastern nation, through a number of channels:

1) Polish scheduled deliveries of many products (especially coal, sulfur, machinery and food) have been delayed or canceled, disrupting production in the importing nations. Polish coal exports to CMEA, for example, dropped

from 20 million tons in 1979 to 12 million in 1980 to an estimated four million in 1981 (NYT, 1/8/82). There is no end in sight to this problem.

2) The USSR, in particular, has been forced to provide Poland with relief in the form of commodities (especially crude oil, gas, and iron ore) at low prices, as well as hard currency and unplanned credits.

3) The Polish credit crisis, not to mention Romania's impending crisis, will raise the cost and endanger the availability of future credits for all the CMEA nations. An explicit Polish default would make matters worse.

4) Soviet support of the Polish military regime and the possibility of Soviet intervention on Poland has stepped up the cold war and threatens to reduce both credits and exports of strategic commodities, especially from the US, which has already imposed sanctions.

5) The crisis represents a weakening of the Warsaw Pact's western front and could induce the USSR into increasing its military effort to compensate.

6) Another possible scenario is that the threatening example of Solidarity might force Soviet leadership into providing its own household sector with more consumer goods than planned, at the expense of investment and perhaps even military expenditures. In the short run, this could reduce the growth rate and worsen the hard currency balance of payments position.

It is almost impossible to quantify the drain that the Polish crisis involves for the USSR. It has been widely rumored that the first year of crisis involved Soviet assistance of $4-5 billion (NYT, 12/24/81). Another dispatch puts Soviet financial aid at $2.15 billion, to which it adds forgiving of debt repayments and extensions of new foreign currency loans (NYT, 1/8/82). Finally it has been reported (NYT, 1/7/82) that the USSR and Poland signed an $11.8 billion trade agreement (presumably for 1982) which includes $3.8 billion in new credits. Dollar signs cannot be put on the remaining difficulties, mentioned above, entailed by the Polish crisis.

Nevertheless, it seems possible that the Polish crisis currently adds a $5 billion burden annually to the Soviet economy.* For a nation with an estimated $1.5 trillion GNP, this is not a lot--less than one percent. And it would not be a big burden if the Soviet economy were buoyant and growing as rapidly as it did in the 1950s. But, beset by many other serious problems, including growth rates which are low and declining, the unexpected loss of perhaps one-third of the annual increment in GNP in the form of assistance to Poland, is undoubtedly viewed as a very heavy burden. Moveover, the Polish crisis is by no means resolved and no one knows what the future holds in store.

Hard Currency Balance of Payments and Trade

Since World War II, most of Soviet trade has been with its Eastern partners, the members of Comecon. Trade with Western Europe rose rapidly after 1960 and with the United States after 1970 as a result of detente. As a result, Soviet trade with capitalist countries grew from between 25-30% of total trade in 1960 to 40-45% in 1978. Over the past few years approximately half of the USSR's hard currency earnings have resulted from sale of petroleum and its products (Cf. Tables 11, 14). Other large earners are natural gas, lumber, weapons and gold. While sales of machinery and equipment have brought in about as much as lumber and natural gas in some years, such exports constitute less than 10 percent of hard currency earnings, an unusually small percentage for an advanced industrial nation. The Soviet Union's major import category on the other hand, is machinery and equipment, which currently amount to more

*Undoubtedly the Polish crisis is partly responsible for the fact that the Soviet current account, which has had substantial surpluses over the past few years, is estimated to have run a hard currency deficit of more than $5 billion in 1981. Increased food imports also played a role.

than one-third of total hard currency imports. The second largest import, reflecting the Soviet Union's agricultural problems, is food. Rolled ferrous metals and chemicals together comprise another 25% (Table 12).

The Soviet Union began the 1970s with virtually no hard currency debt (Table 15). While trade deficits were sustained every year beginning in 1970, these were offset in most years by sales of gold and weapons (included in "Other invisibles," Table 14). Large scale foreign borrowing occurred in 1975 and 1976, however, when western recessions reduced Soviet exports at the same time that unprecedented increases in food imports were necessary because of harvest failures. In 1977 and 1978, however, the USSR managed to bring its current account back into balance. At the end of 1980, the Soviets had a gross debt of approximately $17 billion. However, its net debt was probably only about $11 billion because of large deposits held in Western banks, as well as suppliers' credits extended to western enterprises. At present, the USSR is deemed by most observers to be "creditworthy" and there has been no reluctance on the part of western banks to extend it additional loans at competitively low interest rates (low spreads). As of 1978, its debt service ratio* measured against hard currency commodity export earnings was .24 and against total hard currency earnings (including earnings from transport, tourism, etc.), only .17 (Ericson and Miller, p. 225). These are quite respectable ratios by present day standards and have remained relatively stable since the upward jump between 1974 and 1975. The Soviet performance stands in sharp contrast with those of some other Comecon members, which have very high debt service ratios and are very serious credit risks.

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*The debt service ratio is the debt service (debt repayment plus interest) divided by merchandise export earnings or by all goods and service export earnings.

