The Effect of U.S. Defense Cuts on the Standard of Living

By C. Alan Garner

Before the Iraqi invasion of Kuwait, large cuts in U.S defense spending seemed nearly inevitable. The opportunity for such cuts arose primarily from political changes in Eastern Europe, which were widely viewed as reducing the military threat to the United States and Western Europe. As a result, large defense cuts were included in the budget agreement for fiscal year 1991, and additional cuts were expected in the years ahead.

Recent events in the Persian Gulf and the Soviet Union cast doubt on whether large defense cuts are imminent. The U.S. military response to the Iraqi invasion is substantially increasing military outlays in the short run. And political turmoil in the Soviet Union is reducing Western feelings of euphoria over the prospects for political and economic reform in Eastern Europe.

Nevertheless, a large decline in U.S. defense spending is still possible over the next several years. Much of the current increase in defense outlays is probably temporary. Many experts feel that only part of the military ordnance used up in the Persian Gulf will be replaced after the current conflict is resolved (Murray). And despite uncertainty about political developments in the Soviet Union, the reunification of Germany and the fall of Communist governments in other East European nations have diminished the threat to Western Europe.[1] Consequently, the trend in defense spending may remain downward.

Because large defense cuts are still possible over the next several years, the economic consequences of reduced defense spending should be evaluated carefully. Newspaper and television reports have emphasized the short-run negative effects of defense cuts—for example, layoffs caused by base closings and reduced weapons purchases. Such a view is shortsighted. These negatives could be outweighed

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by less visible long-run improvements in the standard of living.

This article argues that defense cuts would raise the U.S. living standard in the long run. Postwar U.S. history shows the economy can adjust successfully to a large decline in defense spending. Indeed, defense cuts would raise the living standard in the long run by encouraging more capital formation. Defense cuts would probably also raise the living standard by increasing productivity growth in the private sector.

Postwar Changes in Defense Spending: Short-Run Effects

Recent discussion of defense spending has focused on the short-run negative effects of defense cuts on employment and household income. Some areas with a high concentration of defense industries may experience severe economic dislocations.[2] However, the national economy has shown a remarkable ability to absorb large defense cuts without severe short-run declines in the living standard. This resilience can be demonstrated by reviewing changes in military spending and the living standard since 1950.

Defining the living standard

The living standard is defined in this article as the average level of goods and services a nation can provide its citizens. A common measure of the living standard is real, or inflation-adjusted, gross national product (GNP) per person.[3] About two-thirds of GNP is consumer purchases of goods and services. Consumer purchases of nondurable goods and services are used entirely within the current period to meet household wants. Consumer purchases of durable goods, such as a car or refrigerator, may meet household wants for years after the initial purchase.

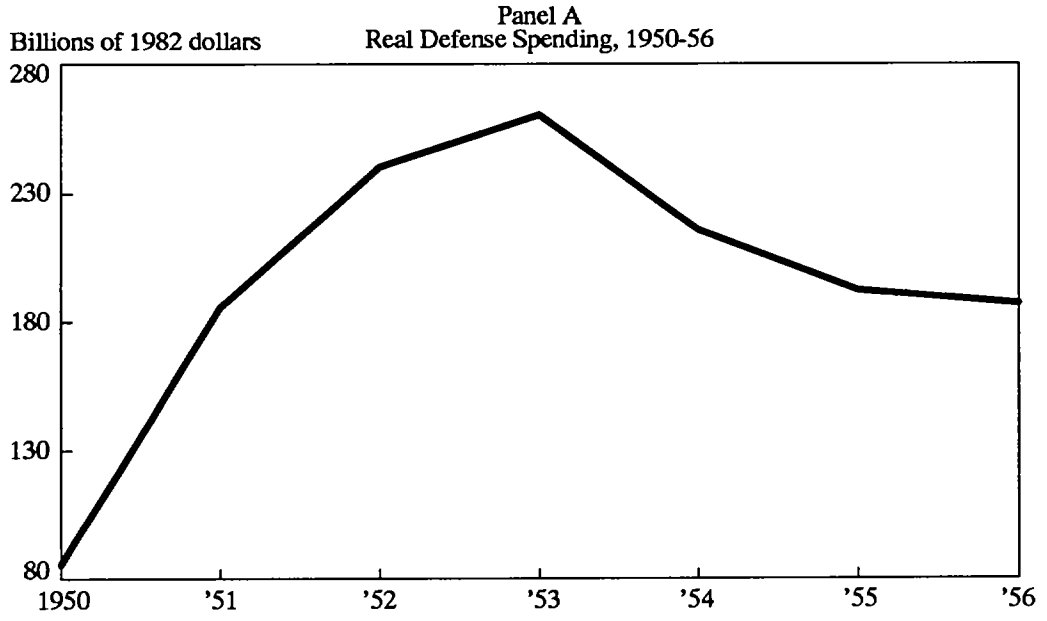
The other components of GNP also affect the living standard because each component affects current or future consumption. In addition to consumer spending, real GNP includes investment spending, government spending, and net purchases of foreign goods and services. Such goods and services help meet household wants in either the present or the future even though households do not buy them directly. For example, government spending to house the poor adds to the living standard in the same way as consumer spending on housing. Business purchases of plant and equipment raise the nation's future ability to consume by increasing productive capacity. And imports can be consumed directly or invested for future consumption, while exports provide the means for purchasing imports.

