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Soviet Intensive Economic Development in Perspective (U)

A Research Paper

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A Research Paper

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Soviet Intensive Economic Development in Perspective

Summary

Information available as of 31 October 1985 was used in this report.

The Stalinist growth model for industry stressed the rapid infusion of labor, fixed capital, and raw materials and minimized the importance of productivity growth. By the 1970s the Soviet leadership realized that this extensive growth strategy could no longer be maintained. Sharply reduced birthrates, the exhaustion of the rural labor reservoir, and the approaching ceiling in female labor participation rates—already at 90 percent—brought much lower growth in employment. Sources of cheap raw materials and fuels were being depleted. Fixed capital stock growth rates were falling sharply. (

Intensive Development Policies

The intensive approach that was approved in the mid-1970s to sustain development sought as much as possible to preserve the existing resource allocations among consumption, investment, and defense. Accordingly, Moscow had to look for relief more in the supply side of the economy—in policies affecting labor, land, fixed capital, and productivity. The focus has been on measures to raise capital productivity.

Accelerating Retirements of Fixed Capital

Attitudes and policies toward the retirement of fixed assets have contributed greatly to declining capital productivity in the USSR. On average, fixed assets have been retained in service twice as long as in the major market economies. Since productivity gains depend upon adding new capital incorporating recent technology and discarding technologically obsolescent assets, Soviet practices clearly retard productivity improvement. Despite official recognition that shorter asset lives are desirable, the steps taken in this direction have been inadequate.

Replacement Rather Than Expansion

The emphasis given since the early 1970s to raising the share of industrial investment devoted to replacement of old assets complements the campaign to shorten asset service lives. Traditionally, with the extensive growth approach, investment plans stressed building new plant or expanding capacity of existing enterprise. By emphasizing reequipment of existing plant, Soviet planners hoped to accelerate the introduction of new technology to the production line. Reequipment might require some reconstruction, but the cost was perceived to be small compared with that of a new plant. (

Why the Intensive Investment Campaign Stalled

Old equipment is kept in service mainly because enterprise managers and ministerial officials are led to do so by the existing incentive structure. In a market economy, firms discard old assets primarily because the new capital is usually more economical in the use of manpower and material or because it is necessary to manufacture competitive products. As long as current production targets remain the overriding criterion for judging success and costs are a secondary consideration, Soviet managers have little incentive to discard obsolescent assets.

Soviet construction practices have also blunted the effort to focus investment on reequipping existing enterprises. The Soviets have favored heavy prefabricated concrete structures with overhead bridge cranes that require large columns and overhead building supports. These features often make it impossible to install automated production lines without costly and time-consuming reconstruction.

The ultimate success of the replacement investment campaign, however, rests upon the accelerated introduction of advanced technology into the production process. Thus, technological performance has been the most critical determinant of the success of the planned transition from extensive to intensive economic development. The explanations for lagging Soviet technological progress can be found mainly in managerial incentives, the institutional relationships between research and development and production, and the technological drain caused by the priority given to defense production:

- Technological progress in market economies depends upon both consumer and supplier initiatives. In the Soviet system, the influence of the consumer is weak, except in defense production where the initiative comes from the Ministry of Defense with reinforcement from the top leadership.

- Reliance on internal sources for machinery has also slowed technical advance. Much of Soviet machinery has been produced in small machine shops attached to the consuming organization rather than in plants belonging to specialized machine-building ministries. Only the specialized ministries, however, have been able to afford to support the research and testing facilities required to develop advanced technology.

- In the Soviet system, research and development is separated from production. The incentives for R&D organizations reward expenditures of budget allocations more than completion of projects or the satisfaction of consumer demand. This supplier-consumer gap is not closed by the central-planning coordination process.

- Still another major deterrent to technological progress in the production of producer durables has been the superior priority accorded to defense production. The share of GNP allocated to defense changed little over the past decade, but the burden of defense on capital productivity continued to rise in terms of the preemption of advanced technological resources and the economy's innovational energies.

On balance, then, the defects in Soviet technological performance are primarily systemic. Their amelioration will require reforms in central planning. But the modifications introduced in organization and management by Andropov, Chernenko, and Gorbachev—including the economic experiment now scheduled to be extended to all industry—do little to improve enterprise incentives to find and use better technology. A far more sweeping shift of authority to the enterprise manager is required.

