
How the Apollo program produced economic wealth

Lyndon LaRouche has been proven right about the relation between a defense build-up at the frontiers of technology, and economic recovery. By Robert Gallagher.

The commitments made last winter by leading Democrats and Republicans toward “Apollo program style” economic policies have so far proven to be worth less than the paper the speeches were written on. Rep. Jim Wright, Speaker of the House of Representatives, has abandoned his promise “to get this country moving again” with the sort of programs that Apollo represents, and has turned booster for austerity and trade war instead. Typically, the focus of recent official economic policy debate has been over whether to raise interest rates to strengthen the dollar in the currency markets (an action that would cut off credit to U.S. industry) or lower interest rates and produce a collapse of the dollar.

Not a single one of the announced Democratic or Republican presidential candidates has even put forward a program for economic recovery, let alone exhibit the determination required to implement it—except of course, Lyndon H. LaRouche, Jr.

A cursory glance at even post-World War II economic history would show these persons the sort of thing that works in economic policy, and what doesn't. For this purpose, we publish here adapted portions of a study from the *EIR Quarterly Economic Report*, 4th Quarter, 1986, on how the Apollo program produced a period of economic growth from 1961 to 1967 unparalleled in the over 40 year postwar period. Complete documentation appears in that *Report*.

When President John F. Kennedy launched the Apollo program in 1961, the stagnant U.S. economy needed some driving economic process that would cheapen the cost of production throughout industry. Investment in the Apollo program and the post-Sputnik missile build-up, provided this driver for the economy so that, by the achievement of set national goals, it forced the economy as a whole forward,

into capital investment to implement more advanced technology.

The effects of the Apollo program on the U.S. economy show that goal-oriented programs in defense and aerospace drive economic recovery and subsequent growth in two distinct ways.

First, by requiring that capital-goods industries develop and produce the most advanced possible equipment and systems to attain a goal within a specific period of time, such as a manned Moon landing, the very initiation of such a program sends the entire economy into a capital investment boom that increases the amount of capital equipment available per industrial operative—that is, increases the capital-intensity of the economy as a whole. This capital investment has the immediate effect of boosting productivity throughout the basic industrial sectors of mining, manufacturing, construction, and utilities, as technology developed by previous programs, but not yet implemented, is infused into the economy. To produce such a “tidal wave” of economic impact, the Apollo program had to be accompanied by the enactment of Kennedy's tax and other incentives for capital investment.

The second type of “economic driver” effect produced by goal-oriented defense and aerospace programs, flows from the propagation of the technology developed by the program throughout the entire economy. This effect, which lags behind the initiation of the program by as much as several years, will, if followed through, produce productivity advances of a qualitatively higher order than the first, and thus amplify the economic impact of the program.

Contrary to Marxist doctrines that portray investment in defense and space exploration as a net cost to the economy, and defense and aerospace workers as a form of “hidden

unemployment,” investment in these areas is an integral part of building the future. In fact, the space program, in a fashion similar to President Lincoln’s program to build the railroads, is entirely an investment in building the future infrastructure of an economy that will increasingly be moving out into space. Thus, in making necessary preparations for the economy’s continued existence, it can hardly be considered over-head.

Even in defense weapons development and production, most of the capital investment goes into production equipment that can be used in both military and civilian production. One example of this dual aspect of military production facilities is the production of the famous Boeing 707 jet airliner, which was nothing but a KC-135 military jet fuel tanker with windows punched along the fuselage and seats installed.

Of course, it is understandable why “Marxist” nations of the East may regard defense and aerospace as a drag on their economies. Only in the democratic republics of the West can these sectors perform the healthy “driver” role we have outlined here.

Spurred on by Kennedy’s investment tax-credit program, new orders for capital goods boomed during the 1959-69 defense-aerospace build-up for the first time since World War II. From 1950 to 1957, annual new orders for capital goods in non-defense industries actually declined by about 8%. By 1958, the decline was 18%. The following decade of the

TABLE 1
Defense cuts and inflation
(Avg. percents)

	1950-1957	1959-1969	1970-1980
Aerospace & defense production workers as % of durable goods production workers	8.0	7.7	5.3
New orders, capital goods, in aerospace as % of nat'l. total	NA	30	22
% change new orders, capital goods, nondefense industries (constant dollars)	-7.7	127	36
Annual % change in wholesale price index	2.4	1.1	9.3
Annual % change in prices of capital equipment	4.1	1.7	8.8

Apollo program, however, saw an explosive growth in capital-goods spending in constant dollars, from \$103 billion in 1959 to \$234 billion in 1969, an increase of 127% (see **Figure 1** and **Table 1**).