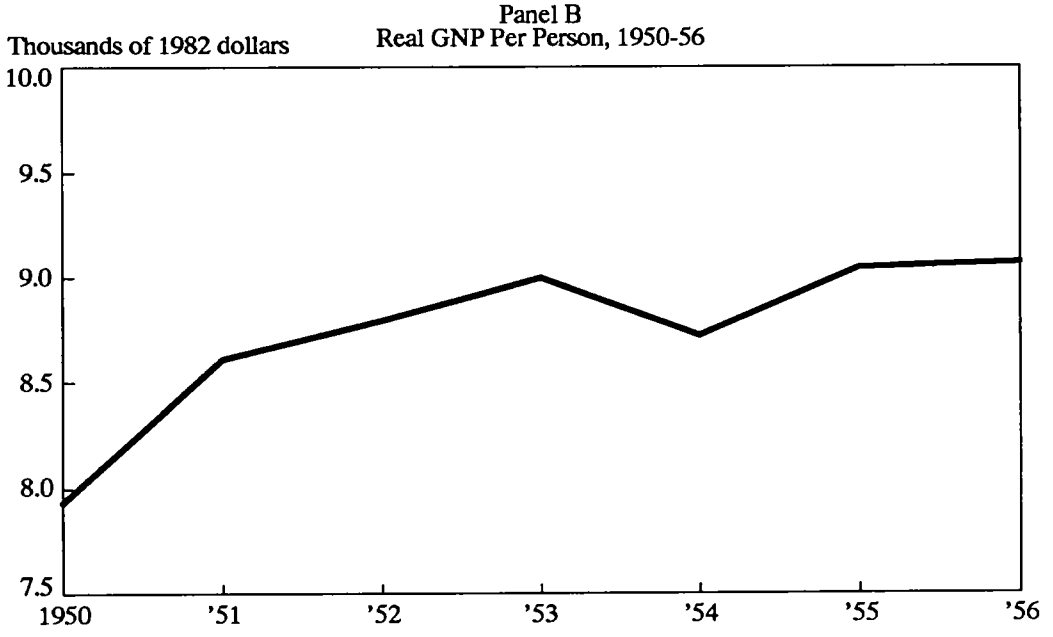
The postwar record

The U.S. economy has successfully adjusted to two large military demobilizations since 1950.[4] The first, following the Korean War, hurt the living standard temporarily but did not have severe effects (Chart 1). After rising sharply at the beginning of the war, real defense spending fell about $73 billion—measured in 1982 dollars—from 1953 to 1956. This sudden demobilization probably caused the recession in 1953-54. As a result, real GNP per person declined $275—about 3.1 percent—from 1953 to 1954. Real GNP per person increased in 1955 and 1956, though, quickly surpassing its highest previous value. Thus, defense cuts after the Korean War did not seriously harm the living standard.

A second large demobilization at the end of the Vietnam War also had no severe effects on the living standard. Real defense spending decreased steadily after the United States began to withdraw from Southeast Asia, falling about $90 billion from 1968 to 1975 (Chart 2). Partly for this reason, the economy underwent