As noted earlier, the relatively good Soviet current account performance undoubtedly owes much to the very favorable trend in terms of trade experienced since approximately 1973. The relatively rapid rise in prices of petroleum, natural gas, weapons (which could now be sold to the Middle East for hard currency), and gold provided the USSR with a windfall of at least $20 billion. To what extent imports would have been curtailed in the absence of this windfall is anyone's guess. It is highly probably, at any rate, that imports would not have declined by the full $20+ billion, which is equal in value to more than one-fourth of hard currency imports and to the total imports of machinery and equipment from the West (Table 12). This leads us to conclude that the Soviet debt would undoubtedly have been somewhat higher than it is under unchanged terms of trade. Even so, the Soviets do appear to have acted fairly responsibly in the face of the rise in debt which did occur. Despite rising prices, total hard currency imports barely increased in 1976 and 1977 (Table 12). Furthermore, new equipment orders are estimated to have declined from $6 billion in 1976 to $3.8 billion and $2.8 billion, respectively, in 1977 and 1978. (Ericson and Miller, p. 243).

Unfortunately for the USSR, its balance of payments situation in the 1980s is likely to deteriorate still further. For an economy which is visibly slowing down and which could benefit from increased imports, particularly of machinery and equipment which embody new technology, this is a gloomy prospect. The three major factors which are likely to lead to further deterioration in the hard currency balance of payments are the Polish crisis, rising imports of grain, and trade in petroleum. As we already noted above, it is virtually impossible to quantify the impact of the Polish crisis, particularly since the time and nature of its final resolution are at this time unpredictable. Much of the negative impact on the USSR will be on its economy in general and on its trade

with CMEA. There will, however, undoubtedly be hard currency spinoffs as well. For one thing, Poland has apparently already received hard currency loans and will probably receive more. For another, to the extent that the USSR has to render unexpected commodity assistance to the Poles, it may either have to replace some of these products by unplanned purchases in hard currency markets or, in cases like petroleum, to divert exports away from hard currency buyers. There is some evidence that Poland may involve a hard currency drain for the Soviets. First, there has been a reported surge in Soviet gold sales in the last half of 1981 (NYT, 1/5/82), as well as persistent reports in the press that the Soviets are short of hard-currency reserves. Finally, as noted earlier, the USSR is believed to have had a hard currency deficit on current account of some $5-6 billion in 1981, a shift of some $8-9 billion in comparison with the surpluses of the preceding few years (Table 14).

While unpredictable from year to year, grain imports are somewhat more predictable over the long run, as is suggested by their history over the past decade (Table 8). Most experts expect the quantity of grain imported to rise slowly over the next 10 years; in value terms, the increase will be more rapid because of projected increases in grain prices. By itself, the need to allocate hard currency reserves to imports of grain is a matter for Soviet concern, although not as serious as the potential threat from declining petroleum exports.

The most serious balance of payments threat certainly does lie with petroleum. Petroleum exports provided approximately half of total hard currency earnings in the late 1970s, reaching a high of $14 billion in 1980. As noted earlier, the future of these exports is problematical. It depends on several factors, the most important of which are: future output, attempts at and successes with conservation, and the degree to which the USSR meets

Eastern Europe's import requirements in the next decade. In the late 1970's, when the pessimistic CIA projections held center stage, prospects appeared very grim indeed, as may be seen from the A and B scenarios of Table 10. Not only were there to be no net exports of petroleum, but net imports were sufficiently large that they would absorb practically all hard currency if indeed they did not require an increase in debt. This outcome would be disastrous, leaving the USSR with virtually no funds with which to import machinery, equipment, and technology from the West. Further, the consequent rapid rise in hard currency debt would eventually raise the USSR's debt service ratio to 70 or 75 percent (Bond and Levine, 1979, p.265) and make it difficult and costly, if not impossible, to obtain additional credits.

Even scenario J, which appears to be the most optimistic plausible forecast for 1985, projects maintenance in the level of petroleum exports for hard currency only under the extremely optimistic assumption "a" regarding conservation. If conservation efforts yield results somewhere between "a" and "b", as appears likely, then hard currency exports are bound to decline. The drop in export earnings is estimated to be still greater between 1985 and 1990, despite rising prices. In fact, large purchases of oil for hard currency are envisaged in the event that conservation efforts fall somewhere between "a" and "b". To sum up: under J, export earnings from petroleum will fall off gradually but significantly under optimistic assumptions and sharply under pessimistic assumptions.*

What extenuating circumstances are there, if any, and what might the Soviets do to improve their hard currency position in the 1980's? First, one significant offset to the projected decline in hard currency earnings are the prospective increased earnings from sales of natural gas. The

*As pointed out in the footnote on page 38, at present I view the J estimates as overpessimistic.

USSR has the largest natural gas reserves in the world and they are developing these very rapidly. Hard currency earnings from natural gas increased 12-fold between 1975 and 1980, exceeding $3 billion in the latter years. In fact, future hard currency earnings from sales of natural gas should be at least large enough to offset projected increases in the costs of importing grain in the near future.

Further down the pike, when (and if) the projected Urengoi-Yamburg pipeline for shipping natural gas from Siberia to Western Europe goes into operation, it is expected that the USSR's hard currency earnings from gas exports will total $8 billion annually, after repayments of principal and interest on loans.

Second, while projection "a" for domestic requirements of petroleum seems overly optimistic, it could be that if (and as) the balance of payments deteriorates, the Soviets will make more heroic efforts to conserve petroleum. However, prospects for doing so do not look too promising. For example, one plan for conserving on the domestic use of oil is to increase the output of coal as a substitute. So far, however, the Soviets have fallen way behind their targets for increasing coal output. Moreover, given the nature of the planning-incentive system in the USSR, the likelihood of getting managers to effectively implement oil conservation measures seems slim.

