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Lloyd J. Dumas
Columbia University

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ECONOMIC CONVERSION, PRODUCTIVE EFFICIENCY
AND SOCIAL WELFARE

Lloyd J. Dumas, Associate Professor, Columbia University

Introduction

Traditional economic theory holds that there is a tradeoff between inflation and unemployment, and that accordingly price stability (i.e. 0% inflation) can only be achieved at the expense of increased unemployment, while full employment (corresponding to an unemployment rate of about 3%)¹ requires acceptance of an ongoing inflation. In 1960, the noted economists Paul Samuelson and Robert Solow published an analysis of annual data for the period 1933-1958, from which they quantitatively estimated this tradeoff.² It was their rough estimate that the elimination of inflation would require acceptance of a 5%-6% rate of unemployment, while the achievement of full employment would impose a continuing 4%-5% rate of inflation. In a later study, Lawrence Klein and Ronald Bodkin looked at quarterly data from 1948-57 and concluded that an unemployment rate of 6.9% would have to be maintained in order to achieve price stability, thus implying a slightly more severe tradeoff.³

The fact is that over the last several years, inflation and unemployment have both been persistently near, and often substantially beyond, these high tradeoff limits simultaneously. During the calendar year 1975, the U.S. national unemployment rate was averaging 8.5% at the same time the consumer price index was rising by 6.5%.⁴ Something had clearly changed in the U.S. economy to produce this unprecedented high inflation/high unemployment situation. The question is what?

An important part of the answer lies not in the events of the last few years by themselves, but rather is rooted in a much longer process of cumulative economic deterioration stretching over the past few decades. Furthermore, this process does not derive from a fatal flaw in the workings of the U.S. economic system. It is neither necessary nor inevitable. Rather it is the unintended result of a conscious decision, with broad popular support, to adhere to a system of national priorities which has given primacy to the development and maintenance of a sector which is particularly unproductive from a purely economic viewpoint -- the military. When the U.S., for the first time in its history, entered into a protracted era of high military spending following the close of the Second World War, it sowed the seeds of the economic decline whose bitter harvest it is just beginning to reap.

The initial section of this analysis traces the mechanism by which the persistence of high military spending has played a major role in producing the economic deterioration underlying the present U.S. recession/inflation, and highlights the implications of this deterioration for social welfare. The second section deals with the nature of the serious economic and political barriers that have developed to the reversal of this economic and social decline. Finally, we consider the kinds of policies which should be effective in overcoming these barriers and accomplishing the transition from military to civilian orientation which is a necessary pre-condition of a serious and successful effort to improve the economic and social welfare of the people of the United States. Some of the plethora of conceivable productive uses of the resources freed from the military are discussed.

The Economic Effects of Military Spending

The idea that persistently high defense spending could play a major role in producing economic decline flies in the face of one of the most deeply ingrained and widely held economic beliefs: that a capitalist economic system benefits from (or at the very least is not harmed by) high levels of military expenditure. From the far left to the far right, there seems to be consensus on this one point. But the fact that a belief is deeply ingrained and widely held does not make it true.

Interestingly enough, Adam Smith, regarded as the father of rough and tumble laissez faire capitalism, did not share this view. On the contrary, Smith apparently saw military spending as economically parasitic, writing in his epic The Wealth of Nations (published in 1776):

"...the whole army and navy are unproductive labourers... Such people, as they themselves produce nothing, are all maintained by the produce of other men's labour. When multiplied ...unproductive hands, who should be maintained by a part only of the spare revenue of the people, may consume so great a share of their whole revenue, and therefore...encroach...upon the funds destined for the maintenance of productive labour, that all the frugality and good conduct of individuals may not be able to compensate the waste and degradation of produce occasioned by this violent and forced encroachment."⁵

There are essentially four reasons why the maintenance of high levels of military expenditure in the U.S. over the past thirty years has produced both inflation and unemployment. These are: (1) the economic nature of military goods; (2) the way in which military procurement has been conducted; (3) effects on the international balance of payments; and (4) effects on civilian technological progress.

Each of these is now considered in turn.⁶

The Economic Nature of Military Goods. Military goods are those products purchased by the military which are to some degree specialized to military use. Thus, tanks, rifles, bombs, fighter planes, etc. are military goods, while milk, meat, detergents, etc. purchased by the armed forces are not.

Military goods so defined are peculiar in that they neither contribute to the present standard of living (as do consumer goods, housing, health care, etc.) nor to the economy's capacity to produce and distribute "standard of living" goods and services in the future (as do industrial machinery, trucks, warehouses, factories, school buildings, etc.). That is not to say military goods are useless, but merely that they do not augment the present or future standard of living in the way that the various consumer goods, producer goods and social services do, and thus do not possess the same kind of economic usefulness. However, despite the fact that they do not produce economic value in the above sense, they do require valuable economic resources for their production, and therefore impose a real cost on society. This cost is best measured not purely in terms of money, but rather in terms of the sacrifice of the economically useful social and economic goods and services that could have been produced with the labor, materials, energy, machinery, etc. which were instead devoted to military production.

Because the money paid out to the producers of military goods does not call forth a corresponding production of goods and services which can be purchased by business firms and consumers, the conditions are created whereby there may be an excess of demand relative to supply of goods. If this occurs, it will produce pressure toward a rise in the general level of prices, i.e. inflation. This potential contribution to inflation is the easiest part of the military spending problem to handle for two reasons: (1) it is only a serious problem when employment is full or near full; and (2) it can be offset, say by raising taxes sufficiently to remove enough money from the rest of the public to balance the flow of funds being spent on military goods. However, during periods of full employment, the money flows for the military have not been fully offset, and so have contributed to producing inflation. For example, during nearly all of the latter part of the decade of the 1960's, when the U.S. involvement in the Vietnam War was intensifying, the unemployment rate was under 4%.⁷ Military spending was not offset, and between 1965 and 1969, the rate of inflation more than tripled.⁸

Military Procurement Practices. Whatever the payment formula formally written into major defense procurement contracts, they have all in practice been what are known as "cost plus" contracts.⁹ These are

contracts in which the producing firm is paid an amount equal to its total cost of production (whatever that eventually turns out to be) plus a profit. Operating under such a system, the firm involved not only has no risk, but also has no incentive to hold its costs down. To the extent that the firm wants to increase its sales revenue, it will have a very powerful incentive to run its costs up in order to achieve the highest possible payment for its product.¹⁰

Combining this incentive system with the very large amounts of money made available for military procurement year after year by the Congress has created a situation in which military industry has bid up the prices of key resources. Chief among these are engineering and scientific personnel, and some grades of highly skilled production labor. Aside from its direct effects in increasing the cost of these resources to civilian industry thus adding to the pressure toward inflation, the purchasing power of defense firms, backed by their rich customer (the Federal Government), has completely pre-empted a substantial amount of some of these resources, with serious long term effects on the health of the civilian economy.

For example, by one crude and conservative estimate nearly one-third of all the engineers and scientists in the United States were engaged in defense-related work as of 1967.¹¹ Assistant Secretary of the Treasury Murray Weidenbaum had earlier put the figure at 52%.¹² The pre-emption by the military of such a large fraction of what we will subsequently see is a critical resource in a modern industrial society, cannot fail to have significant effects on the functioning of that part of the economy that produces goods and services which do contribute to the standard of living and the quality of life.