Gorbachev's Program

Gorbachev does, however, seem committed to a frontal attack on the modernization question. In laying out his program last summer, he focused on the familiar objectives of accelerated retirements and greater emphasis on replacement of capital stock at the expense of expansion. Gorbachev proposed that retirement rates be doubled and that the country's capital stock be renewed through a combination of new investment and accelerated retirements so that by 1990 a third of it, including up to half the machinery portion, will be new. The 1986 Plan goals go a long way toward supporting these objectives. Gorbachev will have to demonstrate more sustained commitment to modernization than did his predecessors, however, to assure that obsolescent plant and equipment are retired and that sufficient investment is provided during the remainder of the 1986-90 Plan to raise the quality of machinery output and deliver it in the necessary volume to the economy.

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Traditional Soviet Development Strategy

As both Soviet and Western economists have repeatedly said,[1] the traditional Soviet approach to economic development has stressed the rapid infusion of labor, fixed capital, and raw materials into industry. Compared with the path followed by industrializing market economies, there has been proportionately far less effort devoted to increasing the productivity of manpower and capital assets. Since 1960, the USSR—among the major industrial economies—has experienced the most rapid growth of employment and, along with Japan, the fastest growth of plant and equipment. In sharp contrast, it has shown the lowest rate of increase in both labor and capital productivity (table 1).

In official Soviet jargon the traditional approach is termed "extensive" and the alternative path of emphasizing productivity, "intensive." While Soviet planners have long accorded lipservice to productivity objectives under the rubric of "hidden production reserves," they have embraced intensive development as a major policy focus only within the past decade.

The historic preference for extensive development can be explained in terms of both resource endowment and institutional factors. Until the 1960s the Soviet economy could draw upon an exceptionally large pool of underemployed agricultural labor. Labor productivity was much higher in nonagricultural employment. The vast migration to the urban work force was reinforced by the success of the system in inducing its female population to seek employment in urban areas. The female labor participation ratio (employment as a proportion of working-age population) is considerably higher in the USSR than in the major market economies.

The high growth rate of "productive" capital stock (fixed capital stock in the nonservice sectors) was achieved by high rates of increase in capital investment, which in turn were made possible by a high national savings rate. Through its control over resource allocation, the Soviet Government forced the population to save a much higher share of national income than would have prevailed under consumer sovereignty. In national accounting statistics, forced saving is reflected in the high share of investment and the relatively low share of personal consumption in GNP. Usually, the national propensity to save is directly proportional to an economy's per capita GNP. However, while the USSR's investment-to-GNP ratio is second only to that of Japan, its per capita GNP level is the lowest of the major industrial economies (table 2).

The favorable consequences of high rates of investment for growth were reinforced by an investment policy that favored heavy industry and energy and directed minimal shares to the consumer-oriented sectors of light industry and housing. The stress on industrial investment, however, was accompanied by underinvestment in the complementary transportation sector. Even from the narrow perspective of planners' priorities, this neglect was shortsighted and required urgent rectification by the late 1970s.[2]

Finally, the impact of the strenuous investment effort on economic growth was intensified by maximizing the rate of *net* investment. The active lives of plant and equipment have been unusually long by market economy experience. Obsolescent machinery and equipment have been retained in production through large and wasteful outlays on capital repairs.[3] Thus, the overwhelming portion of investment in new equipment has been directed into new plant or expansion of existing plant capacity, rather than into replacement of obsolescent assets.

[1] See Notes at the end of this paper for sources used. (U)

Table 1
Real Gross Product, Factor Inputs, and Productivities in Major Industrial Economies

Average annual percentage rates of change

		Real Gross Product	Factor Inputs			Factor Productivities		
			Total	Labor	Capital	Total	Labor [a]	Capital [b]
United States	1961-73	4.4	2.3	1.3	4.1	2.1	3.1	0.3
	1974-78	2.9	2.3	1.5	3.6	0.6	1.4	−0.7
Japan	1961-73	10.8	4.7	0.9	12.2	6.1	9.9	−1.4
	1974-78	3.8	2.5	0.2	7.2	1.3	3.6	−3.4
United Kingdom	1961-73	2.9	0.8	−0.9	3.9	2.1	3.8	−1.0
	1974-78	1.9	0.1	−1.0	4.7	1.8	4.0	−1.7
France	1961-73	5.8	1.9	−0.1	5.1	3.9	5.9	0.7
	1974-78	3.0	1.2	−1.0	4.7	1.8	4.0	−1.7
West Germany	1961-73	4.6	1.4	−1.2	6.2	3.2	5.8	−1.6
	1974-78	1.8	−0.1	−2.4	4.1	1.9	4.2	−2.3
Italy	1961-73	5.6	0	−2.2	4.7	5.6	7.8	0.9
	1974-78	2.1	1.9	1.2	3.3	0.2	0.9	−1.2
USSR	1961-73	5.0	4.3	1.8	8.1	0.7	3.1	−2.9
	1974-78	3.4	3.8	1.4	7.4	−0.3	2.0	−3.7
	1979-85	2.1	3.1	0.8	6.4	−1.0	1.2	−4.1

[a] Defined as output per man-year of employment in business sectors of market economies and nonservice sectors of the Soviet economy.
[b] Defined as output per unit of fixed business capital in market economies and output per unit of fixed "productive" capital stock in the Soviet economy.