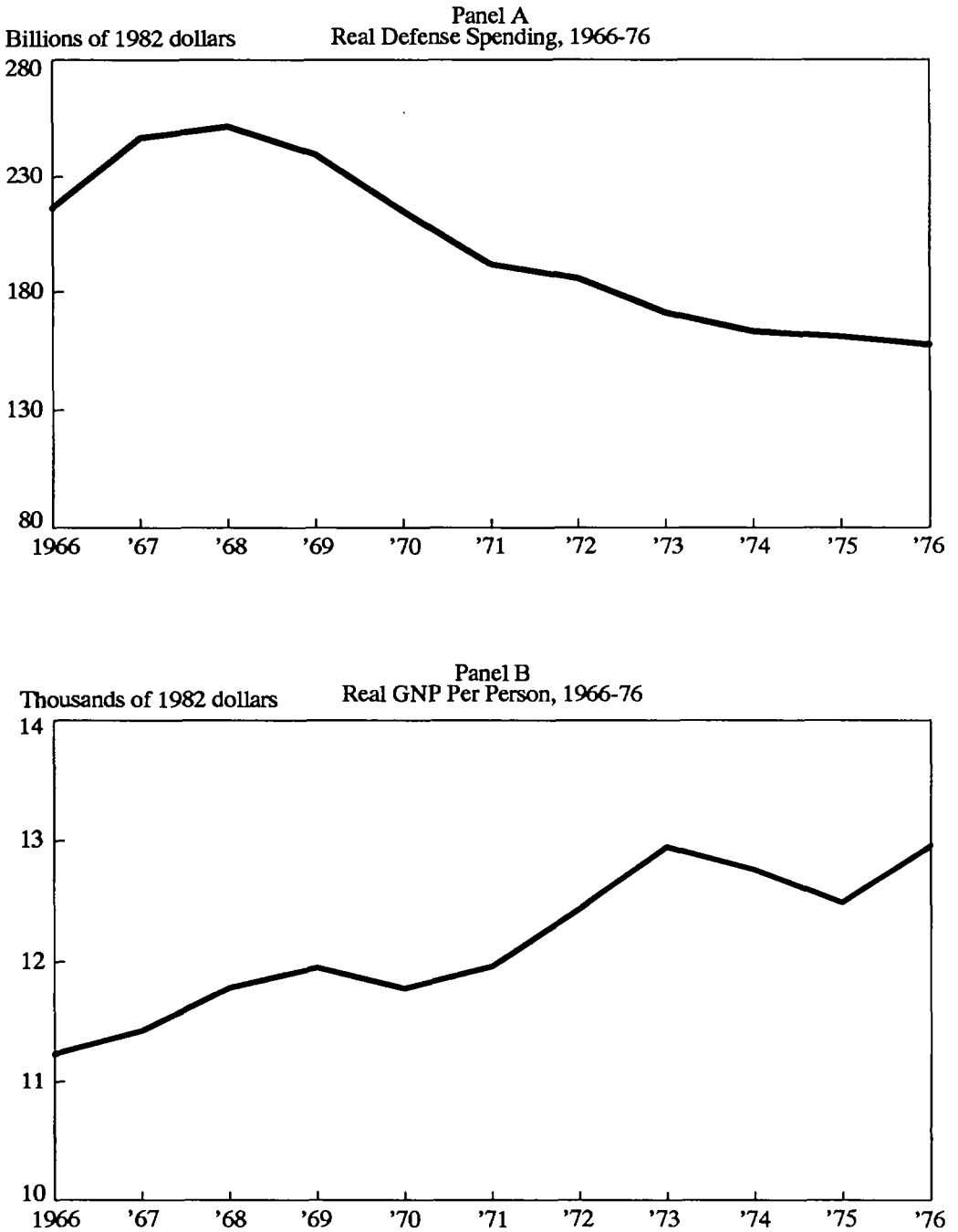
Chart 1
The Korean War Demobilization





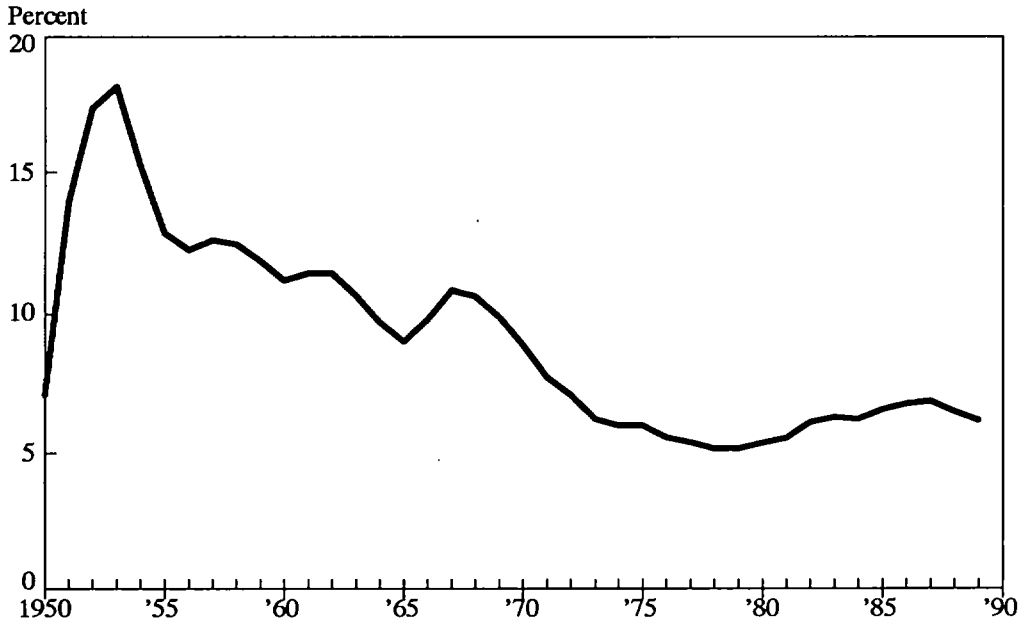
Source: Bureau of Economic Analysis, U.S. Department of Commerce.