International Balance of Payment Effects. From 1893 through 1970, year by year the U.S. had a balance of trade surplus, i.e. the U.S. exported a greater value of goods and services than it imported. Since exports bring foreign currency into the U.S., while imports send U.S. dollars abroad, if this had been the only aspect of the U.S.' international transactions, there would have been a considerable accumulation of foreign currencies (or gold) in the U.S., and a comparative shortage of U.S. dollars abroad. Consequently the U.S. dollar would have been one of the strongest (if not the strongest) currencies in the world. However, the balance of payments includes not only money flows related to trade, but all other international money flows as well, and the U.S. balance of payments has been in continuous deficit for many years.

What role has U.S. military expenditure played in this situation? It has affected the U.S. international economic position directly through outflows of U.S. dollars for defense expenditures abroad, and indirectly through its effects on the balance of trade, chiefly via

its influence on the competitiveness of U.S. civilian industries in foreign and domestic markets.

In the table below are presented some basic U.S. Department of Commerce data which bear on the direct effects of military expenditures abroad and on the U.S. international financial situation. We note that the entire cumulative balance of payments deficit for the period 1960-1970 (inclusive) was \$35 billion, whereas over the same period, total direct defense expenditures (net after military sales abroad) were more than \$30 billion. Hence, U.S. military expenditures abroad accounted for 86.6% of the entire U.S. balance of payments deficit during that period.

During the years 1955-1970 (inclusive) there was a huge inflow of foreign currencies into the U.S., represented by a cumulative balance of trade surplus of nearly \$62 billion. But during those same years, net military expenditures abroad were responsible for an outflow of dollars from the U.S. amounting to more than \$43 billion. The outflow of U.S. currency owing to military spending abroad thus wiped out 69.9% of the balance of trade surplus, 1955-1970.

Perhaps an even more striking fact is that total net direct defense expenditures abroad over the entire 20 year period from 1955 to 1974 were more than 10% greater than the total balance of trade surplus.

These comparisons greatly understate the magnitude of U.S. defense expenditures abroad, because they do not include outright U.S. grants of military goods and services. Since they involve no international flows of currency, these gifts of military equipment and services are not involved in the balance of money flows. However if included, the total of almost \$34 billion worth of such grants recorded during the years 1960-1974 would increase the military expenditure figures given for that period by more than 80%.¹³

It is clear from these data that direct outflows of dollars in the form of U.S. military expenditures abroad played a major role in destroying the favorable balance of trade surplus, and contributed to the severe weakening of the U.S. dollar. This substantially raised the price of imported goods (including oil) upon which the nation's business and consumers have become increasingly dependent in the past few years. This massive outflow of military spending abroad has directly and substantially contributed to the generation of inflation within the domestic U.S. economy.

Military Expenditure and Civilian Technological Progress.

Technological progress is one of the cornerstones of modern industrial society. It is often seen as a kind of unidirectional force, which presses onward, almost with its own imperative, compelling

U.S. Military Expenditures Abroad and the International
Balance of Payments

<u>Year¹</u>	<u>Balance of Trade (\$millions)</u>	<u>Balance of Payments³ (\$millions)</u>	<u>Net Direct Defense Expenditures Abroad⁴ (\$millions)</u>
1955	2,897	---	2,501
1956	4,753	---	2,627
1957	6,271	---	2,466
1958	3,462	---	2,835
1959	1,148	---	2,503
1960	4,892	-3,667	2,752
1961	5,571	-2,252	2,596
1962	4,521	-2,864	2,449
1963	5,224	-2,713	2,304
1964	6,801	-2,696	2,133
1965	4,951	-2,478	2,122
1966	3,817	-2,151	2,935
1967	3,800	-4,683	3,226
1968	635	-1,611	3,143
1969	607	-6,081	3,328
1970	2,603	-3,851	3,354
1971	-2,268	-21,965	2,893
1972	-6,409	-13,829	3,621
1973	955	-7,651	2,316
1974	-5,528	-19,043	2,159
TOTAL	48,703	---	54,263

- Notes: 1. Problems of data availability and comparability complicate a more complete analysis over the entire post World War II period.
2. Exports-imports, merchandise, adjusted excluding military (minus implies deficit)
3. Net liquidity balance (minus implies deficit)
4. Direct defense expenditures - military sales (does not include military grants of goods and services)

Sources: Bureau of Economic Analysis, U.S. Department of Commerce, Business Statistics (1973), pp. 13-14, and Survey of Current Business (June 1975), pp. 26 and 30.

people to adjust themselves to the kind of world it produces.

Actually nothing could be farther from the truth. There is nothing mystical about the development and application of new technical knowledge -- it is merely the product of individuals, trained in the appropriate scientific and engineering disciplines, trying to solve the problems toward which their attention is directed. Technology has no initiative of its own, nor is it unidirectional. Its advance can be accelerated or slowed by altering the magnitude of resources devoted to that purpose. It may be channeled in many different directions by changing the nature of the problems set before the engineers and scientists who develop it. Technology is not a single lane road down which we must travel at a speed beyond our control. It is a complex interconnected network which is explored at a pace and in a pattern largely determined by social decision, within the limits placed upon us chiefly by the availability of appropriately trained engineering and scientific personnel.

The critical functions of civilian technological development in a modern society are to enhance the quality of products available and to improve the efficiency with which these products are produced. Here the word "products" is defined broadly to include not merely manufactured goods, but rather the whole range of goods and services, power supply, transportation etc.

As the cost of labor, fuel, raw materials, machinery and other productive resources rise over time, they exert an upward pressure on the cost of producing any given product, and hence on its price. The only way this pressure can be relieved, i.e. the only way the production cost per unit of product can be held down in the face of rising input costs is by finding more efficient ways of utilizing these inputs. If, for example, an improved production technique were developed which allowed us to produce 10% more output from the same combination of inputs we had been using, we could offset up to a 10% increase in the cost of every input by implementing this technique, and therefore hold production cost steady despite the rise in labor, fuel, etc. costs. Accordingly there would be no cost pressure to raise the product's price. Thus cost increases can be offset by increases in the output produced per unit of input. This latter quantity is known as productivity.

Particular attention is often focused on the rising cost of the labor resource, and therefore on the behavior of its potential offset, labor productivity. Civilian technological progress plays a crucial two-sided role in the improvement of labor productivity. On the one hand, direct improvements in production techniques increase the output obtainable from a given amount of labor. On the other hand, technological progress in the industries that produce the machinery and equipment used in the production of all goods and services make the

purchase of that machinery and equipment more attractive to all producers by holding down its price (through improvements in production techniques) and enhancing its quality. As labor prices rise, the availability of relatively inexpensive high capability machinery will lead producers to purchase more and better machinery, thus increasing the output produced per worker. Therefore, both directly and indirectly civilian technological development plays a vital role in maintaining the economy's ability to offset higher labor (and other resource) costs, and removing the "cost-push" pressures toward inflation.

We have noted that between one-third and one-half of the engineering and scientific personnel in the U.S. have been directing their attention to the development of technology oriented to military uses. The magnitude of this diversion is even greater than these quantitative estimates indicate, since the combination of high prestige and high pay associated with military-related work have tended to attract the top-ranking graduates in the various disciplines into this area. The pre-emption of such a large portion of the nation's technological talent by the military cannot fail to have a strong adverse impact on the rate of civilian technological development.