Sources: Market economies—Estimates of John W. Kendrick prepared for the New York Stock Exchange study, *U.S. Economic Performance in a Global Perspective*, 1981.

USSR—CIA estimates.

This table is Unclassified.

Soviet planners realized that large physical investments had to be accompanied by investment in human capital through education of youth and on-the-job training. The USSR first eliminated mass illiteracy, then proceeded to overtake and surpass Western Europe in providing access to both secondary and higher education. As with physical investment, investment in human capital was structured to have a maximum impact on industrial production. At all levels of education, Soviet schools emphasize instruction in mathematics, science, and engineering. The high priority accorded to education resulted in a rapid increase in the quality of the Soviet labor force

The extensive approach to development is integral to Soviet central planning. Central planning is essentially an arrangement for resource *mobilization* rather than for *efficient use* of resources. The system originated as the mechanism for implementing Stalin's program of frenetic industrialization during the first three prewar five-year plans (1928-41). It has continued with little alteration since that period. The system was later adopted by the Communist regimes of Eastern Europe, East Asia, and Cuba.

Table 2
Per Capita GNP and Investment-to-GNP Ratios in Major Industrial Economies, 1980

	Per Capita GNP *(1975 dollars)*	New Fixed Investment to GNP *(percent)*
United States	7,990	18.2
West Germany	6,880	23.6
France	6,680	21.6
Japan	5,740	32.0
United Kingdom	5,150	17.8
Italy	4,640	20.0
USSR	3,760	25.0

Sources: Per capita GNP—R. Summers and A. Heston, "Improved International Comparisons of Real Product and Its Composition, 1950-1980," *Review of Income and Wealth*, June 1984, pp. 259-60 (in 1975 international—dollar—prices, adjusted for changes in the terms of trade) and CIA estimate, also in 1975 dollars.

Investment-to-GNP ratios—OECD, *Historical Statistics, 1960-1980*, p. 60; and CIA *Handbook of Economic Statistics*, 1985, p. 64.

This table is Unclassified.

Table 3
USSR: Growth of GNP, Factor Inputs, and Factor Productivity

Average annual percent

	1966-70	1971-75	1976-80	1981-85 [a]
Gross national product	5.3	3.8	2.7	2.4
Combined inputs	4.1	4.2	3.5	2.9
Man-hours	2.0	1.7	1.1	0.7
Capital	7.4	8.0	6.9	6.3
Total factor productivity	1.1	−0.5	−0.8	−0.6
Man-hour productivity	3.2	2.0	1.5	1.6
Capital productivity	−1.9	−3.9	−4.0	−3.7

[a] Estimate for 1985 is preliminary.

Source: CIA estimates (December 1985).

This table is Unclassified.

While the planning authorities have direct control over the allocation of labor, education policy, and the rate and structure of investment, they must rely upon plant managers to organize labor and plant and equipment so as to maximize their productivity. They must rely also upon scientists and engineers to develop and apply the new technologies, which are the keys to productivity gains.

But central planners have not succeeded in devising a system of incentives to elicit high productivity from managers.[4] Neither have they devised appropriate institutions and incentives to generate the requisite flows of advanced technology from research and development organizations or the efficient application of R&D by industrial ministries and managers.[5] Socialist reformers in Eastern Europe and China have found it necessary to introduce market decision mechanisms and institutional decentralization to implement intensive developmental policies.

New Strategy Imperative

The traditional extensive growth strategy was yielding diminishing growth in the USSR by the 1970s and threatening stagnation by the 1980s. Sharply reduced birthrates, the exhaustion of the rural labor reservoir, and the approaching ceiling in the female labor participation ratio resulted in much lower employment growth rates (table 3). With the attainment of universal secondary education and little expansion slated for elitist university education, the rate of increase in human capital also declined. This trend was further strengthened by the decline in the size of Soviet youth cohorts.