A third possibility of reducing hard currency payments pressures is to reduce both grain and petroleum exports to Eastern Europe, diverting the latter to either domestic needs or to the West, as circumstances may dictate. Some relief will undoubtedly be sought through these channels but probably not very much. Subsidization of trade with Eastern Europe, for the sake of greater political cohesion, has been a cardinal Soviet policy

for at least 20 years. Significantly reducing exports of two of the most important commodities in intrabloc trade would, as noted earlier, make a hollow shell of CMEA and could be politically very costly.

The outline of yet another possible solution consists in the fact that all of the Eastern nations face hard currency balance of payments problems, which may lead them to reverse the recent increase in East-West trade and to substitute for it greater intrabloc trade. Efforts toward greater economic integration were already apparent in the so-called "Comprehensive Program" of 1971-75 and in the "Coordinated Plan for Multilateral Integration" of 1976-1980. For systemic reasons these efforts have not been too successful, except in fairly obvious activities such as jointly owned and constructed oil and gas pipe lines and in the Comecon electricity grid. However, East-West problems will insure continuation of attempts at further intrabloc trade and integration.

Still a fifth attempt to cope with the hard currency balance of payments problems has been the fairly extensive use of so-called compensation agreements with Western enterprises. Under these agreements, the Soviets import Western equipment under a long-term credit in order to build a factory and later repay the loan by assigning part of the output of the factory to the creditor. These agreements not only often provide relatively cheap credit but also provide what are, in effect, guaranteed hard currency markets. In addition, the Soviets get assistance and experience in selling in Western markets. An example of this type of agreement would be the import of pipe to be paid back in shipments of natural gas through the pipeline. A related type of transaction is the so-called counterpurchase deal, in which exports and imports are exchanged simultaneously. One of

the largest of these, the Occidental Petroleum Company deal, involved U.S. shipments of superphosphoric acid in exchange for Soviet deliveries of ammonia, potash and urea. These projects also reduce Soviet marketing risks.

In aggregate, how large are the compensation deals? One estimate predicts that hard currency exports as a result of such agreements will amount to $2 billion in 1985 (Barclay, p. 468). At the moment, these are not very large figures - but they could be a sizable part of Soviet hard currency earnings if the balance of payments deteriorates sharply. However, it is important to recognize that the estimates just cited are gross figures which do not take account of the fact that, without compensation agreements, some of the exports would have been made anyway.

While the USSR is anxious to complete more compensation agreements, it is not clear how successful they will be. For one thing, such agreements are not usually optimal from the standpoint of the Western partner, who assumes more than the usual risks. So, for example, the products of some agreements have finally been ready for export at times when the markets for those products had become saturated. A further problem is dealing with the Soviet bureaucracy and with Soviet reluctance to having foreigners on their soil for any length of time. And in addition, many of the Western entrepreneurs who might have been interested in deals with the Soviets have since found the Chinese better partners. This is especially true of Japanese investors.

Finally, the Soviets are tinkering with still another approach to improving their hard currency earnings. Despite the fact that the USSR is a relatively advanced nation, it earns less than 10 percent of its hard currency from the export of manufactured products. This is largely a

systemic failure, stemming from planner concentration on quantity rather than quality, and from the fact that, with taut planning, sellers' markets are chronic. Under these circumstances, plant managers do not have to compete in domestic markets and, when they are forced to compete in Western markets, find themselves at a great disadvantage (Holzman, 1979). This problem has been to some extent sidestepped in weapons production by the establishment of priority conditions and special privileges for the enterprises involved, as well as by intimate ties between those enterprises and R&D institutes. It has recently been proposed that special export enterprises also be established, which would receive similar preferential treatment.

Radical reform of the whole economy would be the best way of introducing "competitiveness" and quality into the Soviet performance, of course. In the absence of such a reform, attempting to transform exportables into a competitive sector would probably increase exports somewhat but could be costly to the rest of the economy. It is generally recognized, for example, that the priorities accorded the Soviet military sector have had serious negative spinoffs on the civilian economy, which take the form of denuding the civilian economy of the R&D talent, the most highly skilled workers, and the best materials. In addition, since bottlenecks in military industry have to be avoided at all costs, the burden of planning errors and "tautness" is shifted to the civilian economy. The introduction of a special export sector would increase the burden on the civilian sector and might also tend to decrease the effectiveness of the special privileges granted the military sector. In light of the difficulties currently being experienced in the consumer sector and the poor state of

worker incentives, plus the sanctity of the military sector, it might be very difficult to implement a priority export sector of sufficient magnitude and efficiency to have a discernible impact.

The upshot of this section is that if some of the more pessimistic scenarios regarding petroleum and climate come to pass, the USSR's hard currency balance of payments will deteriorate and the authorities will be forced to borrow more heavily than in the past and to curb imports. The consensus seems to be that some deterioration will take place but how much is hard to predict. Most of the ameliorative measures which have been suggested are, in my opinion, unlikely to have a significant effect. It is worth pointing out, however, that while reduction of imports from the West will reduce Soviet gains from trade, the gains will not be reduced proportionately if the foreign trade planners ration their foreign exchange carefully. There does appear to have been a considerable number of low gain products and projects among Soviet imports in the past and probably at present. So, for example, about one-third of all Soviet beer is produced in breweries built by foreign contractors; a large part of Soviet sugar beets are processed by imported equipment; the Germans built a steel mill in Kursk, the Japanese opened and operate a coal mine in Yakutia; the Soviets imported welding equipment from the United States while selling more advanced welding equipment to an American consortium; and so forth. While these transactions may be quite rational and advantageous under ordinary conditions, as hard currency becomes scarce, it will undoubtedly be reserved for transactions which provide larger gains.