The argument is often made that the technology developed in the pursuit of military oriented goals can also be applied to civilian purposes. To be sure there is some occasional "spillover". But what is found is strongly conditioned by what is sought. Advances in civilian technology, whether they be improved techniques of power generation or food preservation, will typically be found faster and at a much reduced expense if they are pursued directly. Furthermore, to the limited extent spillover exists between military and civilian technological developments, it operates in both directions.¹⁴ At any rate the acid test of the high spillover argument is essentially an empirical one: if it is true, then the pre-emption of technological resources should not have substantially diminished the rate of civilian technological progress.

By early 1976, the indications of decline in U.S. civilian technological development were so manifest that they could no longer be ignored by either business people or the science establishment. The February 16, 1976 issue of Business Week carried an article entitled "The Breakdown of U.S. Innovation", the introduction of which included the following, "...from boardroom to research lab, there is a growing sense that something has happened to American innovation... the country's genius for invention is not what it used to be."¹⁵ The following month, the release to Congress of the seventh annual report of the National Science Board, the governing body of the National Science Foundation, was reported in the New York Times under the headline "U.S. Science Lead is Found Eroding". The news account began, "The international predominance of the United States in science and

technology has suffered erosion in the past 15 years...¹⁶

Several years earlier, a special report in Business Week detailed the increasing difficulties being encountered by industry after industry in the U.S. as a result of the decline of U.S. civilian technological progress. U.S. heavy machinery builders were running into fierce foreign competition on price and design as early as the early 1960's. U.S. companies increasingly licensed the rights to European developed technology in such high technology industries as chemicals and electrical equipment. In shipbuilding and electrical power transmission, American firms adopted improved methods developed by Swedish firms. In steel manufacture and in construction, U.S. industry lagged behind Japanese and European industry in the application of improved techniques.¹⁷

The economic and social effects of this civilian technological retardation are very serious. Since civilian-oriented technological progress is a key element in the productivity process, which is in turn critical to the economy's cost-offsetting capability, the slowing of that progress directly implies that rises in the costs of labor, fuels, materials, etc. will increasingly result in higher production costs for a whole range of products. In the case of goods and services produced by private enterprise, these production cost increases must eventually be passed along to consumers in the form of higher prices.¹⁸ In the case of governmentally provided transportation, health care, educational and other social services, taxes will have to be increased to pay for increased costs, direct charges that may in some cases be levied on users of these services to cover a portion of their cost will have to be raised, and/or services will have to be curtailed.

Publicly provided or subsidized social services, which would not normally be expected to experience substantial cost-offsetting technological progress in the absence of this military diversion of technologists, e.g. education, suffer considerable cost-push inflationary pressures as a direct result of the retardation of civilian technological progress elsewhere. The cost of every material input they require, will be rising because of the failure of technological advance in the industries which produce those inputs.

The failure of the cost offsetting mechanism implied by the military's pre-emption of a large share of the nation's engineers and scientists thus clearly leads to a substantial and ongoing inflation. But, at the same time, it also plays a major role in generating unemployment. On the one hand, the rising costs of publicly provided economic and social services may persuade or compel state and local governments to curtail these services because of the real or perceived intolerance of their constituents for tax increases sufficient to

maintain them. This directly results in the loss of jobs by those individuals who were formerly engaged in providing these services.

The rising prices of domestic private producers of goods and services make their products less and less competitive in both foreign and domestic markets, especially relative to those foreign producers in nations which continue to place sustained emphasis on the development of civilian-oriented technical knowledge. The relative loss of markets by domestic producers to foreign firms, both in the U.S. and abroad, results in cutbacks in domestic production which in turn generate unemployment even in the face of relatively high product demand. Hence extraordinary situations of simultaneously high demand and rising unemployment can develop, such as the existence, in July 1971, of 16% unemployment in Detroit (and near 10% in Michigan as a whole) during the best auto sales year in the nation's history to that date.¹⁹

The loss of foreign markets by U.S. producers shows up as a decline in exports, the loss of domestic markets as an increase in imports. But falling exports and rising imports result in a deterioration of the balance of trade. So it was in 1971 that the balance of trade finally turned against the United States, after more than three-quarters of a century of continuous annual surplus. Clearly this further aggravated the balance of payments deficit, weakened the dollar and hence constituted yet another indirect contribution of the military to inflation.

Faced with a progressive inability to offset high resource costs, particularly that of labor, U.S. business firms began moving their operations to areas in which labor costs were much lower than in the U.S. This substantially aggravated the nation's unemployment problem. A few of the numerous examples of this "export" of jobs from the U.S. are the loss of 2000 machinists' jobs in Utica, New York as a consequence of General Electric's transfer of its operations to Singapore between 1966 and 1972; General Instrument's closing of plants in Massachusetts and Rhode Island and subsequent hiring of more than 7000 workers in Taiwan; and the complete transfer of all of its consumer electronic components manufacturing operations overseas by Westinghouse.²⁰

Thus, for a number of reasons the decline in civilian technological progress resulting from the relative concentration of U.S. technological talent on military research is perhaps the most important of the severe inflation and unemployment generating effects of the past three decades of persistently high military expenditure. It has resulted not merely from the gross military pre-emption of engineers and scientists, but also from the feedback effect that pre-emption has had on engineering and scientific education in the United States. This feedback has to some extent affected even those technologists who

have opted for civilian-oriented research.

Social Welfare Implications of the Economic Effects of Military Spending. To the extent that an individual's income rises at least as fast as the price level, that individual will be partly protected against the erosion of his or her ability to purchase goods and services.²¹ Hence, that person should be able to maintain or improve that part of his or her material standard of living that is related to the direct acquisition of those products in the market place. However, any individual whose income is not keeping pace with the inflation will experience a lessened ability to buy goods and services and thus a reduced standard of living. Those living on essentially fixed incomes will suffer the most severe decline.

For various reasons, the people whose incomes rise the most slowly or are totally fixed, tend to be those lowest on the economic ladder to begin with, e.g. the elderly, the chronically unemployed, the unskilled. And for such individuals, the loss of purchasing power resulting from inflation is not merely a source of inconvenience or discomfort, but of real deprivation.

The inflation-related rise in the cost of state and local public services, such as fire and police protection, education, mass transportation, health care, etc. particularly in the presence of continued diversion of the lion's share of discretionary Federal funds to military programs, must lead to higher taxes and/or increasingly severe cutbacks in services provided. Curtailments in such essential services diminish everyone's well-being both in the short and long run. The economically underprivileged, because they lack alternatives, tend to be the most dependent on publicly provided services as well as direct public support. They are most severely burdened by state and local governmental cutbacks. Those in the economically middle class undergo a two-sided squeeze, bearing a large part of the growing tax burden required to cover the rising costs of state and local services, while not being sufficiently wealthy to protect themselves against at least some of the service cutbacks without real sacrifice (say by removing their children from deteriorating public schools and placing them in high quality private schools). Even higher income individuals suffer as a result of reduced police and fire protection.

As to unemployment, the economic damage caused by sustained high military spending is again disproportionately borne by those least able to economically cope with it. Low income workers are in that status partly because of a lack of skills, partly because of various types of ethnic discrimination, and partly because they are either unorganized or organized into relatively weak unions. They are normally considered the most marginal laborers, and are accordingly the first to be laid off as production is reduced in response to lowered sales.

Another very important social effect which has developed as a result of the unemployment effects of prolonged military emphasis is the potential for reversal of the labor force gains made by some ethnic minority groups and women during the past decade. The widespread, nearly pervasive practice of laying off those workers with least seniority first has put at greater risk all those who have made recent penetration into employment areas formerly closed to them.