The role of aerospace as a driver for the economy is seen in the fact that while annual new orders for capital goods in aerospace almost doubled from 1958 to 1967 (92% growth), this growth in aerospace provoked a faster acceleration of investment in non-defense industries as a whole (127%), while aerospace accounted for only three-tenths of the total growth in new orders in that period.

Three periods in postwar economic history

Under Kennedy’s program, the stagnant U.S. steel industry got a new lease on life. Although very little steel is actually used as material in fabrication of, for example, a Saturn V rocket, the requirements for steel of the machine-tool, metal-working, and construction industries, to meet national objectives, drove even industries like steel, apparently remote from aerospace, to implement more advanced technologies in major capital investment programs. Backed by the investment tax credit, the industry was able to convert its steel-refining mills from the obsolete open-hearth furnace technology to the basic oxygen process.

Only as a result of the momentum built up during the Apollo program, did the Kissinger-Carter years see an additional increase of 36% in annual investment in capital goods up through 1980.

U.S. postwar economic history is thus characterized by three periods: 1) a period of stagnation following the Korean War mobilization, from Harry Truman’s second administration until the 1958 recession; 2) the post-Sputnik aerospace-defense build-up from 1959 to 1967; and 3) renewed stagnation deliberately imposed on the economy from the election of Nixon and installation of Kissinger as national security

FIGURE 1
New orders for capital goods in manufacturing boomed during Apollo program

New orders

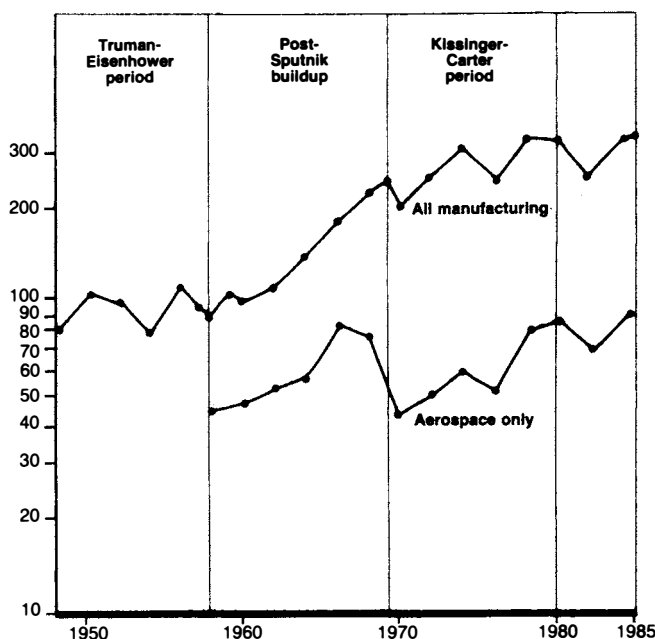
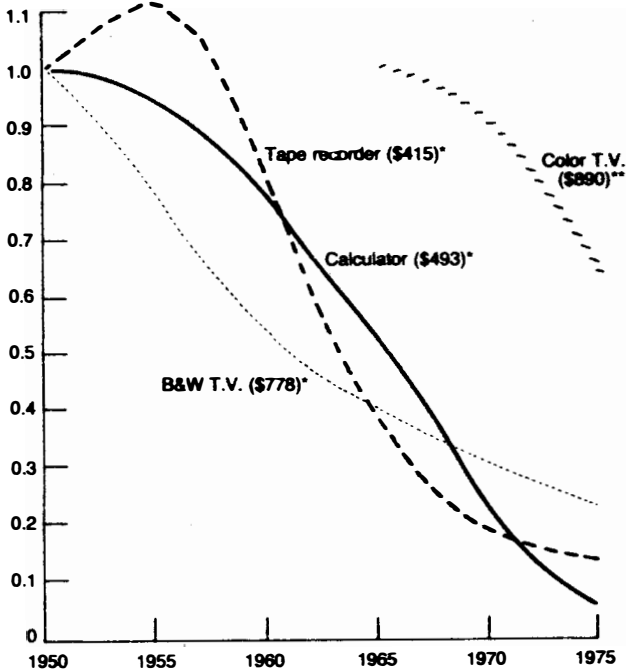


FIGURE 2

Cost trends for high-technology civilian electronic products, 1950-1975

Ratio of annually advertised prices to 1950 price



* Figures in parenthesis are 1950 prices in constant FY 1977 dollars

** Color T.V. figure is 1965 price in constant FY 1977 dollars

Source: Jacques Gonzier, *The Defense Industry*, MIT press.

adviser, through the Carter years. This was a conscious reversal of President Kennedy's conservative economic policies. The third period of enforced recession saw inflation take off at rates previously unimagined for the U.S. economy, and a drop in the percentage of the productive labor force involved in defense and aerospace, to as low as the immediate postwar years by 1973.