Economic Reform

Some of the Soviet Union's economic problems are primarily system-independent (e.g. demographic trends, climate, growing energy shortages), others flow in part from the nature of central planning by direct controls (e.g. poor quality of goods, lag in technology). In the past quarter century, the Soviets have instituted four major reforms, which appear to have had little impact on economic performance, although, the returns on the 1979 reform are not yet in. The trouble with all of them is that they have accepted central planning by direct controls but have tried, through the introduction of administrative measures, to make it work better. Since it is central planning by direct controls which itself has been responsible for the difficulties faced, administrative tinkering was bound to fail.

This does not mean, of course, that more fundamental reforms would be sure to significantly improve Soviet performance. Hungary introduced a New Economic Mechanism (NEM) in 1968, which has been evolving steadily since that time. It appears to have led to an improvement in the quality of products produced, but does not appear to have increased Hungary's rate of growth above that of some of the other less radically reformed Eastern nations. Nevertheless, the possiblity does exist that if the USSR shifted to a modified form of market socialism, under which plant managers had some autonomy over output and prices, competition existed, prices became more meaningful, profits rather than output or sales became the criterion of management success, and overfull employment was eliminated, then Soviet economic performance would improve.

There are several reasons for believing that a radical reform would be opposed by almost everyone in the production hierarchy. The bulk of the management and planning bureaucracy would stand to lose their jobs if central planning by direct controls were replaced by the market. Reforms would also be opposed by production association and plant management personnel, who would feel threatened by the sharp change in the nature of their jobs (if they were able, even, to keep them). Instead of having the plan tell them how much to produce, where to ship their output and where to buy their inputs, etc., managers would have to compete for inputs and to compete in selling their outputs.

The workers would also be opposed to decentralization, viewing it as a threat to their job security. It is unlikely, however, that, in practice, job security would be significantly reduced. Under the NEM, the Hungarians were not able to achieve labor reallocation, which is probably one reason why that Reform has not been a greater success. The Soviets attempted to increase labor mobility in the so-called Shchekino experiment in which, if a redundant laborer were fired, the remaining workers were allowed to divide up his wage. The experiment failed, an indication of labors' dedication to job security. Finally, there is evidence that most Soviet economists and political leaders still believe in the superiority of central planning over the market. All of this entrenched interest and ideological opposition adds up to very strong political opposition to a radical reform.

Futhermore, the abortive Czech Reform of 1968 demonstrated the very close relationship between radical economic reforms and liberalization in political and intellectual life - which of course was why Warsaw Pact troops marched into Czechoslovakia and aborted the Reform. True, the

Hungarians have managed to keep their NEM from infecting their political and intellectual life to an extent that might invite intervention, yet the threat remains. And the Soviet leadership is obviously much more sensitive to such threats than the Hungarians.

Again, if the Soviets adopted a radical economic reform, it would undoubtedly lead to the adoption of similar reforms by other Eastern nations. Radical reforms throughout the Bloc would destroy it as a relatively tightly knit economic trading group and also tend to reverse the attempts that are currently being made to integrate Bloc economic activity through the "Comprehensive" and "Multilateral" programs noted earlier. This is because radical reforms would result in foreign trading by enterprises on the basis of market criteria rather than through bilaterally binding trade agreements. Under these circumstances, East-West trade would increase rapidly at the expense of intrabloc trade since Eastern demands for Western goods are presently relatively repressed. It seems unlikely that Soviet leaders would countenance reforms, the implications of which would be such a sharp reduction in intrabloc trade ties which are, after all, viewed by the Svoiets as a source of political cohesion.

For the above reasons, I would predict that the Soviet Union will not adopt radical reforms in the near future, except in the unlikely event of an acute economic crisis. At the moment, Soviet difficulties appear mildly disabling and chronic, not acute.

III. Concluding Remarks

The Soviet economic prospects for the 1980s do not look too good. It seems highly probable that the downward trend in overall rate of growth will continue; it would seem to be virtually guaranteed by the decline in growth rate of labor force and systemic weaknesses of the economy with regard to developing and diffusing new technology. Furthermore, continuing poor performance in agriculture and rapidly rising costs of raw material extraction will act as further drags. Should the pessimistic scenarios regarding petroleum supplies and climate materialize, growth will be slowed directly but also indirectly, through the impact on the hard currency balance of payments. Still another potentially depressing factor would be an acceleration of the arms race.

On the other hand, one must recognize that if the Soviets luck out on some of the crucial probabilities, the 1980s may turn out to be not much different from the 1970s which, despite a disturbing downward trend, did achieve a respectable average level of growth. So, for example, better than average weather conditions for agriculture, achievement of Soviet petroleum goals announced for the 1981-85 Five Year Plan, and reasonable and quick settlement of the Polish crisis, would probably result in at least a 4% annual growth rate of GNP.