Unemployment always diminishes not only the economic and social welfare of those who are unemployed, but also of society in general. It represents a failure to develop and fully utilize labor, and as such implies the sacrifice of a part of the potential contribution to economic and social wellbeing of which that resource is capable.

Ongoing excessive inflation, high unemployment, rising taxes, curtailment of basic and essential state and local government services, a continuing deterioration of a substantial part of the nation's economic and social infrastructure -- these are the legacy of thirty years of excessive military expenditure. Far from being economically beneficial, high defense spending has been a cancer on the economy and on the society. And like a cancer, the damage it does will compound as long as we permit it to persist.

The Nature of the Conversion Problem

It is perfectly possible to return the economy to its previous civilian orientation without producing severe economic and social dislocations during the period of transition. But there are real economic, political and social obstacles to overcome. The nature of the distortions produced in the economy by the long term emphasis on military expenditure are such as to require structural intervention to correct. Simple macro-economic policies like manipulating the money supply, cutting taxes, offering investment tax breaks to business, etc. may be helpful, but they cannot conceivably come near being sufficient to produce a smooth transition. We will see why, as we consider, in turn, some of the major components of the conversion problem.

The Conversion of Engineers and Scientists. Since so much of the economic damage inflicted by high military spending has resulted from its adverse effects on civilian technological progress, the successful conversion of engineers and scientists from military-related to civilian-oriented research is especially critical to rebuilding the nation's economic strength. Since society has an enormous investment in the training of these individuals, it would be extraordinarily wasteful to merely find any sort of civilian job for them.²² For both these reasons, we will assume that the conversion process is required to provide these engineers and scientists with the kind of civilian work which utilizes their skills.

A very important part of the problem of converting technologists to civilian research is rooted in the differences between requirements for successful military and civilian technological development. Present day high technology military products are extremely complex, and are designed with an effort to squeeze every possible ounce of performance out of the product. Whether or not this extra performance capability actually has military significance, the presumption that it does clearly underlies the practice of weapons research and development.²³ This has led to the assignment of large teams of technologists to the design of weapons systems, each, in effect, developing and designing a part of a part. Accordingly, the need to become expert in a very narrow range of knowledge has led to extreme specialization of engineers and scientists engaged in military-related work. In addition, the extreme priority attached to military funding, combined with the common practice of procuring weapons on an effectively cost-plus basis and the pressure for even small increments in weapons capability, has led to a virtually complete de-emphasis on the cost implications of design. In fact, more expensive designs will certainly result in increases in sales revenue and typically in profit as well to the firms which generate them.

Successful design for the civilian market place, on the other hand, requires very heavy emphasis on the implications of the specific design for the cost of producing the ultimate product. This implies that designers, rather than being extremely specialized, should have a fairly clear concept of the overall design of the product and the interactions of its subcomponents. This, together with a basic understanding of the effects on cost of modifying the design in one way or another, will enable them to trade off changes in one part of the design against changes in the other to achieve desired product performance at the lowest possible cost. Keeping production cost down enables the price to be kept at a level which will make the product attractive to potential customers, and hence bring expanded sales and profit to the firm.

Because of these differences, engineers and scientists performing defense work must be retrained and re-oriented before they can be successful in civilian research and development. They do not need to be completely retrained because much of what they already know is also required for civilian work. But their overspecialization needs to be undone and they must be sensitized to the cost issue, and thus put in touch with civilian design realities.

The conversion process must also be extended to the educational institutions responsible for the training of engineers and scientists. These institutions have, altered their curricula to emphasize specialization, especially in areas and sub-areas of interest to the military, and strongly de-emphasize training in cost-related matters. Instruction in mundane civilian-oriented areas like, for example,

power engineering was curtailed or eliminated, particularly at the "best" schools. All this was an appropriate institutional response to the changing shape of the high-pay/high-prestige opportunities available to their graduates. And yet, these changes meant that even those engineers and scientists who did go directly into civilian areas were to some extent less than optimally trained for the development of civilian-oriented technological progress. Therefore, this response served only to exacerbate the deterioration of U.S. civilian technology and thus the nation's economic problems.

The inability of military-oriented engineers and scientists to move into civilian-oriented research and development without conversion retraining is indicated by the commonly observed tendency of technologists, laid off because of the termination of a defense contract, to either move to another geographic area in which defense firms have just received new contracts, take jobs which do not involve engineering and scientific work or simply remain unemployed until the contracts return. This tendency has been read by some as an indication that civilian technology is not starved by the diversion of engineers and scientists to military areas as we have argued, since they are not "grabbed up" by civilian industrial research programs when they do become unemployed.²⁴ But, that the failure of these technologists to be readily absorbed into civilian industry is due to the inappropriateness of their training and not an overall lack of demand is illustrated, for example, by the development of a critical shortage of engineers qualified to design new power plants reported in the early 1970's²⁵, side by side with the existence of an unemployed pool of military-oriented engineers.

Management Conversion. The management of military industrial firms operate in a very different atmosphere from that which prevails in civilian-oriented enterprise. Defense firms have, in practice, only one customer -- the United States Government. They cannot sell their products to civilian customers in any case, and can sell to foreign governments only with the direct and specific approval of the U.S. Department of Defense.²⁶ Even so, weapons sold to foreign governments were originally designed, developed, and produced for sale to the U.S. Government.

The one-customer orientation produces a very different sales and marketing situation from that faced by civilian firms. Rather than knowing how to run an effective electronic and print media advertising campaign, how to survey markets for public acceptance of a new product line, how to price a product for penetration into new markets or expansion of existing ones, etc., it becomes critical to know the minute detail of the Armed Services Procurement Regulations, to develop good working relationships with key government procurement personnel, and to be able to lobby effectively with members of the Congress.

Another critical difference is that the single customer does not itself have to sell its product in a market place. It does not therefore have to worry either about the effects on the ultimate price of its "product" of paying too much for the goods it buys, or the danger of its being forced into loss or bankruptcy by a drop in its sales if the equipment it purchases does not perform well.

This strongly interacts with a third critical factor, the extremely high priority accorded to defense procurement, currently supported by at least national public acquiescence, if not implicit consensus. This not only assures that the Defense Department will continue to be a very rich customer, but also that its purchase decisions will be readily validated by both the Congress and the President. Thus, the wealthy customer that military industry services faces no economic market test, and only the very loosest political constraints.

The net effect of these last two factors has been to guarantee at least higher revenues and typically higher profits to those military firms which are most effective in running up the cost of the products which they are contracted to produce, often regardless of whether or not these products perform as they were supposed to. A management operating in such milieu will become very effective at finding ways of producing at high cost. But this sort of management training and experience is completely inappropriate to successful operation in civilian markets, where holding costs down, is the crucial skill.