The point of this comparison of the period of the 1960s with the Truman-Eisenhower or Kissinger-Carter periods, is simply this: The economy in the postwar years has been healthier the greater the proportion of national resources committed to defense and aerospace—industries that under conventional wisdom, do not contribute to national wealth. When these industries are cut back, inflation is set off, as if upon command.

The period of 1958 to 1968 when U.S. defense and aerospace spending grew at the highest rate in the postwar period, coincides with the period of the greatest postwar price stability. From 1959 to 1969 the average annual percent change in wholesale prices was 1.1% per year. From 1950 to 1957, the rate was 2.4%, and from 1970 to 1980 the average annual percent change was 9.3% per year. Increases in inflation correlate with cuts in investment in defense and space exploration.

Inflation rates for capital equipment parallel these statistics. From 1959 to 1969, the average annual percent change in the price of capital equipment was 1.7%. From 1950 to 1957, the rate was 4.1%, and from 1970 to 1980, the average annual percent change was 8.8%.

Figure 2 gives one indication of the tremendous cheapening of production throughout the economy produced by aerospace and defense investment. Note that the rapid drop in prices for the items shown in the figure, coincides with the capital investment boom set off by the post-Sputnik missile and space programs. The specific technologies whose application brought down these prices (for example, the mass production of reliable transistors), had actually been developed under the 1950s ballistic-missile program or earlier, but were only driven into the civilian economy as a result of Apollo.

Notice also that the rate of fall of these prices slows dramatically from the late 1960s onward, after the investment driver effect of the Apollo program had been aborted with the election of Nixon and the installation of Kissinger at the White House as national security adviser. This regressive shift in national investment policy removed the mechanism for driving technologies produced by the Apollo program into the civilian sector. As a result, most Apollo-era technologies never saw application in industry as a whole.

For example, the second-generation nuclear fission technologies, developed by NASA in the 1960s program for a manned mission to Mars, never became commercial breeder and high-temperature reactors built by U.S. utilities.

The economy that Kennedy inherited

When the United States embarked upon its civilian and military space program, the U.S. economy was actually, in foundation, in miserable shape.

1) From 1948 to 1958, new orders of capital goods in non-defense industries had stagnated around the same level of 80-100 billion constant 1982 dollars per year.

2) By 1958, fully 60% of metalworking machine tools in use in metalworking industries were classified as "over-age" or "obsolete" by the American Machinists' Inventory of Metalworking Equipment, a significant increase from previous inventories (see *EIR Quarterly Economic Report*, June 1985).

3) The American iron and steel industry was based on antiquated technology from the 19th century, the ancient open-hearth furnace and the same basic blast furnace developed by Andrew Carnegie, improved only by computerization and the introduction of superior raw materials. Stagnation in iron and steel was indicated by the fact that per capita iron production had remained for 40 years at about the same level as it was in 1920 (see *EIR Quarterly Economic Report*, June 1985). From 1958 to 1960, per capita iron and steel production was lower than any year since World War II. Energy flux density in U.S. blast furnaces, a measure of reducing power, leveled off in the postwar period.

4) The electric power industry was little better off. Since the 1930s, it had been struggling with the technological limitations of boiler technology. The increase in energy flux density across the boiler heat transfer area, had leveled off in the 1930s due to these limitations. As a result, increases in energy flux density in electric power production, could only be achieved by increasing the scale of furnaces (or going nuclear! See *EIR*, June 20, 1986).