Efforts to sustain earlier rates of growth by investment under such circumstances would have led to rapidly diminishing returns. Even though the investment share of GNP continued to rise gradually, falling GNP growth rates led to declining growth rates for all resource claimants, including investment. As a result, plant and equipment growth rates fell

Table 4 *Percent share*
USSR: Distribution of Gross National Product by End Use at Factor Cost [a]

	1960	1965	1970	1975	1980	1984
Consumption	57.9	54.2	54.2	53.8	54.0	53.2
Investment	24.3	27.2	28.2	30.6	32.8	33.9
Other [b]	17.9	18.5	17.6	15.6	13.2	12.9

[a] Because of rounding, components may not add to 100 percent.
[b] Includes defense, administration, R&D, inventory change, net exports, and outlays n.e.c.

Sources: CIA estimates of GNP in 1970 rubles at factor cost.

This table is Unclassified.

sharply. Even with large reductions in investment growth rates, investment-to-GNP ratios still rose significantly, alarming Soviet economists and planners. By Soviet measurements the return on investment has fallen by half in the past 30 years and by a third in the past decade.[6]

Slowing growth of factor inputs is typical of the industrialization process. It has occurred generally in market economies with the onset of industrial maturity. What is unusual in Soviet performance is that productivity fell from levels that were below those in market economies at similar stages of economic development. Market economies have managed to offset declining rates of increase in labor and fixed capital through productivity gains. (

During the remainder of the century, demographic influences promise even more drastic declines in additions to the labor force.[7] With the easy gains already attained, the stock of human capital will increase at much lower rates. Moreover, there is little margin to raise the investment share of GNP because consumption cannot be squeezed further without hurting productivity and because the leadership is reluctant to sacrifice the high priority given to defense. Rather, capital stock is likely to grow more slowly as the Soviets pursue such declared policy objectives as accelerating the retirement of obsolescent assets and increasing the share of investment allotted to replacing them.

The course available to the Soviet leadership is therefore the same as that available to and pursued by market economies—to focus on productivity. Thus, the intensive approach to development has become the dominant path.

Intensive Development Policies

The new approach to sustained development has thus far preserved existing resource priorities. There has been some slippage in the personal consumption share of GNP in the 1980s, but part of the explanation may lie in subnormal agricultural performance. The share of investment has been creeping upward (table 4), while the share allocated to defense has remained in the 13- to14-percent range with little variation since 1970.[8] For decisions related to intensive development, one must look at what has been happening in the supply side of the economy, in policies affecting labor, land, fixed capital, and productivity. The leadership's options regarding manpower and education policies have been few, so the focus of intensive development is upon fixed capital and technology.

A further rise in the labor participation ratio is not feasible. The regime continues to pursue pronatalist policies, but these are neutralized by continuing housing shortages and high labor force participation by women of childbearing age. The most recent labor initiative has centered on motivating workers by means of tighter labor discipline. However, tougher disciplinary measures in the workplace are not a long-term solution, because worker attitudes and performance are strongly conditioned by recurrent industrial supply disruptions, tight labor markets, and the necessity to use working time to purchase consumer goods.

Having placed a lid on the number of students admitted to higher education, the leadership is trying to direct more students at both secondary and higher levels into vocational and technical education. Educational reforms proposed in 1984 would raise the proportion of eighth-grade students assigned to vocational and professional-technical schools from 40 to

60 percent, reducing the share striving for admission to higher education.

Investment policy is focused upon measures to raise capital productivity. The priority given investment continues to be high, as shown by its rising proportion of national product. The continuing decline in the return on investment highlights the crucial necessity to raise its productivity. But the productivity of investment depends on technological advances assimilated with the investment, so investment and technology policies are complementary.

Accelerating Retirements of Fixed Capital

Attitudes and policies toward the retirement of fixed assets have contributed greatly to disappointing capital productivity performance. On average, fixed assets have been retained in service twice as long as in the major market economies.[9] Since productivity gains depend upon adding new capital incorporating recent technology and discarding technologically obsolescent assets, Soviet practices clearly retard productivity improvement.