One of the most striking examples of the contrast between the way in which products get produced for military as opposed to civilian markets lies in the comparison of the Boeing 747 and the Lockheed C5A cargo plane. Both of these are jumbo jets of roughly comparable size, but the former was designed and produced for sale to the airlines and the latter for sale to the Air Force. The 747 is a smooth flying, highly reliable aircraft flown daily by nearly every major airline in the world, and is as energy efficient when fully loaded as a Volkswagen beetle carrying only its driver. The C5A has been plagued by severe operating difficulties including cracking of the wing pylons, crash-producing failures of the rear cargo door, and considerable landing gear problems. The Air Force has acknowledged that a cargo version of the 747 could carry a larger payload than the C5A.²⁷ In 1971, the 747 sold at about \$23 million per plane, the C5A about \$60 million per plane. Furthermore, wing defects on the C5A which reduced its estimated service life by more than 70%, were projected to cost 1.3 billion to repair, nearly doubling the original cost estimates for the program.²⁸

That managements of military firms are rewarded for high cost, despite low product quality and poor performance, is illustrated by the following listing of article headlines excerpted from the New York Times:

- (1) "Nine Spy Planes Lost in Crashes, Pentagon Says" (March 23, 1970) -- these planes were developed by Lockheed.
- (2) "X Factor Continues to Raise Luftwaffe's Starfighter Toll" (July 4, 1972) -- report of the 154th crash of this plane, designed by Lockheed.
- (3) "Lockheed's Step Is Costliest Ever: \$800 Million Write-Off on Tristar..." (November 23, 1974) -- report of loss by Lockheed in its development of the L1011 commercial jet.
- (4) "Lockheed Says \$22 Million Went to Officials Abroad" (August 2, 1975) -- payments to foreign officials and political organizations to obtain weapons contracts.
- (5) "C5A Jet Repairs to Cost 1.5 Billion" (December 5, 1975)
- (6) "Lockheed Rises to Top as Defense Contractor" (December 11, 1975).

All this involves the same defense firm that was given a \$250 million loan guarantee by the Federal Government.

Nowhere but in military industry could a management avoid financial disaster, much less achieve ascendancy, by performing so poorly, for so long. Clearly, one cannot expect managers accustomed to operating in a situation in which there is no risk, high costs are not merely tolerated but become the path to success, and only one rich customer need be serviced, to operate successfully in risky, cost sensitive, multicustomer civilian markets without substantial retraining and re-orientation. When unconverted military industrial managements have turned their attention to production of civilian products for state and local governments, the results have borne a striking resemblance to their military operations in both cost and performance. Consider, for example, the Bay Area Rapid Transit (BART) system in San Francisco whose prime contractor was the Rohr Company, a firm which made its reputation in aerospace and related operations. Although the system was supposed to be in operation by 1968, prototypes were still crashing in 1971.³⁰ A few weeks after it opened in 1972, the computer-controlled network experienced a number of breakdowns, including one instance in which a train "failed to slow down at the end of the line, barreled through a sand barrier, and did a nosedive into a parking lot."³¹ As of late 1975, up to half the cars were out of service at any given time, "causing delays and standing room only for San Francisco commuters, who have dubbed it Bay Area Reckless Transit."³² By 1971, estimates for the cost of the system had grown from \$792 million to \$1.4 billion.³³

There is little question, that whether military oriented managements are turned to the supervision of the production of goods and services sold in the civilian market place or for civilian use by government, they must be retrained and re-oriented as a prerequisite for successful conversion.

Conversion of Production and Low-Level Administrative Workers.

With the possible exception of a few highly skilled workers, the primary problem in channeling production and administrative workers into civilian oriented work lies not in the need for re-education, but rather in the numbers of people involved. By 1971, at least six million people in the United States were directly employed in military-related work -- 3.8 million by the Pentagon, and another 2.2 million by military-oriented industry.³⁴ Clearly, the bulk of these employees are production workers and low level administrative employees, including clerical workers.

Re-orientation to the standards of work of civilian enterprises will undoubtedly be required, and it is possible that additional vocational training will be required for some of these employees. This latter training is not so much to undo the effects of having been employed in military-related work as such (as in the case of engineers, scientists and managers), but rather to bring their skills into more perfect congruence with the best civilian opportunities available. The transition problem is simpler here because of the less involved nature of the re-education required, but more difficult because many more people are potentially involved.

The fact that many of the workers involved in defense production are unionized also presents a barrier to conversion, to the extent that the leaders of these unions take an inordinately short term and parochial view. The problem is that the civilian re-employment of the workers displaced by cutbacks in military expenditures may involve their transfer into industries or lines of work in the jurisdiction of unions other than those to which they currently belong. Because this tends to reduce the membership of defense industry related unions to the extent that it occurs, the leaders of these unions have an incentive to oppose this transfer and thus potentially the entire economic conversion process, pressing instead for continued high military spending. Such a position tends to be attractive to the membership of these defense unions, since it appears to be in their direct, short term interest. But, as we have seen, continued high military expenditure is economically destructive, and in the longer term its inflation and unemployment-generating effects hurt defense workers as well as the large numbers of nondefense workers who constitute the vast majority of the U.S. labor force. It is therefore only in the most, narrow, nearsighted and parochial sense that any union membership benefits from the continuation of high defense spending.

Capital Equipment and Facilities. Some of the industrial equipment and facilities currently employed in the service of the military are sufficiently general purpose in nature to be directly usable in civilian-oriented work. But some, such as certain types of extremely high capability machine tools, specialized shipbuilding facilities and military bases are not so directly transferable. To the extent that

some of this machinery suffers primarily from the excessive cost related with its excessively high performance capability, the equipment should be usable for civilian operations if some sort of special write-offs or tax breaks are allowed to overcome the cost penalty.

Those industrial facilities which do not so much possess excess capabilities as the wrong capabilities will have to be reconstructed, but that cannot be effectively done until specific plans have been developed for the particular alternative purpose to which those facilities are to be turned. Similarly, military bases are unlikely to be appropriate, without some degree of alteration, for efficient performance of a civilian oriented activity.

Intra-Regional Concentration and the Conversion Problem. Military bases and the facilities of military-industrial firms are not spread evenly throughout the United States, but are rather concentrated in certain areas within the various regions of the country. Every major section of the country contains some geographically small pockets of major military or military-industrial employment. Examples include the San Francisco Bay area, parts of Long Island, Seattle, and the Boston-Cambridge area. This combination of high concentration and geographic dispersion has important political and economic implications.

Politically, one would be hard-pressed to devise a geographic pattern which would provide better leverage. The Congressional representatives elected by constituencies which include one or more of these pockets, feel themselves compelled to support military programs that they perceive are in the interest of the people by whom they were elected, providing them with continued employment. They come to believe, that their continued election depends upon the effectiveness with which they can aid in at least maintaining, if not expanding the flow of military funds to their district. Accordingly, they may become salespeople for the military industry in their area.

Through the usual type of legislative agreements, the support of these legislators from various key areas for various military programs becomes multiplied into broad Congressional support for the funding of virtually any program the military can put forth. Legislators who do not go along can be punished by merely withdrawing military funds from their areas (e.g. by closing bases, cancelling contracts), or switching promised new funding to other regions. In the absence of prior serious conversion planning, this kind of "cold turkey" cutoff of funding will produce real economic difficulties and this is not conducive to re-election.

The primary economic implication of the geographic pattern of military-related facilities is that macroeconomic policies such as income tax reductions and money supply increases cannot cope with the problem of stimulating the economy so as to effectively produce a

smooth absorption of the resources freed from military use into civilian activities. Such policies average their effects broadly over the nation. But what is required here are policies which will reach specifically into these pockets of military concentration and redevelop them. Only in this way can the temporary economic dislocation which accompanies any major structural change be held to a minimum, and the economic reconstruction of the United States thus accomplished without real hardship.

Policies for Successful Conversion

An economically and socially successful conversion process requires considerable planning and preparation. First, a careful analysis must be performed to identify appropriate civilian alternatives into which the resources released from military-related activities may be effectively channeled. Second, a program for efficiently preparing the resources for their new civilian-oriented functions must be carefully developed. Finally, in the case of the human resources involved, various social services must be provided during the period of transition including income maintenance, employment services, and relocation and educational assistance where required. We shall consider each of these problems in turn.