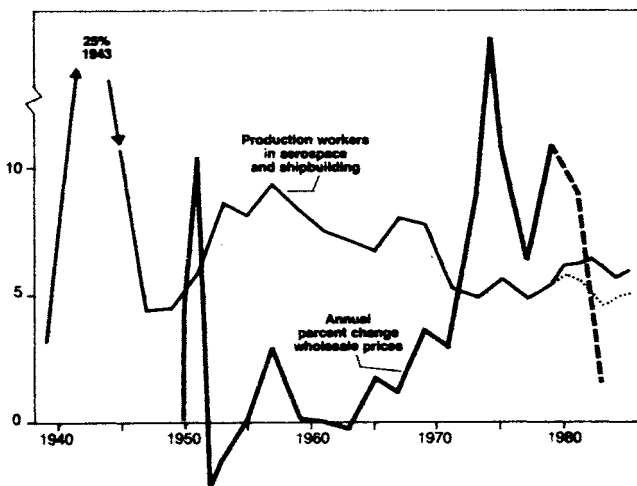
These, and problems elsewhere in basic industry, contributed to producing the 1958 recession that resulted in Kennedy's victory in 1960. These same factors prompted U.S. Steel to attempt to raise steel prices in the early part of President Kennedy's administration, resulting in his famous confrontation between the steel companies and the young President.

Aerospace as a science driver

In the 1959-69 boom, it was not mere employment in aerospace that was the driver for the economy. From 1959 to 1967, the number of production workers in aerospace increased only about 14%. The driver was the effect that aerospace investment had on the rest of the economy. We have already mentioned how investment in new orders of capital goods by aerospace industries almost doubled between 1958 and 1967. This is remarkable given that in 1958, the Air Force ballistic missile program was already tooled up for full production and the long-range bombers were already rolling off the production lines.

The mere quantity of capital investment is not the only feature of aerospace's driving of the economy to cheapen the cost of production. Rather, the type and quality of capital investment is just as important. The aerospace industry has

FIGURE 3
Production workers in aerospace and shipbuilding as a percentage of all production workers in durable goods, 1937-1985



the unusual characteristic that it employs one scientist or engineer in research and development for every four or five production workers. By contrast, in manufacturing industries as a whole, one scientist or engineer is employed for every 30-40 production workers. In part, it is this characteristic of aerospace that makes it possible for its contribution to the economy as a whole to be a healthy one. However, this high-technology industry must be assigned a definite goal to achieve, without budgetary constraints, and backed up by the right national investment policy, for this potential to be realized.

Lyndon H. LaRouche, Jr. has recently argued that a healthy U.S. economy would consist of a labor force of which 55% would be production workers in manufacturing, mining, construction, utilities, and agriculture, and another 10% scientists and engineers involved in research and development, with a resulting ratio of one scientist or engineer for every five or six production workers in the economy as a whole. The only sectors "in the ballpark" with this projection, are aerospace and communications. In 1983, there was one scientist or engineer for every 5.5 production workers in production of communications equipment (Standard Industry Classification 366).

Profile of economic decline

One way to understand how the economy was wrecked in the 1970s by Kissinger, et al., is to compare the proportion of the productive labor force—the fundamental resource of any economy—deployed in aerospace and defense in the 1960s aerospace build-up, with the Kissinger-Carter years. Another metric is investment patterns in these high-technology areas.

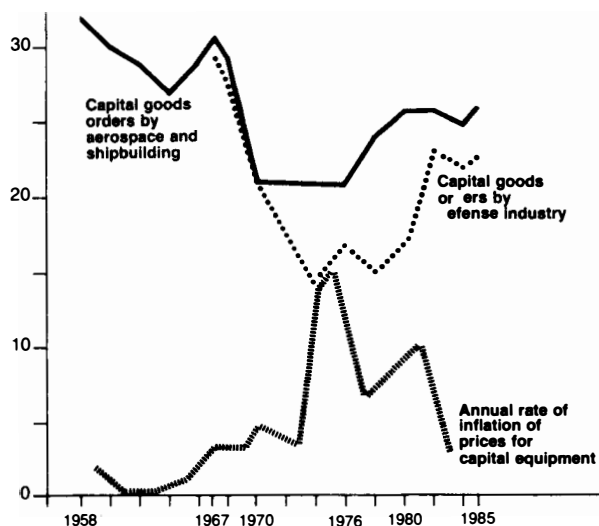
During these periods in postwar economic history, the deployment of the American productive labor force in defense and defense-related industries, such as shipbuilding and aerospace, was markedly different. From 1950 to 1969, almost 8% of production workers involved in durable-goods production were employed in shipbuilding and repair, aircraft and aircraft parts production, and production of missiles and space vehicles. In the period from 1970 to 1980, the average percentage of durable-goods production workers involved in these defense-related areas, had declined to 5.3% (Figure 3).