Finally, even if pessimists prove to be correct, one must put the Soviet predicament in perspective. The USSR is not unique in facing difficult economic and social problems. One can easily envisage a Soviet economist writing a paper entitled "The United States Economy in the 1980s." Such a paper would undoubtedly point out that:

"In recent years the United States has had a low overall rate of economic growth and, in some years, the rate of growth has been negative. Further, the increase in factor productivity has been declining and is presently growing at an alarmingly low rate for a nation which considers itself to have the most advanced industrial economy in the world. The rate of innovation and of investment have also both been declining, as has the position of this nation in world markets. Even the American automobile and steel industries, once the world leaders, can no longer meet foreign competition and are begging the government for protection. Like other capitalist nations, the United States cannot control inflation nor can it any longer keep its labor force fully employed. Because prices are rising faster than the wages of most of the labor force, workers' real wages have actually been declining. Since the Reagan administration took office, real wages have been further reduced by the wholesale scrapping of social-welfare programs in order to provide the funds for that nation's mad military buildup."

Table 1

U.S.S.R: Average Annual Rates of Growth of Total GNP Production, Factor Inputs, and Factor Productivity, 1951-78

[Percent]

	1951-55	1956-60	1961-65	1966-70	1971-75	1976	1977	1978	1979	1980
Total GNP	6.0	5.8	5.0	5.5	3.8	4.8	3.2	3.4	0.8	1.4
Inputs:										
Labor (Man-hours), capital, and land-	4.5	3.9	4.1	3.9	4.1	3.5	3.7	3.7	3.6	3.3
Man-hours	1.9	.6	1.6	2.0	1.9	1.1	1.5	1.7	1.5	1.2
Capital	9.0	9.8	8.7	7.5	7.9	7.2	7.0	6.9	6.8	6.5
Land	4.0	1.3	.6	-.3	.9	0	-0.2	0	0	0
Factor productivity:										
Labor (man-hours), capital, and land-	1.4	1.8	.9	1.5	-.2	1.2	-0.4	-0.3	-2.7	-1.9
Man hours	4.6	5.1	3.4	3.4	1.8	3.6	1.7	1.7	-0.7	0.2
Capital	-2.7	-3.6	-3.3	-1.9	-3.8	-2.3	-3.5	-3.3	-5.6	-4.8
Land	1.9	4.4	4.4	5.8	2.9	4.8	3.4	3.4	0.8	1.4

Sources: Greenslade, p. 279 (1951-1975)

CIA, Handbook, 1981, p. 60 (1976-1980)

Table 2

U.S.S.R.: Average Annual Rates of Growth of Industrial Production, Factor Inputs, and Factor Productivity, 1951-78

[Percent]

	1951-55	1956-60	1961-65	1966-70	1971-75	1976	1977	1978	1979	1980
Total industrial production---	11.3	8.7	7.0	6.8	6.0	3.9	4.0	3.5	3.0	3.4
Inputs:										
Labor (man-hours) and capital--	7.4	5.3	6.4	5.5	4.5	5.0	4.3	4.3	4.1	3.5
Man-hours----------	4.2	1.1	2.9	3.1	1.5	2.2	1.5	1.7	1.3	1.0
Capital----------	12.0	11.3	11.2	8.7	8.7	8.1	7.5	7.2	7.3	6.4
Factor productivity:										
Labor (man-hours) and capital--	3.6	3.2	.6	1.3	1.5	1.0	-0.4	-0.7	-1.1	-0.2
Man hours----------	6.9	7.6	4.0	3.6	4.5	1.6	2.4	1.8	1.6	2.4
Capital----------	- .6	-2.3	-3.8	-1.8	-2.4	-3.9	-3.3	-3,4	-4.0	-2.9

Sources: same as Table 1.

Table 3

USSR: Growth of Gross National product,[1] by Sector of Origin

	Average Annual Percent Change														
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
GNP	5.3	4.8	6.1	2.9	7.3	4.1	2.1	7.0	4.0	1.7	4.8	3.2	3.4	0.8	1.5
Agriculture[2]	4.5	0	6.0	-3.1	12.4	-0.5	-5.5	14.6	-0.8	-8.8	8.1	4.6	3.3	-5.8	-4.4
Industry	5.7	7.5	6.8	5.4	6.4	6.7	4.9	6.3	6.3	5.9	3.9	4.0	3.5	3.0	3.4
Construction	4.8	7.8	5.4	3.9	7.7	6.8	5.2	6.0	5.3	5.0	3.4	2.4	3.0	0.8	2.5
Transportation	7.3	9.2	8.1	5.6	7.1	7.1	5.6	7.2	7.0	6.2	4.4	2.2	4.6	2.3	3.3
Communications	10.4	10.4	7.5	8.4	7.6	7.3	7.4	7.2	7.2	7.2	6.4	5.7	5.5	5.6	5.4
Trade	8.2	7.1	6.8	5.0	6.7	4.9	3.2	5.5	4.7	4.6	3.5	3.7	3.1	2.3	2.4
Services	4.4	4.2	4.4	3.9	3.9	2.7	3.6	2.6	4.1	3.2	2.5	2.5	3.1	3.0	2.9
Other	3.1	3.7	5.3	4.7	3.4	3.3	1.8	1.3	1.5	1.2	1.6	0.6	0.9	0.8	0.7

Sources: CIA, The Soviet Economy in 1978-79 and Prospects for 1980, p. 25. (1966-1974)

CIA, Handbook, 1981, p. 57 (1975-1980).