Asset lives are prolonged at high cost through capital repairs. In the mid-1970s, outlays for repairs were one-fourth as large as gross investment in industry and nearly 40 percent as large as outlays for industrial equipment. The resource drain of repairs was considerable, absorbing one-tenth of the industrial labor force and one-third of the stock of machine tools.[10] Over the total lives of these assets, capital repairs generally exceeded original investment costs.[11]

Despite official recognition that shorter asset lives are desirable, the steps taken in this direction have been inadequate. The most recent change in official amortization norms, in 1975, lowered average service lives for industrial equipment from 17 to 14 years,[12] compared with average lives of 10 years in France, Germany, and Italy and 12 years in the United States.[13] A Soviet economist estimates that machinery on the average becomes obsolescent after eight years of service under Soviet conditions.[14]

In actual practice the official guidelines have not been followed. The annual estimates of equipment retirements in the Soviet statistical abstract are limited to equipment discarded because of physical wear and tear. This retirement rate averaged only about 2.5 percent (equivalent to a 40-year service life) in the 1970s. A Soviet economist, relying on a sample survey, included retirements for obsolescence. His estimates doubled the retirement rate and implied an average equipment service life of 20 years.[15]

Replacement Rather Than Expansion

The main new focus of Soviet investment policy—raising the share of industrial investment devoted to replacement of old assets—complements the campaign to shorten asset service lives. By emphasizing reequipment of existing plant, Soviet planners hope to accelerate the introduction of new technology to the production line by shortening the investment cycle. Construction of new facilities is the most time-consuming element of capital investment, so the idea is to avoid construction by replacing equipment in existing buildings. Reequipment may require some reconstruction, too, but the cost is small compared with that of a new plant.

The Soviet replacement effort has been much lower than that in the United States. In the mid-1970s, 56 percent of US industrial investment was directed toward replacement and modernization.[16] In Soviet nonservice sectors, this proportion averaged only 29 percent in 1976-80.[17] While the US proportion may be too high a standard for the Soviet Union given slower US industrial growth, some Soviet economists had recommended that the Soviet share should be doubled or tripled.[18]

The replacement share of "productive" investment has, in fact, been steadily rising during the 1981-85 Five-Year Plan, reaching 35 percent in 1984.[19] The draft version of the 12th Five-Year Plan (1986-90) set the proportion at one-third, but, in his rejection of this version, General Secretary Gorbachev reportedly insisted that it be increased to a half.[20]

The advantages of an intensified replacement effort are severalfold, according to special surveys carried out in the USSR. Labor productivity reportedly was

Table 5 *Percent*
USSR: Deliveries of Producer Durables, by Plan Periods [a]

	Share of Total Deliveries			
	1966-70	1971-75	1976-80	1981-85 Plan
Railway equipment, automotive equipment, agricultural machinery, construction machinery	60	58	55	49
Mining, metallurgical, hoisting equipment	12	12	19	20
Stamping-pressing, metal-cutting equipment	9	10	10	13
Instruments, automation, atomic energy equipment	5	7	10	13

[a] Investment time series are measured in 1969 estimated prices, adjusted for selected wholesale price changes of 1 January 1973.

Source: V. Fal'tsman, V. Borisov, "Mobil'nost' mashinostroyeniya," *Planovoye khozyaystvo*, November 1982, p. 79.

This table is Unclassified.

about 50 percent higher and capital productivity 86 percent higher for capacity introduced through reconstruction of existing facilities than for capacity resulting from new plant construction.[21] These results reportedly were attained with cost savings of one-half to two-thirds and with capacity being brought on stream three to 3.5 times as rapidly.[22] The calculations underlying these findings are not explained. Much of the discussion turns on the faster assimilation of new capacity through reconstruction compared with new construction. But it is not clear, for example, that the production losses incurred during reconstruction are taken into account. Nonetheless, the arguments for reconstruction in present Soviet circumstances are persuasive. New plants require additional labor that is not available during a period when no growth is planned for the industrial labor force.

The rising share of replacement in investment has been matched by a rising technological intensity of investment. The key feature of this trend is the accelerated automation of production. In Soviet official parlance this policy panacea is termed the "scientific-technological revolution." Automation serves the dual objectives of facilitating substitution of capital for labor in an era of worsening labor shortages and raising the productivity of capital. The growing share of high technology in production of producer durables can be seen by comparing the composition of total deliveries of producer durables since the mid-1960s with those projected for the 1981-85 Five-Year Plan (table 5). The deliveries consisting of high-technology products—to the extent that they can be segregated in the statistics presented by Fal'tsman and Borisov—may be found in the third and fourth rows of table 5. Newer machine tools included in the third row are increasingly computer controlled. The share of high-technology products has nearly doubled since the mid-1960s and now constitutes one-fourth of total investment.