Investment in capital goods was greatly different over the periods examined. From 1958 to 1969, an average of 30% of all new orders for capital goods in the United States originated from the aerospace and shipbuilding sectors. From 1970 to 1980, the average percentage of new orders of capital goods in aerospace and shipbuilding had declined to 22% (Figure 4).

The full extent to which the policies of Henry Kissinger's Mutually Assured Destruction (MAD) tore the guts out of U.S. defense industries, producing the collapse of the U.S. economy, is shown when we look at the tremendous decline in the absolute numbers of production workers devoted to

FIGURE 4

New capital goods orders by aerospace, shipbuilding and by defense as percent of national total, 1958-1985



aerospace and shipbuilding over the past 25 years. In the late 1960s, these defense-related industries reached a peak employment of industrial operatives of approximately 680,000. In the two years from 1969 to 1971, employment in these sectors was reduced 40% to 417,000, and remained at that level until 1977. Even in 1985, at the height of the Reagan defense build-up, productive employment in shipbuilding and aerospace is still over 234,000 (30%) lower than the peak reached in the late 1960s.

The trend in investment in capital goods in the same sectors, over the same period, is just as alarming. In 1967, new orders for capital goods in aerospace, that is, aircraft, missiles, and space vehicles production, had reached a height of \$30.4 billion (in 1967 dollars). By 1970, this level of new orders of capital goods in aerospace alone had collapsed 50% to \$15.5 billion in constant 1967 dollars. New orders for capital goods in defense work alone, in all industries—aerospace, communications, shipbuilding, and others—totaled almost \$30 billion (in 1967 dollars) in 1968. By 1972, this rate of investment had collapsed 42%. Only in the last few years has the rate of investment in aerospace and defense begun to approximate that of the late 1960s.

This drop in new orders for capital goods was specific to the aerospace and defense sectors in the early 1970s. In the same period, from 1967 to 1972, in which new orders of capital goods in aerospace and defense plummeted 42%, new orders of capital goods in the entire economy fell only 3% and recovered in succeeding years. In 1984, when defense and aerospace had begun to achieve late-1960s investment rates, new orders of capital goods for the entire economy were 33% greater, in constant dollars, than in 1967. This

indicates the shift in the nature of investment away from the high-technology investment characteristic of aerospace and defense industries.

This same pattern of redeployment of resources appears in the deployment of the productive labor force over the 1960s and 1970s. While the number of production workers involved in production of durable goods reached a postwar peak of 9,110,000 in 1979, production workers in shipbuilding and aerospace became a diminishing proportion of that total.

There is this dubious distinction: Only with the collapse of production in basic manufacturing and durable-goods industries since Paul Volcker became head of the Federal Reserve in 1979, has aerospace and shipbuilding risen significantly as a percentage of production workers involved in durable-goods production. Defense-related employment as a percentage of production workers involved in durable-goods production at the 1979 peak, has stagnated at the level of 5% under the Reagan administration; the administration's defense build-up really doesn't have all that much muscle.

How McNamara got the decline going

The destruction of the U.S. economy did not begin precipitously with the swearing in of Henry Kissinger as national security adviser to the President in 1969. Kissinger merely carried on a process that was set into motion when Defense Secretary Robert McNamara adopted the policy known MAD. Underlying this dogma was the assumption that it was not necessary for national defense to have a strong basic industrial economy, that only the maintenance of a fleet of ballistic missiles was necessary, and that once this fleet was deployed, further investment in new defense technologies and strategies was not required.

Although McNamara announced this policy in the wake of the Cuban missile crisis before President Kennedy's assassination, the policy itself, and especially its economic impact, was not felt until after Kennedy was dead.

McNamara and his allies began dismantling Kennedy's "New Frontier." They eliminated aerospace and defense programs right and left: the supersonic transport, the Air Force manned orbiting laboratory, the original 1960s program for an aerospace plane, Project Defender for a space-based ABM system, and NASA's post-Apollo program for rapid development of a Shuttle and space station, and many others. As LaRouche recently wrote in an essay "The World Economic Depression in Progress: Why It Happened, and How Recovery Must Be Organized":

The collapse of the U.S. economy, is not the result of any single facet of U.S. policy; it is the result of the mutual interaction of the past 20 years' trends in several policy areas: monetary policy, credit policy, tax policy, and economic policy. In the area of economic policy, the most powerful depressing factor, was a dramatic shift in U.S. defense policy, estab-

lished under President Johnson, and consolidated under the Nixon, Ford, and Carter administrations.