[1]Calculated at factor costs.

[2]Excluding intra-agricultural use of farm products but does not make an adjustment for purchases by agriculture from other sectors.

Table 4

U.S.S.R.: Growth in Per Capita Consumption, 1951-79

[Average annual rates of growth]

	1951-55	1956-60	1961-65	1966	1967	1968	1969	1970	1966-70	1971	1972	1973	1974	1975	1971-75	1976	1977	1978	1978/79
Total consumption	5.3	4.2	2.3	5.1	5.5	5.4	5.0	4.1	5.0	3.1	1.4	3.2	3.2	3.8	2.9	1.9	2.4	2.2	<2.0

Sources: 1951-1960, Schroeder and Severin, p. 622
1961-1978, Denton, p. 768
1978/1979, CIA, June 1980, p. 14

Table 5

Vital Rates for the U.S.S.R.: 1950 to 2000

[Per 1,000 population]

	Births	Deaths	Natural increase
Year:			
1950	26.7	9.7	17.0
1960	24.9	7.1	17.8
1970	17.4	8.2	9.2
1980	19.2	9.3	9.9
1990	17.3	9.8	7.5
2000	16.0	10.2	5.8

Source: Feshbach and Rapawy, p. 122

Table 6

USSR: Population of Working Age[1]

Million Persons (Midyear)

	Total	Annual Increments	Entrants (16-year-olds)	Deaths	Departures (55/60-year-olds)
1955	114.7	2.7	4.7	0.4	1.6
1956	116.9	2.2	4.3	0.4	1.7
1957	118.6	1.7	3.9	0.5	1.7
1958	119.6	1.0	3.1	0.4	1.7
1959	119.6	Negl	2.1	0.4	1.7
1960	119.5	-0.1	1.9	0.2	1.8
1961	119.6	0.1	2.3	0.4	1.8
1962	120.2	0.6	2.8	0.4	1.8
1963	121.2	1.0	3.3	0.4	1.9
1964	122.6	1.4	3.8	0.4	2.0
1965	124.1	1.5	4.1	0.5	2.1
1966	125.7	1.6	4.2	0.4	2.2
1967	127.2	1.5	4.3	0.5	2.3
1968	128.6	1.4	4.4	0.6	2.4
1969	130.0	1.4	4.3	0.5	2.4
1970	131.7	1.7	4.5	0.6	2.2
1971	134.0	2.3	4.8	0.5	2.0
1972	136.5	2.5	4.9	0.5	1.9
1973	139.0	2.5	4.9	0.5	1.9
1974	141.7	2.7	5.0	0.4	1.9
1975	144.4	2.7	5.1	0.5	1.9
1976	147.2	2.8	5.2	0.5	1.9
1977	149.9	2.7	5.2	0.5	2.0
1978	152.2	2.3	5.0	0.6	2.1
1979	154.2	2.0	4.8	0.6	2.2
1980	155.8	1.6	4.5	0.5	2.4
1981	156.9	1.1	4.3	0.7	2.5
1982	157.7	0.8	4.2	0.7	2.7
1983	158.3	0.6	4.1	0.6	2.9
1984	158.8	0.5	4.0	0.6	2.9
1985	159.2	0.4	4.0	0.7	2.9
1986	159.5	0.3	4.0	0.7	3.0
1987	159.9	0.4	4.1	0.6	3.1
1988	160.6	0.7	4.2	0.6	2.9
1989	161.2	0.6	4.3	0.7	2.9
1990	161.9	0.7	4.4	0.7	3.0

[1] Males age 16-59, females age 16-54. U.S. Department of Commerce, Bureau of Economic Analysis, September 1976. Taken from: CIA, USSR:Some Implications of Demographic Trends for Economic Policies, Jan. 1977, p. 4.

Table 7

Gross Investment as Percentage of GNP (at factor cost)

1960	24
1965	27
1970	28
1975	31
1976	32
1977	32
1978	32
1979	32
1980	33

Source: CIA, Handbook 1981, p. 56

Table 8

Soviet Grain Output and Imports

	Output (millions of metric tons)	Imports (millions of metric tons)	Cost of Imports ($ millions)
1960	125.5	0.8	0.0
1961	130.8	0.8	30.8
1962	140.2	0.6	0.0
1963	107.5	10.4	193.4
1964	152.1	2.6	566.4
1965	121.1	9.0	408.6
1966	171.2	3.9	493.0
1967	147.9	2.3	147.7
1968	169.5	1.2	122.2
1969	162.4	1.8	46.1
1970	186.8	1.3	122.7
1971	181.2	8.3	207.0
1972	168.2	22.8	888.8
1973	222.5	11.3	1527.3
1974	195.7	5.7	724.3
1975	140.1	26.1	2527.8
1976	223.8	11.0	2935.5
1977	195.7	18.9	1456.6
1978	237.4	15.6	2429.0
1979	179.2	31.0	3538.2
1980	189.2	35.0	5276.2

Source: Centrally Planned Economies Service, Wharton Econometric Forecasting Associates.