Civilian Alternative for Military-Related Resources. In a broad policy sense, it is not at all difficult to identify economically and socially productive alternatives for the employment of resources now devoted to unproductive military use. One need only consider those vital social services and important areas of the economic infrastructure that are either presently in an advanced state of decline or clearly undergoing serious progressive retrenchment. Urban mass transit, housing, intercity rail transportation, police and fire services, mental and physical health care, standard education and vocational training, special education, care for the elderly, day care, etc. all would benefit enormously from a transfusion of resources from military programs, and that would clearly produce a major increase in the nation's economic and social welfare.

It is possible to get a very rough but concrete idea of the kinds of tradeoffs which exist between military and civilian programs by comparing the funding requirements for a series of specific alternatives.³⁵ A list of a dozen such tradeoffs is presented below:³⁶

- (1) Impounded federal housing funds, 1972 = \$130 million =
8 F-14 aircraft
- (2) Vetoed EPA plan to de-pollute the Great Lakes = \$141 million
= 1 B-1 bomber plus 1 DD963 destroyer
- (3) National solid waste treatment program = \$43.5 billion = B-1
bomber program
- (4) Unfunded program to upgrade rural American life = \$300 million

- = 5 C5A aircraft
- (5) Child nutrition programs funding cut = \$69 million = 2 DE-1052 destroyer escorts
 - (6) To bring all Americans above the poverty line, 1971 = \$11.4 billion = B-1 bomber program, low estimate
 - (7) To eliminate hunger in America = \$4-5 billion = C5A aircraft program
 - (8) Philadelphia 1971 schools deficit = \$40 million = 2 F-14 aircraft plus 2 Main Battle Tanks
 - (9) Graduate fellowships funding cut, 1973 = \$175 million = 1 nuclear attack submarine
 - (10) 1973 cities' needs to rebuild blighted areas = \$3 billion = 1 nuclear aircraft carrier, equipped, and escorts.
 - (11) 1972-73 cut in federal mental health budgets = \$65 million = 1 C5A aircraft plus 5 Huey helicopters
 - (12) Construction of a 584 bed general hospital in San Francisco = \$41 million = 1 B-1 bomber

Besides such directly socially conscious alternatives, general re-direction of resources into the production of "standard of living" goods and services, from machine tools to bubble gum, would revitalize the civilian economy. This revitalization would play a major role in creating the conditions under which the goal of full employment without significant inflation becomes economically achievable. And major gains in social welfare would clearly follow this kind of economic re-development.

But while broad prescriptions are important from the viewpoint of policy and perspective, an effective conversion process requires the detailed specification of particular alternatives for each facility, and each area undergoing this transformation. Let us assume that we are focusing on the development of specific civilian alternatives for a particular industrial facility or military base complex. What do we do?

The first step is to analyze the nature and quantity of all the productive resources involved in the transformation: the types and numbers of machines and their capabilities, the sorts of buildings (including their layout), the skill and experience mix of the labor force, and the characteristics of the site, including its size, terrain and location. The second step is lay out a list of alternatives whose requirements for productive resources most closely correspond with what is currently available, as indicated by the resource analysis of the first step. Seeking alternatives which best match the capabilities of the present mix of resources minimizes dislocation and disruption by reducing the need for labor force hiring, firing, and retraining, and new equipment purchases. This tends to minimize the social cost of transition, as well as its direct financial cost.

Furthermore, playing to the strengths of existing capabilities also increases the probability of success in the new activities. To some extent, the initial resource analysis will in itself, suggest at least broad classes of feasible alternatives. For example, a manufacturing firm which owns considerable metalworking equipment and employs a fair amount of machinists would be more likely to convert successfully to the manufacture of metal office furniture or railroad cars than to the production of detergents or cosmetics.

We should not conceive of this list of alternatives in purely industrial terms. Public and private nonmanufacturing projects, in areas such as pollution control, education, transportation, etc. are also major alternative productive uses of resources. For example, it may well be that the prime civilian-oriented use for a particular naval facility may be as a major sewage treatment complex, medical center, or new university campus, rather than as an industrial park. It would be a serious mistake to think too narrowly at this critical stage of developing alternatives.

Finally, the "success potential" of each of the alternatives should be evaluated. In the case of conversion of industrial facilities to civilian production this primarily involves a study of what is called the "marketability" of the product, which involves an analysis of the demand for the product at the ranges of price that would permit a sufficient margin of profit (after covering costs) to make this product line attractive to the producer. In the case of public or non-profit projects, the evaluation should involve an analysis of the social need for such a project in that region, as well as its estimated cost. In either case, the accuracy and realism of estimates of both one-time conversion costs and subsequent continuing post-conversion production costs play a critical role in determining the feasibility and attractiveness of any proposed alternative.

To the extent that there is less than a perfect match between the labor requirements of even the best civilian alternatives for a given military enterprise and its pre-conversion labor force, there may be a need to channel some of the labor force into productive civilian activities wholly outside of that particular enterprise. For example, it is extremely unlikely that all, or even most, of the engineers and scientists currently employed by military industries would be required for any reasonable civilian alternative activities to which these industries would turn. This is no particular problem, in the sense that there are many civilian activities outside these particular converted industries in which the services of such personnel would be of great value.³⁷ We need to think in terms of sufficient alternatives to productively re-employ all of the resources (particularly labor) released from military activity, and not simply sufficient alternatives to convert present military bases and military-industrial firms into civilian facilities.

Preparing Resources for Conversion. Conversion of the labor resource requires different amounts and kinds of retraining and re-orientation depending on the original function of that resource in the military-related activity. Personnel employed in the development of technology, i.e. engineers and scientists, will as has been argued, generally require despecialization training in their fields, along with re-orientation to the cost implications of their work. The specific course work required, however, will differ somewhat depending upon the particular new civilian direction in which any given individual will be heading. For example, mechanical engineers who will become involved in the development of urban mass transit systems should not follow exactly the same program as those who will be designing home appliances. Therefore, in order to avoid one of the most common fatal flaws in well-intentioned occupational training programs -- training people into areas in which insufficient employment opportunities exist -- it is necessary for planning purposes to know what civilian employment opportunities are available. This is one of the reasons why the analysis of civilian alternatives discussed just previously is a key prerequisite for successful conversion.

It is important to understand that for any given individual a specific program, built around his or her past experience and training, and tailored for entry into the area that he or she prefers (given the available opportunities), can be developed by direct personal consultation with an educational advisor. What is needed for general conversion planning purposes is a clear idea of how many people from each field and level of education will be involved, and which broad areas of opportunity will exist for absorbing them into productive civilian activity. In this way, sufficiently accurate estimates may be made of the time, funding, and personnel requirements of this conversion retraining to permit an effective, intelligently designed re-education program to be developed.

The educational component of the conversion process for management decision makers will on the whole be somewhat simpler because it can be considerably more general. Within limits, the kind of re-orientation to cost minimization and civilian type marketing, sales, etc. functions they require will be valuable to them regardless of what civilian activity they subsequently manage. At least insofar as formal training requirements are concerned, there is a greater similarity between effectively managing a paper manufacturer or computer company, than between effectively designing appliances or rail systems.