Chart 2
The Vietnam War Demobilization



Source: Bureau of Economic Analysis, U.S. Department of Commerce.

Chart 3
Defense as a Share of Real GNP



Source: Bureau of Economic Analysis, U.S. Department of Commerce.

recessions in 1969-70 and 1973-75. However, higher oil prices and tight credit conditions were probably more important than defense cuts in causing these contractions. Moreover, real GNP per person increased nearly $700—about 5.9 percent—from 1968 to 1975 and also grew steadily in the late 1970s. Consequently, large defense cuts at the end of the Vietnam War did not prevent gradual improvement in the living standard.

The prospective defense cuts of the 1990s should hurt the living standard even less than the demobilizations following the Korean and Vietnam wars. Defense spending currently is a smaller proportion of economic activity than when the previous two demobilizations began. Real defense spending increased substantially during the Reagan Administration, rising from $171 billion in 1980 to $265 billion in 1987. Yet even at the peak of the Reagan buildup, defense spending was only 7 percent of GNP, well below the 18 percent share reached during the Korean conflict and the 11 percent share during the Vietnam War (Chart 3). Moreover, defense spending declined slightly after 1987, falling to about 6 percent of real GNP in 1989.

The defense cuts of the 1990s are also likely to be gradual. As a result, some defense firms may be able to lessen the effects of reduced military procurement on their revenues by diversifying into the production of civilian goods and services. In addition, the gradualness of the cuts may give some defense workers who expect to lose their jobs more time to look for

employment in expanding civilian industries. Although defense spending cuts in the 1990s might cause dislocations in some areas and slow overall business activity temporarily, such cuts are unlikely to have severe short-run negative effects on the living standard.

Long-Run Effects on Private Capital Formation

Any short-run negative effects from large defense cuts must be weighed against the positive long-run effects on the standard of living. In the long run, the economy operates at full capacity because wages, prices, and interest rates adjust to correct economic imbalances. The living standard improves in the long run if capacity growth permits the economy to produce higher real GNP per person. Such long-run improvements in capacity come from two main sources: increases in the private capital stock and increases in total factor productivity.

The private capital stock includes all structures and equipment used by workers to produce real output. Capital formation occurs when business investment in new structures and equipment exceeds the depreciation of the existing capital stock. The resulting increase in the private capital stock raises labor productivity, or output per hour worked, because workers have more capital with which to perform their tasks.

Total factor productivity differs from labor productivity, being the amount of output produced by a fixed combination of capital and labor. Measures of total factor productivity hold the amount of capital per worker constant in order to focus on other sources of productive efficiency. Total factor productivity grows because of improvements in the public infrastructure, education, and technology. This section assumes total factor productivity growth is constant and analyzes the long-run effects of defense cuts on private capital formation. The following section will consider whether defense cuts are likely to change total factor productivity.[5]

The long-run effects of reduced defense spending on capital formation, and hence the living standard, depend on how fiscal policymakers use the "peace dividend," the budgetary savings from defense cuts. Fiscal policymakers have three alternatives: increase nondefense spending, cut taxes, or reduce the budget deficit by leaving nondefense spending and taxes unchanged.

Effects of higher nondefense spending

Faced with a growing demand for government services, fiscal policymakers might use the peace dividend to expand government purchases of civilian goods and services. Private capital formation would be little affected by a shift from defense spending to nondefense government spending. Although firms producing goods and services for the defense sector would probably invest less, firms producing for the nondefense government sector would invest more to expand their output. Such changes in investment spending would tend to offset each other, making the overall change in investment spending relatively small.[6] Moreover, firms producing goods and services for consumers would have little reason to change their investment spending because any change in consumption would be temporary. In the long run, the economy would operate at full capacity, restoring household income and consumption to previous levels.[7]

Effects of a matching tax cut

An alternative for fiscal policymakers would be to use the peace dividend to reduce taxes. A decrease in taxes would increase private capital formation and cause the future living standard to rise.