Table 9

Forecasts of Soviet Petroleum Output and Trade
(mns. of metric tons)

Scenarios	Output		Domestic Requirements				Net Exports or Imports (-)			
	1985	1990	1985		1990		1985		1990	
			a	b	a	b	a	b	a	b
A	500	500	460	532	450	571	40	132	50	-71
B	400 to 415	-					-45 to 60	-117 to-132	-	-
C	500 to 550	350 to 450					40 to 90	- 32 to 18	-100 to 0	-121 to -221
D	550	550					90	18	100	-21
E	605	605					145	73	155	34
F	655	710					205	123	260	139
G	700+	700+					240+	168+	250+	129+
H	620 to 645	-					160 to 185	88 to 113	-	-
J	600	550	460	532	450	571	140	68	100	-21

Output

Sources:CIA: April 1977; Bond and Levine, 1979,p.258; Bond and Levine,May 1981, Table B-4; Stern,1981, pp.30,54

A - CIA 1977 optimistic estimate
B - CIA 1977 pessimistic estimate
C - CIA 1981 revised estimate
D - Oil and Gas Journal projection
E - Leslie Dienes, pessimistic estimate
F - " " , optimistic "
G - UN Econ. Comm. for Europe estimate
H - Soviet 11th 5 Year Plan Target
J - Bond and Levine, 1981, estimate

Note: 50 million metric tons per year is roughly equivalent to 1 mn.barrels per day per year.

Domestic Requirements

a. Bond and Levine 1981 optimistic estimate
b. Bond and Levine 1979 pessimistic estimate

Note: The following figures are presented for purposes of comparison:

	1975	1980
Output	491	603
Domestic req.	364	443
Net exports	127	160

Source: Bond and Levine, 1971, Table B4

Table 10

Soviet Net Exports or Imports (-) of Petroleum in Hard Currency Markets

	Quantities - Millions of Metric Tons				Values - Billions of Current Dollars			
	1985		1990		1985		1990	
	a	b	a	b	a	b	a	b
A	-30	-102	-20	-141	-6.0	-20.4	-6.0	-42.3
B	-115 to -130	-187 to -202	-	-	-23.0 to -26.0	-37.4 to -40.4	-	-
C	-30 to -20	-102 to -52	-170 to -70	-191 to -291	-6.0 to 4.0	-20.4 to -10.4	-51.0 to -21.0	-57.3 to -87.3
D	20	-52	30	-91	4.0	-10.4	9.0	-27.3
E	75	2	85	-36	15.0	0.4	25.5	-10.8
F	135	53	190	69	27.0	10.6	57.0	20.7
G	170+	98+	180+	59+	34.0+	19.6+	54.0+	17.7+
H	90 to 115	18 to 43	-	-	18.0 to 23.0	3.6 to 8.6	-	-
J	70	-2	30	-91	14.0	-.4	9.0	-27.3

Sources and notations: See Table 9.

Explanation: Hard currency trade in petroleum is estimated by deducting sales to the CMEA nations from net exports or imports as calculated in the last 4 columns of Table 9. Sales to CMEA have been arbitrarily assumed constant at 70 mmt. Obviously, if pessimistic scenarios like B and C should materialize, sales to CMEA would be at least sharply reduced and probably stopped entirely.

The value of trade is calculated in the columns on the right by assuming that the world price of petroleum is $200 per metric ton in 1985 and $300 in 1990, in comparison with an actual price of approximately $150 in 1980. The 1985 and 1990 figures "round off" projections by Bond and Levine (1979, p. 276).

Those who disagree with the assumption regarding sales of 70 mmt to CMEA can add $2 billion to hard currency sales for each 10 mmt reduction in those sales in 1985 and $3 billion per 10 mmt in 1990.

Table 11

U.S.S.R.: Selected Hard Currency Exports in Current Dollars

[In millions of U.S. dollars]

Description	1971	1972	1973	1974	1975	1976	1977	1978
Total	2,630	2,801	4,790	7,470	7,835	9,721	11,345	13,157
Of which:								
Machinery and equipment	184	225	299	340	561	657	797	1,209
Petroleum and petroleum products	567	556	1,248	2,548	3,176	4,514	5,275	5,716
Coal and coke	124	230	134	251	390	368	357	293
Natural gas	20	23	23	86	209	347	566	1,063
Ferrous and nonferrous metals	252	273	455	569	412	459	174	126
Wood and wood products	360	403	709	1,002	712	852	1,029	975
Of which:								
Lumber	147	169	262	407	262	400	437	403
Cotton fiber	81	165	221	355	298	392	514	344
Unspecified:								
Of which:								
Diamonds	257	371	515	545	478	511	606	NA
Platinum	95	187	296	372	201	187	181	230
Nickel	69	35	62	106	53	46	43	85

Source: Erickson and Miller, p. 242.

Table 12

U.S.S.R.: Selected Hard Curency Imports in Current Dollars

[In millions of U.S. dollars]

Description	1970	1971	1972	1973	1974	1975	1976	1977	1978
Total imports	2,701	2,943	4,157	6,547	8,448	14,257	15,316	14,645	16,951
Of which:									
Machinery and equipment	927	960	1,282	1,739	2,334	4,593	5,074	5,114	5,969
Of which:									
Transportation	110	103	62	56	94	456	304	230	243
Chemicals	90	150	272	324	339	503	1,084	1,853	1,938
Oil and oilfield	8	24	15	4	6	138	175	110	NA
Motor vehicle manufacturing	224	665	659	141	393	346	260	233	123
Rolled ferrous metals	279	366	489	880	1,892	2,565	2,251	1,750	2,480
Of which:									
Pipe	168	219	251	428	655	1,509	1,165	801	1,269
Nonferrous metals	44	28	33	40	78	113	128	8	74
Chemicals	209	213	257	278	710	742	632	617	831
Of which:									
Plastics	61	63	86	95	337	242	181	183	272
Rubber and rubber products	144	102	85	140	293	217	216	175	187
Textile & textile raw materials	246	239	214	439	507	390	434	535	588
Food	280	405	981	1,841	1,001	3,319	3,401	2,412	3,175
Of which:									
Grain	101	185	770	1,423	509	2,323	2,627	1,354	2,360
Other consumer goods	260	250	235	194	261	436	428	429	340

Source: Ericson and Miller, p. 241.