Existing business schools will probably prove competent to accomplish the kind of management re-orientation required. Existing engineering schools, however, will themselves require some redirection before they can effectively accomplish the required re-education of technologists. Though it might involve some trauma, there is every reason to be confident that these institutions can make the necessary

changes without excessive delay.

Individuals in production and lower level administrative functions can most probably be given the kind of re-orientation to civilian standards of performance they might require in an on-the-job situation. Formal occupational retraining will be needed only to the extent that the best civilian alternatives available to them in the economy at the point of conversion require somewhat different skills from those which they currently possess. It is undoubtedly a good idea, to provide some vocational retraining programs for such individuals, but it is unlikely that these will need to be anywhere near as intensive or extensive as the programs for engineers, scientists and managers. Even so, clear knowledge of the civilian alternatives available is once again critical to the economic and social effectiveness of retraining.

Preparing capital equipment and facilities for conversion is primarily a matter of assessing in detail what changes in layout, direct equipment and facilities, and supporting equipment and facilities are implied by the chosen civilian alternative. Given such an assessment, it should not be difficult to estimate both financing requirements and the time needed from start to finish for the actual physical conversion. This will in turn enable development of a financial plan, as well as effective coordination of this phase of the resource conversion process with the others.

Transition Support Services. Workers undergoing occupational transition, whether or not it is part of a process of conversion from military to civilian economy, must find ways of connecting with new job opportunities, getting whatever retraining is necessary, financing a move when relocation is required, and keeping body and soul together during the period between jobs. The burden of meeting all these needs can be greatly eased by the availability of appropriate social services.

Not all of the workers involved in the conversion process will be changing employers, and those who will not do not have to worry about locating new job opportunities or maintaining their income. They may or may not require retraining, and probably will not require relocation, but even when retraining or relocation is necessary it should be possible to finance them at least partially through employers, though perhaps with some public supplementation.

Those individuals who must change employers will generally have much greater need for social services. Besides direct income maintenance assistance, they will likely require temporary public replacement of some employment fringe benefits -- in particular group medical and dental insurance plans. An effective public program of employment

services will be critical in making them aware of the nature and location of the new employment opportunities which best match their skills. Along with counseling services, this will be of vital importance in enabling them to plan whatever specific retraining they may need. In addition, the employment service will facilitate the process of direct placement of dislocated employees into new jobs. To make the transition even smoother, the government could provide special tax or other incentives for employers to sign conditional employment contracts with potential employees during this period that in effect guaranteed the prospective employees a job with that organization upon successful completion of a mutually agreed upon program of retraining. In this way, individuals requiring retraining that could be expected to stretch over a period of from six months to a year would have some assurance that undertaking training into a particular area of civilian expertise would provide them with attractive re-employment. Aside from any direct government benefits, private enterprises (whether businesses or private nonprofit institutions) would gain from the increased certainty in planning such agreements would imply.

Operating the entire conversion process along the lines suggested will tend to minimize the amount of geographic relocation required. This is important because moves over extended distances tend to be very disruptive of family and friendship ties. While people develop social roots after living in an area for a prolonged period, their ability to re-establish roots in a new area should not be underestimated. This is particularly true of young people, who often actively seek a new area in which to live and grow. In fact, the general population of the United States is normally highly geographically mobile. For example, in 1970 more than 40% of the U.S. population lived in a different house than that in which they lived in 1965, and nearly 45% of this group had moved to a different county or a different nation.³⁸

At any rate, the high degree of geographic concentration of military-related facilities virtually guarantees that some relocation will be required for some individuals. This is particularly true for engineers and scientists since they are concentrated within pockets of defense industry much more highly than they would be likely to be in any civilian-oriented industry. But, the engineers and scientists who work in military industry have already developed a pattern of extraordinarily high geographic mobility as a result of their occupational need to follow the shifting defense contracts. So the prospect of one more move, coupled with the enhanced likelihood of future geographic stability, should not be, for them, an overly difficult thing with which to cope.

Expenses incurred in relocation for the purpose of re-employment in a new area are already tax deductible as a matter of course. Supplemental government relocation allowances for one time, conversion-

connected single moves, along with aid in locating new housing, should go far in further easing the difficulties of relocating for those who must do so.

It is extremely important to the successful revitalization of the U.S. economy and society that the conversion process have a defined end. In order to avoid establishing new kinds of unhealthy dependencies, any effective conversion process must be designed to put itself out of business. The permanent existence of a very small version of the machinery for easing economic transitions may be of real value in a dynamic economy, but great care must be taken to avoid giving birth to large, new, self-perpetuating conversion bureaucracies.

Developing a Consensus for Conversion

As long as this nation remains a democracy, no process of economic conversion requiring the broad intervention of government can hope to be successful without the development of a political consensus to support it. This was true for the conversion to a military-oriented economy, and it is just as true for the conversion back to a civilian economy. The present consensus supporting the continuation of high levels of military expenditure derives primarily from two widely held beliefs, one economic and one military: (1) Military expenditure is economically necessary and beneficial; (2) Expansion in the quantity and quality of weapons systems and other components of national military forces increases national security. Both of these beliefs are wrong, in the most straightforward sense of the word -- they are simply at variance with the facts. It is for this reason that I believe the education of the general U.S. population to the objective economic and military realities of the present world is a critical pre-condition to the development of broad-scope support for the process of economic conversion discussed here.

Attention has been focused in the present paper on the economic side of the issue. It has been argued that the actual economic effects of sustained high military expenditure are highly destructive, and that these effects go far in explaining the unprecedented simultaneous high inflation/high unemployment which has become a fact of life in the U.S. With respect to weapons of mass destruction, the expansion of military systems reduces the security of the nations engaged in building up their forces, because they become increasingly endangered by their own weapons.³⁹ There is a great need for further exploration of both these areas of research, and perhaps even more critically for the popularization of the arguments and evidence developed by such work.

There is neither any need nor any value in conducting the educational process required for the development of a conversion consensus in a propagandistic fashion. I believe the clear presentation of the

objective facts, the logical linkages between them and their implications is more than sufficient to break the power of the illusions that have so long supported the continuation of high military expenditure.

In order for this educational process to have the maximum chance for success, it should not be completely confined to the presentation of scholarly treatises and the writing of journal articles. It must stimulate debate not only at conferences of academicians, but also at political gatherings, in school classrooms, union meetings, mass media programs, etc. Such grass roots debate is in the best traditions of U.S. democracy, and should at the very least raise the awareness of the public with respect to these critical issues.

It should be pointed out that the development of plans for the conversion of military-oriented resources to civilian activities is of considerable value even in the absence of a curtailment of military spending. Since military contracts periodically shift from one place to another, it would clearly be in the best interests of the workers in defense industry to have detailed plans for turning to the production of civilian-oriented goods and services when military contracts are terminated or lost by their firm. In this way, they could avoid being laid off until the defense contracts return. The availability of such ready plans is also an advantage to society in general because it permits some productive purpose to be served by these workers between defense contracts, and avoids the need to pay them unemployment compensation. Thus, it would make sense for unions to support at least conversion planning, even if they were not initially willing to support full-scale economic conversion.

As a rough estimate, the entire economic conversion process can be expected to take from two to four years. It will involve a great deal of detailed planning (mostly on a local basis) and careful implementation, at the cost of a considerable investment of time and effort. However, the economic and social benefits which will accrue as a result of this investment are truly enormous. The smooth and efficient transition to a civilian-oriented economy can be accomplished, but it requires nothing less than a national commitment to insure its rapid and successful completion.