Fiscal policymakers might decide to reduce

taxes without changing tax rates. For example, policymakers might enact a tax credit by reducing each household's tax bill $50 regardless of household income. Households would then have more income left after taxes and be able to consume more. The labor and capital released by the defense industry could be employed to produce the additional consumer goods and services.[8] In addition, a small part of the additional after-tax income would be saved. The increased savings would make a larger fraction of current output available for capital formation, increasing future productive capacity and the living standard.[9] Real GNP per person would increase only slightly in the long run, however, because only a small part of the tax cut would be saved.[10]

Alternatively, policymakers could cut marginal tax rates—the rates paid on an additional dollar of income. Reductions in corporate and personal income tax rates are examples of cuts in marginal tax rates. Such a cut in marginal tax rates would have larger effects on private capital formation and the future living standard.

Lower corporate tax rates would stimulate private capital formation by increasing the after-tax returns to business investment in new plant and equipment. Higher business investment would gradually build the nation's productive capacity above its initial level, allowing higher real GNP per person.

Some economists believe lower personal income tax rates would also raise real GNP per person by increasing the incentives for households to save and work (Lindsey; Ture). Supply-side economists argue that lower personal tax rates would increase the after-tax return from personal investments, such as stocks and bonds, causing households to save more of their income. Higher saving would stimulate private capital formation and increase future productive capacity. Also, a higher after-tax wage rate would cause workers to work more hours and possibly increase their effort. According to supply-side economists, such increases in capital formation and the labor supply would raise the U.S. living standard.

It is not certain how greatly cuts in corporate and personal tax rates would increase private capital formation and the future living standard. A wide range of statistical evidence supports the view that cuts in business tax rates would stimulate investment in plant and equipment. Still, economists disagree about whether there would be sizable supply-side effects on future productive capacity. In particular, many economists are skeptical about supply-side effects on saving because large cuts of personal tax rates in the 1980s failed to raise the household saving rate. Moreover, the statistical evidence on how tax cuts affect the saving rate and the labor supply are inconclusive.[11]

Effects of deficit reduction

A third alternative for fiscal policymakers would be to use the peace dividend to reduce the federal budget deficit. By leaving taxes and nondefense spending unchanged, reduced defense spending would directly lower the budget deficit. Such a policy would raise the living standard in the long run by increasing private capital formation and enhancing the nation's ability to produce goods and services.[12]

A large federal deficit reduces future living standards by lowering national saving and raising real interest rates. National saving, which is private saving minus the federal deficit, measures the funds available for private capital formation. In the 1980s, the large federal deficit and low household saving rates reduced national saving. As a result, competition by borrowers for these scarce funds bid real interest rates—interest rates adjusted for expected inflation—to historically high levels. The high real interest rates encouraged foreign lending to U.S. firms and the federal government, helping to alleviate the domestic shortage of funds. Nevertheless,

the high real interest rates discouraged capital formation by domestic firms. Moreover, the U.S. foreign debt grew, raising future interest payments to foreigners.

If fiscal policymakers used the peace dividend to reduce the budget deficit, the decreased federal borrowing would improve the living standard by increasing the private capital stock. A decline in real interest rates would stimulate private capital formation. As a result, the nation's capacity to produce goods and services—and thus real GNP per worker—would be larger in the future.

Reducing the federal deficit would also raise the future living standard by decreasing U.S. dependence on foreign capital. With a lower budget deficit, a larger share of U.S. investment needs could be financed out of domestic saving. As a result, the nation would build up less foreign debt, lowering future interest payments. Consequently, the United States would have to export less future output to make its interest payments, leaving more goods and services for domestic consumption.

Recent empirical studies support the view that deficit reduction would improve the living standard in the long run. A midrange estimate by the Congressional Budget Office (1989) suggests that a 1.0 percent reduction in the budget deficit as a share of GNP would raise the living standard 3.5 percent by the middle of the next century. With the federal deficit averaging around 3.0 percent of GNP in the late 1980s, balancing the federal budget could raise the future living standard by over 10.0 percent.

Simulations with a macroeconomic model by Throop also show large government deficits reduce the future living standard. Throop finds deficit spending in 1981-88 imposed a burden of $390 billion on future generations in the form of a lower private capital stock and higher interest payments to foreigners. By implication, reducing the budget deficit from current levels would increase the future living standard by encouraging capital formation and decreasing foreign interest payments.[13]

In summary, the effect on private capital formation depends critically on how fiscal policymakers use the peace dividend—increasing nondefense government spending, decreasing taxes, or reducing the budget deficit. The first would do little to raise private capital formation, while the second and third would be much more effective.

Long-Run Effects on Productivity Growth

Reduced defense spending is also likely to raise the future living standard by increasing total factor productivity. This section discusses three major avenues by which total factor productivity could increase—public infrastructure, education, and technological progress. Defense cuts would affect public infrastructure and education only if fiscal policymakers used the peace dividend to increase nondefense government spending. Technological progress might increase under any of the three fiscal policy alternatives.

Public infrastructure and education

Although not part of the private capital stock, public infrastructure and education combine with capital and labor in producing real GNP. Thus, government spending on these items increases the amount of real output that can be produced with fixed amounts of capital and labor—that is, such government spending increases total factor productivity.