These trends in Soviet investment policy have led to a rising dependence upon foreign technology. Imports of high-technology products surged during the early and mid-1970s, leveled off in the latter part of the decade, and then showed signs of renewed resurgence in the 1980s.[23]

Why the Intensive Investment Campaign Stalled

Low Retirement Rates, Reproduction Instead of Replacement

The accelerated retirement guidelines adopted in 1975, as noted earlier, have not been implemented. Official retirements for wear and tear, as reported in the annual statistical abstract, have shown no significant change. Indeed, a Soviet investment specialist has asserted that rates of retirement of obsolescent assets have declined.[24] During the 1970s the average age (number of years in production) of current machinery output rose significantly. The share of new products fell from 4.3 to 2.5 percent of total output while the share of machinery in production for more than 10 years climbed from 20 to 28 percent.[25]

The failure of the new retirement policy is partly due to inadequate financing. Specific proportions of amortization allowances are earmarked for replacement

and for capital repair. Even though the replacement proportions were raised in 1975, they are still insufficient to finance higher replacement rates. The Ministry of Finance has found it necessary to authorize transfers of accummulated and unused funds for capital repair to finance replacement outlays.[26] More important, the reduction in specified service lives has not been matched by adequate financial incentives to get rid of old equipment. Enterprise managers and ministry officials are led to keep old equipment by the existing incentive structure. In a market economy, firms discard old assets primarily because the new capital is more economical in the use of manpower and material inputs or because it is necessary to manufacture competitive products. As long as current production targets remain the overriding criterion for judging success, Soviet managers will have little incentive to discard obsolescent assets.

As noted earlier, replacement investment is the keystone of the push for intensive development. In analyzing past Soviet performance, it is important to distinguish between progress toward formal goals, expressed in proportions of total investment, and the intrinsic effectiveness of a larger replacement effort in improving productivity. The USSR has raised the proportion of replacement in total investment but has fallen woefully short in its bottom-line objective of accelerating capital productivity.

Why have the productivity-enhancing results of intensive investment not been achieved? The explanations lie first in Soviet construction practices and second in the failure of the system to generate and assimilate the advanced technology necessary to support the replacement investment program.

Construction Practices Hinder Replacement

A major advantage of the new approach, in theory, is the time and cost savings attained by retooling without reconstruction. Existing buildings and structures supposedly can be used with little or no alteration while obsolescent machinery and equipment are replaced with technologically advanced models. Reequipment is easier if the working spaces are unobstructed by immovable columns and supports. If the buildings are built of light materials (aluminum, sheet steel, and asbestos-cement), structural alterations are not difficult.

The installation of automated production lines and assembly-type operations in the process of retooling, however, often requires some alterations of existing factory buildings. Improvements in light and ventilation are often required. Moreover, traditional Soviet construction practices have favored heavy prefabricated concrete structures.[27] While more durable than those built of lighter materials, these buildings are less amenable to the alterations that accompany equipment replacement. In the same vein, Soviet construction design favors the use of overhead bridge cranes, rather than more mobile lifting and transport equipment. Bridge cranes require heavy columns and overhead building supports that limit the possibility of rearranging the use of floorspace.

These features of Soviet industrial construction have often required costly and time-consuming reconstruction as part of equipment replacement programs. Consequently, the theoretical cost and time savings envisaged in the Soviet investment literature have not been fully realized.

The replacement effort has also been confounded by organizational deficiencies in construction. Soviet construction organizations work best in building new plants, where standarized techniques can be used on a large scale. Reconstruction is typically carried out on a smaller scale, requiring specialized techniques for which construction organizations are ill prepared. The incentive system is skewed toward those indicators of construction that characterize new construction.[28] As a result, reconstruction activity is often performed by inefficient repair organizations belonging to the enterprises being reequipped rather than by specialized construction organizations

Investment in Obsolescent Technology

Since the ultimate success of the replacement investment campaign rests upon the accelerated introduction of advanced technology into the production process, technological performance is crucial. A perceptive Soviet economist who analyzed the reasons for the continuing decline in the rate of return on

investment cited such external influences as the worsening quality of natural resources, the growing share of investment in high-cost eastern and northern regions, rising pollution control outlays, and reduced manpower availabilities. However, he asserted that the principal reason has been the insufficient support of the investment process by scientific and technical progress.[29]

The explanations for lagging Soviet technological progress can be found mainly in managerial incentives, the institutional relationships between research and development and production, and the technological drain caused by the priority given to defense production.