Defense policy enters the picture in the following way.

Although the Johnson administration launched the neo-malthusian, "technetronic" policy as an official policy-trend of government, the "post-industrial" policy was consolidated by the Nixon administration. Key in this was Henry A. Kissinger's leading role in negotiating arms-control and other treaties with Moscow, treaties which made neo-malthusianism federal law, spilling over from the military sector into civilian production and the economy generally.

The victorious survivors of the death of President John F. Kennedy—McGeorge Bundy, Averell Harriman, George Ball, Robert McNamara, and so on—started the process of transforming the United States from the most powerful state in world history, into becoming a second-rate power. The initial emphasis, in which McNamara figured prominently, was turning the United States into a second-rate military power.

The means by which the U.S. began to be transformed into a second-rate military power, during McNamara's term and later, was destroying the U.S. position as a leading economic power. . . .

Under "normal" conditions, in which the Western nations are committed to continuing a policy of technological progress in both military and civilian production, the total economic strength of the Western alliance is between three and four times as great as the combined resources of the Soviet empire. Therefore, as long as we use that economic superiority to maintain military superiority, we have no reason to seek war with the Soviet empire, and the Soviet forces would not dare to attack us. That is the kernel of a "peace through strength" policy.

As long as the U.S. remained committed to such a "peace through strength" approach to defense of the United States and its allies, it was impossible for the advocates of a malthusian "post-industrial society" to sustain any headway in pushing the U.S. government into a "post-industrial" policy. It was impossible for the Soviet empire to threaten launching a nuclear first-strike attack against us. Only if we abandoned a "peace through strength" policy, could there be the danger of an actual thermonuclear conflict. Only if we abandoned a "peace through strength" policy, could fellows such as Zbigniew Brzezinski succeed in selling their ruinous "technetronic" sort of "post-industrial" policy.

McNamara's doctrine of "systems analysis" started the process of ruining the Defense Department's role in the economy. McNamara's doctrine could not succeed by itself; without Kissinger's actions of the 1969-76 period, the Soviets could have never built up military superiority, nor could the collapse of the U.S.

economy have gone as far as it has gone.

Data on the 1963-65 period give several indicators, that the seeds of the economic crisis that Kissinger forced the country into in 1969, had been planted under Defense Secretary McNamara. In 1963, the number of metalworking machine tools in use in metalworking industries per 1,000 production workers in mining, manufacturing, and construction, achieved a postwar peak of 180 machine tools per 1,000 production workers, and then proceeded to decline into the 1970s and 1980s.

Following Kennedy's assassination, the proportion of funding of industrial research and development provided by the federal government, underwent its first period of continuous decline in a decade. Under the post-Sputnik aerospace and defense build-up, the federal government contributed between 56% and 59% of all industrial research and development funds invested in the country. Curiously, this proportion began a continuous decline in 1964, from 58% in 1963 to 49% by 1968. This coincides with McNamara's policy of pulling the government out of the financing of capital equipment and work-in-progress in the aerospace and defense industries, as detailed in the second 1986 *EIR Quarterly Economic Report*.

The effect of the shift in policy introduced by McNamara under President Johnson, had an almost immediate impact on the economy. The lag time between the shutdown of Kennedy's ambitious aerospace/defense policy by McNamara, and that shutdown's effect on other industries varied with the condition of other basic industries and their proximity to aerospace and defense. Industries that were in the worst shape exhibited problems earliest.

In electric power production, the rate of increase in energy flux density leveled off in the mid-1960s, productivity growth leveled off by 1970, as did improvements in the efficiency of power production.

In the machine-tool industry, production of heavy metal-cutting and metal-forming tools, reached a peak in 1967 of shipments of 118,000 tools. The industry then entered a decline which has yet to be reversed.

Productivity in the steel industry continued to grow into the early 1970s as a result of a large-scale conversion of steel refining from open-hearth technology to basic oxygen process technology from 1960 to 1972. However, the impact of this conversion was short-lived, and the across-the-board trends in the overall economy began to express themselves as per capita iron and steel production reached a postwar peak in 1973, and began to decline thereafter, for the first time since Herbert Hoover's depression.

Shortly thereafter, in the second half of the 1970s, per capita production of electric power entered into its first decline since the early 1930s. Productivity in the machine-tool building sector itself peaked in the mid-1970s, at about 340 heavy metal-forming and metal-cutting machine tools per 100 production workers.