Infrastructure. Government spending on roads and highways provides a clear example of how infrastructure spending raises total factor productivity and improves the living standard. Better highways speed deliveries of raw materials and finished products. Faster and more reliable deliveries also encourage

manufacturers to adopt more efficient production techniques, such as just-in-time inventory management.[14] And better roads reduce congestion and travel delays.

Declining spending on U.S. infrastructure over the last 20 years has been associated with poor productivity growth. Government outlays for infrastructure projects fell from around 2.3 percent of GNP in the late 1960s to around 1.0 percent of GNP in the late 1980s. Meanwhile, improvements in total factor productivity have slowed dramatically. Private nonfarm business productivity fell from a 1.5 percent annual growth rate in the 1960s to only 0.3 percent in the 1970s and 0.8 percent in the 1980s.[15]

Economic research by Aschauer (1989, 1990) supports the view that government infrastructure spending benefits private sector productivity. Aschauer finds government spending on military capital goods, including both structures and equipment, has little effect on productivity growth. Yet government spending on such civilian infrastructure as roads, airports, water and sewage systems increases total factor productivity in the private sector. If fiscal policymakers were to shift government funds from defense spending to civilian infrastructure spending, total factor productivity and the U.S. living standard would be higher in the future.

Education. Higher government spending on education also raises the future living standard by increasing total factor productivity. More educated workers tend to be more productive. Such workers learn new tasks more quickly, reducing training costs and allowing the firm to respond more rapidly to new market opportunities. Educated workers can also perform more complex tasks and thus add greater value to the firm's revenues with given labor hours and given amounts of private capital.

Economists and business executives have expressed concern that inadequate education harms productivity growth and reduces U.S. international competitiveness. Many observers cite a prolonged decline over the last two decades in average scores on college entrance exams as evidence of poorer educational performance.[16] This apparent decline in educational quality was associated with sluggish productivity growth in the 1970s and 1980s.

Recent economic research supports the view that higher educational spending would increase future productivity and the living standard. Card and Krueger find that men educated in states with higher quality schools earned more throughout their working lives. Because economic theory implies more productive workers earn higher wages, these results suggest that men attending better schools really were more productive. Educational quality was measured by the pupil-teacher ratio, the length of the school term, and the average pay of teachers. Increasing school quality along any of these dimensions would likely require greater educational spending per pupil. Shifting government funds from defense spending to educational spending could be expected to raise productivity growth and future living standards.[17]

Technological progress

Living standards also improve over time because technological progress raises total factor productivity. The pace of technological progress might be slowed by cuts in defense research, which has dominated federal spending on research and development (R&D) in the postwar era.[18] However, large defense cuts also might increase the rate of technological progress by encouraging civilian R&D spending. Would an increase in civilian R&D spending offset—or more than offset—the effect of reduced defense R&D spending on the rate of technological change?

Two issues must be weighed in considering the effects of defense cuts on technological progress. First, is defense R&D or civilian

R&D more effective in improving civilian technology and, therefore, the living standard? Second, if civilian R&D is more effective, will defense cuts actually lead to greater civilian R&D spending?

Defense R&D versus civilian R&D. How well defense R&D stimulates total factor productivity growth depends on whether advances in defense technology can be adapted for civilian use. Advocates of defense R&D often argue defense-related research has produced technological breakthroughs with substantial benefits to civilian technology and the living standard. For example, military technologies, such as radar and jet aircraft, were commercialized and ultimately increased the living standard. Other technologies, such as semiconductors, were civilian inventions that received a boost from large military purchases early in the product life.

But while past defense research has produced some civilian benefits, the technological transfers from the military to the civilian economy are often overstated (Rosenberg; Weston and Gummett). Modern military hardware is highly specialized and has few applications to the civilian sector. For example, jet fighters are engineered for maximum performance with little consideration of maintenance costs or fuel economy. In contrast, commercial airlines are greatly concerned about such operating costs. Moreover, many technological advances attributed to defense spending probably would have occurred anyway. Semiconductors would almost certainly have been incorporated into civilian products without large military purchases. As a result, technological progress in civilian industries would probably not suffer greatly if defense R&D spending and defense procurement were reduced.

Moreover, economic research finds that government-funded R&D increases productivity growth less than privately sponsored R&D (Griliches; Lichtenberg). Government R&D may be less effective because government-funded research "crowds out" private R&D. Such crowding out might occur if higher federal R&D spending increases the salaries of technical personnel and drives up corporate research costs. Deutsch and Schopp found a 1.0 percent increase in the military share of R&D spending would slow U.S. productivity growth nearly 0.1 percent annually. Greater civilian R&D spending could potentially offset the effects of any reduction in defense R&D spending on the rate of technological change.