Technological progress in market economies depends upon both consumer and supplier initiatives. In the Soviet system, the influence of the consumer is weak, except in defense production where the initiative comes from the Ministry of Defense with reinforcement from the top leadership. Innovation is inhibited by the chronic seller's market that prevails for Soviet producer durables—a trait that a Soviet scholar called planned scarcity.[30] Under such circumstances, consumer demand provides little effective pressure for technologically improved or lower cost products. The potent influence of consumer sanctions is absent. From the point of view of suppliers, the willingness of Soviet managers to pursue cost savings through asset replacement is deterred by what a leading Soviet investment expert terms "self-reproduction," the propensity toward perpetuating existing technology, which has assured sources of material supply and provides near-certain production bonuses.[31] In his speech to the plenum on science and technology last June, Gorbachev declared "it is first of all necessary to adopt measures increasing the influences of the consumer on the technical level and quality of output" by encouraging competition among the suppliers, expanding wholesale trade, and increasing the importance of direct bargaining and contracting between suppliers and consumers.[3]

Reliance on internal sources of supply for machinery and equipment and components also slows technical advance.[33] Centralized planning promises a producer an adequate allocation of necessary supplies but provides no guarantee of timely and sufficient delivery. As a result, a good deal of Soviet machinery is produced in small machine shops attached to the consuming organization rather than in enterprises belonging to specialized machine-building ministries. Only the specialized ministries, however, can afford to support the research and testing facilities required to develop advanced technology. To the degree that the tendency toward vertical integration (self-sufficiency) prevails, Soviet industry forgoes the division of labor that characterizes industry in market economies.

Even within the 20-odd machine-building ministries, product specialization does not match administrative specialization. The main exceptions are those machinery ministries largely engaged in military production. Even in the production of general purpose semifabricates—such as gears, castings, forgings, and stampings—the degree of specialization is far lower than in US industry. Production of single-unit customized equipment is not organized in specialized machinery ministeries. By default, such items are produced in the technologically backward internal machine shops.

Technological backwardness is also explained by insufficient supplier initiative. In market economies, most technical progress at the plant level originates in sales pressure by equipment suppliers. In the Soviet system, research and development is separated from production. The incentives for R&D organizations reward expenditures of budget allocations more than completion of projects or the satisfaction of consumer demand.[34] This supplier-consumer gap is not closed by the coordination process under central planning. The defects in Soviet technological performance are thus mainly systemic in nature. Their amelioration will require major reforms in central planning institutions.

The other major deterrent to technological progress in the production of producer durables is the high priority accorded to defense production. The share of GNP allocated to defense has changed little over the past decade, but the defense drain on advanced technological resources and on the economy's innovational energies has risen

The cutting edge of improved capital productivity is the application of high technology in the production of producer durables. The heavy defense production drain on high-technology output may be deduced by combining information on the reconstructed versions of Soviet interindustry tables [35] with a Soviet economist's estimates of the breakdown of deliveries of machinery to investment.[36] In 1966, the military probably accounted for more than half of final demand for four high-technology machinery sectors—precision instruments, communications and other electronic equipment, electrotechnical equipment, and transportation machinery and equipment (which includes the aircraft industry).[37] In 1972, defense claims preempted a similar proportion of high-technology output. Conclusions for 1977 are more tentative, but they indicate that the military procurement claim was of similar magnitude

The technological burden of military production appears even larger when product quality is taken into account. Information obtained from emigres reinforces the presumption that the presence of military inspectors in all plants producing defense products enables the Ministry of Defense to refuse defective or inferior output, a privilege not afforded to civilian customers. The observers also assert that factories that produce products with both military and nonmilitary applications set higher quality standards for their military customers.

The importance of advanced technology to the accomplishment of increasing capital productivity cannot be overestimated. As noted in table 5, during the 1981-85 Five-Year Plan, one-fourth of all investment durables consisted of high-technology products. Some notion of future trends in the high-technology content of Soviet investment may be conveyed by recounting recent US experience. By the early 1980s, purchases of office and computing machinery and communications equipment constituted over one-third of the producer durables component of new fixed investment.[38] If this definition of high-technology investment is expanded to include scientific and engineering instruments and photographic equipment, the share rises to nearly half.[39]

This rising investment imperative collides with the continuing push to upgrade the technological content of military production. Even though there has been little increase in total military procurement in the Soviet Union since the mid-1970s,[40] the technological sophistication of most systems has risen markedly.[41]

Prospects for Successful Intensive Development

As the June 1985 party plenum affirmed, the future dynamism of the Soviet economy depends upon successful implementation of an intensive growth strategy. To date, the fruits of the "new" approach have been meager. The common theme that emerges in the analysis of the failure is the unsuitability of centralized planning and control as an institutional framework for implementing intensive development. While admirably devised for directing the resource mobilization that promoted extensive development, it is ill suited to stimulate the productivity improvements that are the core of the intensive approach.