Table 13

USSR: Gold Production and Reserves

(million troy ounces)

	Production	Reserves
1965	5.33	29.61
1966	5.69	33.01
1967	5.94	36.84
1968	6.23	41.37
1969	6.59	46.77
1970	7.00	52.43
1971	7.20	57.77
1972	7.81	59.22
1973	8.03	56.16
1974	8.42	59.02
1975	8.29	61.08
1976	8.87	57.77
1977	9.19	54.72
1978	9.54	49.08
1979	9.87	50.83
1980	10.20	58.22

Source: CIA Handbook, 1981, p. 63. Sales of gold are included in Table 14.

Note: For illustrative purposes, if gold were selling at $400 an ounce, 1980 output would be worth slightly more than $4 billion and reserves slightly in excess of $23 billion. From 15 to 25% of output is used, domestically, for industrial, decorative, medical, coinage, and other purposes. Soviet reserves are so large relative to the quantity of gold bought and sold in world markets that only a fraction of these can be sold each year without substantially lowering the gold price.

Table 14

U.S.S.R.: Hard Currency Balance of Payments

[Million U.S. $]

	1960	1970	1974	1975	1976	1977	1978	1979	1980
Trade Balance	-250	-500	-978	-6,422	-5,595	-3,300	-3,794	-2,036	-2,455
Exports, f.o.b.	768	2,201	7,470	7,835	9,721	11,345	13,157	19,549	23,792
Imports, f.o.b.	1,018	2,701	8,448	14,257	15,316	14,645	16,951	21,585	26,247
Gold Sales	200	0	1,178	725	1,369	1,618	2,522	2,167	800
Net interest	-2	-83	-102	-568	-716	-846	-881	-799	-710
Other invisibles and hard currency not included elsewhere[2]	-66	605	1,916	1,551	2,011	2,530	3,523	5,140	4,900
Current account balance	-118	22	2,014	-4,714	-2,931	2	1,370	4,472	2,515
Direct investment abroad[3]	0	0	-11	-3	-31	0	0	0	0
Borrowing from abroad[4]	88	291	1,426	5,402	4,694	1,777	1,002	860	526
Lending to other countries[5]	0	-25	-1,029	295	-1,711	140	-1,582	-2,926	0
Capital account balance	88	266	386	5,694	2,952	1,917	-580	2,066	526
Errors and omissions[6]	30	-288	-2,400	-980	-21	-1,919	-790	-2,406	-3,061

Source: CIA, Handbook, 1979, p.67. (1960-1977)
1981, p.62. (1978-1980)

[1]Estimated.

[2]Including estimated receipts from arms sales, official transfers, and net receipts from tourism and transportation.

[3]Estimated investment in Soviet banking operations in the West.

[4]Soviet drawings on Western credits and East European investment in construction of the Orenburg pipeline. Excludes borrowings by the International Investment Bank and International Bank for Economic Cooperation, which borrow on behalf of CEMA countries. The extent to which the USSR has borrowed (if at all) from these CEMA banks is unknown.

[5]Net change in Soviet assets held with Western commercial banks and in outstanding trade credits extended to finance Soviet exports.

6Including intra-CEMA hard currency trade and other hard currency payments.

Table 15

U.S.S.R.: Estimated Drawings, Scheduled Repayments on Western Credits, and Debt Outstanding[1]

[Million U.S. $]

	Estimated Drawings[2]	Repayments[3]	Interest[4]	Amount Available to Offset Trade Deficit	Gross Debt Outstanding at End of Year	Net Debt Outstanding at End of Year	Percentage of net debt covered by Government Guarantees
1970	450	159	83	208	1,515	--	--
1971	511	223	135	153	1,803	582	100
1972	878	276	170	432	2,405	555	100
1973	1,737	397	332	1,008	3,745	1,166	100
1974	2,052	625	508	919	5,172	1,654	100
1975	6,371	969	804	4,598	10,574	7,451	49
1976	5,661	1,386	1,012	3,263	14,849	10,115	51
1977	2,850	1,975	1,140	-265	15,724	11,230	52
1978	3,051	2,352	1,219	-520	16,423	11,217	62
1979	3,660	2,800	1,430	-570	17,283	--	--
1980	3,576	3,050	1,625	-1,099	17,809	--	--

Sources: 1st 5 columns: CIA, Handbook, 1979, p. 68; 1981, p. 63
last 2 columns: Ericson and Miller, p. 224,

[1]Totals for 1970-78 reflect recent revision of Soviet debt estimates.

[2]Drawings on credits backed by Western government guarantees and on commercial credits, which lack official guarantees.

[3]Scheduled repayments on government-backed debt and known repayments on medium-term commercial debt.

[4]Interest payments on government-backed debt and on gross commercial debt.

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