Footnotes

1. Full employment is defined in this way rather than as corresponding to 0% unemployment in order to allow for various forms of "frictional unemployment", including the temporary unemployment of those in transition between jobs. These are felt to be inevitable in a dynamic economy, and different in kind from the unemployment represented by increases in the unemployment rate beyond this base.

2. Their analysis was rather casual, and their estimates were characterized by the economists themselves as rough approximations. See Paul A. Samuelson and Robert M. Solow, "Analytical Aspects of Anti-Inflation Policy", American Economic Review (May 1960), p. 192.

3. Lawrence R. Klein and Ronald C. Bodkin, "Empirical Aspects of the Trade-Offs Among Three Goals: High Level Employment, Price Stability, and Economic Growth", Inflation, Growth and Employment, A Series of Research Studies Prepared for the Commission on Money and Credit, Prentice Hall, 1964, p. 393.

4. Bureau of Economic Analysis, U.S. Department of Commerce, Survey of Current Business (March 1976), pp. S-8 and S-13.

5. Adam Smith, The Wealth of Nations, Modern Library (1937), pp. 315 and 325-6. Smith was not writing solely of the military, but also included the king and his court, and the "ecclesiastical establishment", among others, in his category of unproductive labor.

6. The line of economic analysis presented here is based on that which has been developed, in considerably greater detail, by Seymour Melman in his powerful and insightful book, The Permanent War Economy: American Capitalism in Decline (New York: Simon and Schuster, 1974). Pieces of this analysis were presented in some of Melman's earlier books including Our Depleted Society (New York: Holt, Rinehart and Winston, 1965) and Pentagon Capitalism (New York: McGraw-Hill, 1970)

7. Bureau of Economic Analysis, U.S. Department of Commerce, Business Statistics (1973), p. 69.

8. Ibid, p. 40.

9. For example, the Air Force's C5A transport plane, which experienced a \$2 billion cost overrun (i.e. excess of actual cost over original cost estimates) was produced under a firm "fixed price" contract. Payment was simply adjusted upward to cover the overrun. Thus the "fixed price" was fixed in name only. For a fascinating and detailed account of the operation of military procurement procedures in the case of the C5A and several other major weapons systems, written by a former Air Force Deputy for Management Systems in the Pentagon, see A. Ernest Fitzgerald, The High Priests of Waste (New York: W.W. Norton, 1972).

10. For a straightforward theoretical comparison of the effects of sales maximization and profit maximization on production costs under various contractual payment formulas, see Lloyd J. Dumas, "Payment Functions and the Productive Efficiency of Military-Industrial Firms", Journal of Economic Issues (June 1976).

11. Footnote 11 appears at end of list.

12. U.S. Senate, Committee on Labor and Public Welfare, Subcommittee on Employment and Manpower, Hearings: Nation's Manpower Revolution, Part 9 (Washington, U.S. Government Printing Office, 1964), p. 3146

13. Bureau of Economic Analysis, U.S. Department of Commerce, Survey of Current Business (June 1975), p. 30.

14. Interestingly enough, at least two of the developments most commonly cited as major examples of beneficial civilian fallout from military-related technology programs -- Pyroceram (made by Corning Glass Works), a material used first for missile nose cones and later for cookware, and medical telemetry devices -- were in fact products of long civilian technological development programs which spilled over into military applications. (See Edwin Diamond, The Rise and Fall of the Space Age (Garden City, New York: Doubleday, 1964), pp. 64-65.).

It is curious, however, that none of the advocates of the spillover benefits of military technology ever seem willing to accept the argument, which follows directly from the same logic, that if the transfer of technology between these two sectors is so high, we could just as well concentrate our resources on civilian technological development and let military technological advance proceed as a result of spillover.

15. "The Breakdown of U.S. Innovation". Business Week (February 16, 1976), p. 56.

16. Victor K. McElheny, "U.S. Science Lead Is Found Eroding", New York Times (March 14, 1976).

17. "Making U.S. Technology More Competitive", Business Week (January 15, 1972).

18. In an industry in which firms were making substantial profits, the cost increases could be absorbed for a time by the firm by its acceptance of lowered profits, though this could not be done indefinitely. However, firms which are earning substantial profits normally do so as a result of their possessing some degree of control over their markets, and to the extent that they have such market power they will be able to enforce a pass-along of costs in the form of increased prices. Firms under severe competition, on the other hand, will tend not to have a substantial enough profit margin to absorb higher costs, and so will be compelled to pass them along as higher prices. Thus in any case, over the long term higher costs lead to higher prices.

19. New York Times, July 25, 1971.

20. Seymour Melman, The Permanent War Economy (New York: Simon and Shuster, 1974), pp. 99-101.

21. To be completely protected, the dollar value of all assets owned by that person (e.g. stocks, bonds, savings accounts) would also have to be rising at least as fast as the rate of price inflation.

22. A rough estimate for the year 1967 was that the complete termination of all defense work would have released scientists and engineers with an aggregate total of nearly 8,000,000 person-years of education (see Lloyd J. Dumas, op. cit. 1970, p. 313).

23. I would argue that, at least as it applies to nuclear weapons and other weapons of mass destruction, many of these performance improvements not only have no direct military significance, but actually introduce complexity which renders weapons systems less reliable, thus reducing national security. It is rather like designing a device which slightly reduces the sound produced by the detonation of a dynamite stick, at the expense of making it more likely to accidentally explode in one's face.

24. See, for example, Davis B. Bobrow, "Military Research and Development: Implications for the Civil Sector", Annals of the American Academy of Political and Social Science (March 1973), pp. 120-121.

25. New York Times, July 27, 1972.

26. In fact, most foreign sales of arms are apparently funneled directly through the Defense Department, which buys the weapons from U.S. manufacturers and resells them to the foreign governments involved. (See Michael C. Jensen, "U.S. Arms Sales Are Complex", New York Times, April 15, 1975).

27. John W. Finney, "C5A Jet Repairs to Cost 1.5 Billion", New York Times, December 5, 1975.

28. Seymour Melman, op. cit., p. 47.

29. John W. Finney, op. cit.

30. Seymour Melman, op. cit., p. 85.

31. "BART in Transit", Newsweek, January 12, 1976.

32. Ibid.

33. New York Post, December 15, 1971.

34. Interagency Economic Adjustment Committee, Second Annual Report to the President on Federal Assistance to Defense-impacted Communities, (Washington: April 29, 1972).

35. It is only a rough idea because it focuses on money rather than resources.

36. Adapted from Seymour Melman, The Permanent War Economy (New York: Simon and Shuster, 1974), pp. 200-202.

37. In 1968, I roughly estimated that more than 95% of the engineers and scientists who would have been released from their place of employment even in the event of a total elimination of military activity could have been re-employed productively in areas such as urban renewal, teaching and transportation. (Lloyd J. Dumas, op. cit., 1970, pp. 313-320.)

38. Bureau of the Census, Statistical Abstract of the United States, 1975 (Washington: U.S. Department of Commerce, 1975), p. 37.

39. Lloyd J. Dumas, "National Insecurity in the Nuclear Age", Bulletin of the Atomic Scientists, (May 1976).

11. For a straightforward theoretical comparison of the effects of sales maximization and profit maximization on production costs under various contractual payment formulas, see Lloyd J. Dumas, "Payment Functions and the Productive Efficiency of Military-Industrial Firms", Journal of Economic Issues (June 1976).