Economists have differentiated between tangible and intangible technical progress. The tangible component refers to improvements in the quality of inputs, whether human or material. Such qualitative improvements flow from education and technical progress (R&D), respectively. The intangible component depends upon the ingenuity of management in organizing factor inputs in the production process. All of these improvements depend upon individual efforts and cannot be prescribed by centralized fiat.

This conclusion has been most recently reflected in a limited-dissemination statement prepared by a group of Soviet economists affiliated with the Academy of Sciences' Siberian Division in Novosibirsk. Citing the steady decline in economic growth in recent years, the Novosibirsk economists blamed the traditional system of administrative methods, with its high degree of centralized decisionmaking. They urged its replacement by "truly economic" (socialist market) methods of management.[42]

The group highlighted the continuing improvement in the quality of worker and managerial skills and criticized the failure of the system to adjust to "the core of highly skilled workers" who are better educated than their predecessors and capable of "critically assessing the activities of political and economic leaders." The essence of the new institutional arrangements would be a vast expansion in the authority of the "leading officials of enterprises." In particular, plant managers would be freed from centrally imposed constraints in such matters as investment, technological innovation, and wage and salary payments. The reforms introduced by Andropov, Chernenko, and Gorbachev—including the economic experiment now under way—do little more than tinker with existing institutions. Their thrust has been to strengthen rather than dilute centralized controls. So far, proposals for fundamental changes have not emerged in the open literature.

Gorbachev's Approach to Intensive Development

Instead, the USSR's new leader seems to be considering a substantial redirection of resources toward refurbishing the country's stock of plant and equipment. When Gorbachev came to power, he acknowledged that, without a resurgence of economic growth, the USSR would have trouble meeting consumer expectations while providing for defense needs. To reverse the downward trend in growth, he is relying in the short run on a combination of measures to strengthen discipline and weed out incompetents—the emphasis on so-called human factors. But his economic policy in the longer run will succeed or fail in proportion to his ability to follow through on an extremely ambitious modernization program

In laying out this program last summer and fall, Gorbachev proposed doubling retirement rates on fixed capital and—through a combination of new investment and accelerated retirement—modernizing the nation's capital stock so that by 1990 a third of it, including up to half the machinery portion, will be new. Taken at face value, the target for renewing the country's capital stock implied an annual rate of growth of investment in machinery and equipment of 15 percent or more in 1986-90.

The demands on the Soviet machine-building complex will be great. Therefore, the Soviets plan to raise investment in the civilian machine-building sector by 80 percent in 1986-90, compared with 1981-85. Meanwhile, the qualitative side of Gorbachev's strategy has emphasized development of those sectors—especially those producing machine tools, robots, microelectronics, and computers—that provide the advanced equipment needed for modernizing the civilian industrial base and the defense industry.

The priority given to investment and industrial modernization has at least been embedded in the 1986 Plan. Investment in 1986 is scheduled to grow by a whopping 7.6 percent, a rate that implies an increase of nearly 15 percent in the machinery component of investment, the highest in more than a decade. Investment plans for the 1986-90 period will not be finalized until the party congress meets in February, but the preliminary figure of 3.5- to 4.0-percent growth per year given in the draft guidelines suggests that the priority given to investment in 1986 will not be maintained during the remainder of the plan. Gorbachev is obviously counting on large gains in productivity to sustain continuing high rates of machinery output. The productivity increases called for in the 1986-90 Plan, however, are far greater than achieved in recent years and are unlikely to be achieved. To maintain the momentum of his modernization program, Gorbachev would have to boost investment substantially above the planned target for 1986-90, as his predecessors did during the 1981-85 Plan when expected productivity gains were not forthcoming.

Gorbachev could be taking considerable risks in implementing his modernization program:

- If he tries to carry out the program without raising the overall investment rate for 1986-90, the impetus to growth based on the 1986 Plan is likely to trail off after a few years, leaving the shortages and disproportions characteristic of an unbalanced plan. General disillusion might then set in, with the population seeing Gorbachev as no more effective than Brezhnev or Chernenko.

- A determined campaign to introduce new machinery models and throw out outdated capital stock is likely to cause interruptions in production not envisaged in the plan.

- If he shortchanges the energy sector, for example, the resulting decline in oil exports, and thus hard currency earnings, could force the USSR to reduce imports of state-of-the-art technology for the modernization program.

- If he tries to curb military demands for machine-building output and R&D resources, the military might become restless while waiting for the deferred improvements in the technological base of military industry.

Notes

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This information is Unclassified.