Effects of the peace dividend on civilian R&D. Will defense cuts actually lead to greater civilian R&D spending? Reduced defense spending would encourage civilian R&D spending in different ways depending on how fiscal policymakers use the peace dividend.

Fiscal policymakers might use the peace dividend to increase nondefense government spending rather than to cut taxes or reduce the budget deficit. Higher government spending on basic research—research devoted to advancing scientific knowledge—would probably be more effective than defense R&D in raising the future living standard. Basic research appears to be a more important determinant of productivity growth than other kinds of research (Griliches; Mansfield). Despite federal spending on such projects as interplanetary exploration and particle accelerators, federal R&D spending is primarily for applied research—research that develops products or manufacturing processes with existing scientific knowledge. Federal R&D is usually applied because defense research dominates federal R&D outlays and the military spends little on basic research. Greater federal spending on basic research at universities and firms, therefore, might offset any negative effects of reduced defense R&D even with no change in private R&D spending.

If policymakers decided instead to use the peace dividend to cut taxes or the budget deficit, privately sponsored R&D spending would

likely increase. Tax cuts or deficit reduction would encourage private R&D by lowering the after-tax cost of corporate capital. Corporate R&D is an investment similar to building a new factory. The company incurs expenses, such as the cost of a laboratory and the salaries of technical personnel, in the hope of obtaining an uncertain future return, such as profits from a new product. A lower after-tax cost of capital would encourage companies to invest in new research projects as well as new factories.

Tax cuts would encourage corporate R&D spending by increasing the expected after-tax return from research projects. Companies often choose investment projects by setting required after-tax rates of return based on the riskiness of the project. With lower corporate tax rates, more research projects would be undertaken because a smaller before-tax return would be needed to achieve the required after-tax return. The same objective could be achieved by providing more generous tax credits for civilian R&D spending or by cutting capital gains tax rates.

Deficit reduction would lower the after-tax cost of capital by reducing real interest rates. As discussed earlier in this article, many economists believe the federal deficit raised average real interest rates over the last decade and discouraged business investment, including corporate R&D spending. Reduced federal borrowing would allow interest rates to decline, encouraging companies to undertake new research projects.

A lower cost of capital also might increase productivity by encouraging companies to devote a larger share of their research budgets to long-term projects. Although the determinants of productivity growth are not completely understood, Mansfield found that industries doing more long-term research had faster productivity growth. The managements of U.S. companies are sometimes criticized for focusing on short-term results and ignoring promising technologies with long-term paybacks.[19] A high cost of capital encourages this behavior because firms incur high costs waiting for profits in the distant future. Cutting tax rates or reducing the federal deficit would lower the cost of capital, encouraging firms to invest more in long-term R&D projects.

Reduced government R&D spending would also encourage private research efforts by making technical personnel more readily available. High wages paid by defense companies to skilled scientists and engineers may increase the costs of company-sponsored R&D and discourage innovation in the private sector. Large defense cuts would reduce the overall demand for such personnel, decreasing the wage rates of scientists and engineers. However, lower wage rates would encourage companies to hire more technical personnel and increase their civilian R&D projects.

In summary, large defense cuts could raise the future living standard by increasing the rate of technological progress and thus total factor productivity in the years ahead. Any improvement in the rate of technological progress would depend on how fiscal policymakers used the peace dividend. An increase in nondefense spending would promote technological progress if the federal government increased funding for basic research. Tax cuts or deficit reduction also would raise productivity growth by lowering the cost of capital and encouraging private R&D expenditures.

Conclusion

Despite recent developments in the Persian Gulf and Eastern Europe, the United States may be able to reduce defense spending substantially over the next several years. Although many recent discussions of defense cuts have stressed the short-run negative effects, this article has shown such cuts actually create an opportunity to raise the U.S. living standard in the long run.

The future living standard depends primarily on the amount of private capital formation and the rate of improvement in total factor productivity. In deciding how to use the peace dividend, fiscal policymakers face three alternatives—higher nondefense spending, tax cuts, and deficit reduction. Although each alternative would raise the living standard in the long run, the alternatives would affect the future living standard in differing ways. An increase in nondefense government spending would have little effect on the private capital stock but would raise productivity growth through higher spending on infrastructure, education, and basic research. In contrast, tax cuts and deficit reduction would stimulate private capital formation by lowering the after-tax cost of capital. A lower cost of capital would also raise productivity growth by encouraging private spending on research and development. Fiscal policymakers should weigh these differing effects when deciding what to do with any future peace dividend.

Endnotes

[1] The reduced military threat from the Warsaw Pact countries and its implications for U.S. defense spending are discussed in Carpenter and Fiscarelli; Kaufmann; and Nunn. According to Kaufmann, about 54 percent of current defense spending serves primarily to deter an attack by the Warsaw Pact nations on Western Europe.

[2] This article focuses on the national economic effects of large defense cuts. Martin and Taylor discuss possible impacts on U.S. cities and states.

[3] Another common measure of the living standard is real consumer spending per person. Neither real GNP per person nor real consumer spending per person is a complete measure of economic welfare because neither takes account of the income distribution or environmental quality. For further discussion of these measures and a cross-country comparison of living standards, see Garner.

[4] A major military demobilization also occurred after World War II. Because the defense effort dominated economic activity to an unprecedented degree during the war, this demobilization does not provide a good basis for assessing the economic effects of the more gradual defense cuts likely in the 1990s.

[5] Some economists do not believe a large cut in defense spending could increase future growth of real GNP per person. As an example, see Wynne.

[6] Firms producing for the defense sector and firms producing for the nondefense government sector generally have similar inclinations to invest because such firms use capital and labor in similar proportions (Congressional Budget Office 1983). However, the changes in private capital formation might not be perfectly offsetting if the defense cuts were concentrated in industries using substantially more or less capital than the average defense industry.

[7] A shift in the government budget from defense to nondefense spending might have other effects on economic welfare that are not captured by the private capital stock. For example, higher nondefense spending might provide U.S. citizens with cleaner national parks, faster tax refunds, and more reliable economic statistics. If better nondefense services can be provided without reducing national security, economic welfare is clearly improved. However, private capital formation would be unchanged.

[8] Such sectoral shifts of demand could cause unemployment to increase temporarily. Lilien argues that sectoral demand shifts are responsible for a large part of cyclical changes in the unemployment rate. However, Abraham and Katz dispute this view. Regardless of which position is correct, a one-time shift of demand from defense goods to civilian goods would have only short-term effects on the unemployment rate. In the long run, capital and labor would move from the defense sector to civilian industries.

[9] In the standard Keynesian analysis, matching cuts in government spending and lump-sum taxes decrease aggregate spending because households save part of the tax cut. However, the economy eventually returns to the natural level of output because a decline in the price level increases real money balances and reduces the interest rate. This decline in the interest rate stimulates private investment and raises the future capital stock.

[10] An increase in transfer payments, such as Social Security payments and unemployment compensation, would have similar effects on private capital formation and the living standard. If fiscal policymakers used the peace dividend to increase transfer payments, household spendable income would rise. Although most of the additional transfer payments would be consumed in the current period, saving would also rise slightly. The higher level of saving would raise private capital formation and the future living standard.

[11] Gault reports that cuts in business tax rates increased business investment in simulations with the Data Resources, Inc. quarterly model of the U.S. economy. However, the increase in investment depends on which business tax is changed—for example, raising the investment tax credit has more impact on business investment than cutting corporate income tax rates. Bosworth summarizes a wide range of theoretical arguments and empirical evidence on how marginal tax rates affect personal saving and the labor supply.

[12] Some economists believe private capital formation is unaffected by how government spending is financed. In this view—called Ricardian equivalence—the future capital stock would be the same whether the government finances its spending by taxes or borrowing. This article assumes Ricardian equivalence does not hold. However, even Ricardians believe changes in the level of government spending caused by large defense cuts could have real economic effects. Barro develops a theoretical model in which Ricardian equivalence holds. Tobin criticizes this viewpoint.

[13] Simulations by the author with the Data Resources, Inc. quarterly model also showed deficit reduction would improve the living standard in the long run. Two simulations were conducted over the period from 1990 to 2015. Real defense spending grew at about the same rate as real GNP in the baseline simulation. But in the defense cuts simulation, real defense spending declined 20 percent between 1990 and 1995 before resuming moderate growth.

Real GNP per person was initially lower in the defense cuts simulation than in the baseline simulation. However, real GNP per person was slightly higher in the defense cuts simulation by 2005 and 3.3 percent higher by 2015.

[14] Just-in-time inventory management is the practice where firms schedule deliveries of parts or raw materials immediately before production takes place. This practice can improve business profitability because scarce company funds are not tied up in inventories and the facilities to store them. However, just-in-time inventory management requires timely delivery of parts and materials to avoid production delays. Better roads—and other improvements in the transportation infrastructure—make such deliveries faster and more dependable.

[15] The statistics on infrastructure investment are from Koretz. The statistics on total factor productivity growth were computed from data in Bureau of Labor Statistics, *Monthly Labor Review.* The growth rate of total factor productivity for the 1980s covers 1980-87. Productivity growth has been more favorable in the manufacturing sector where total factor productivity grew at a 3.3 percent rate in the 1980s.

[16] The verbal score on the Scholastic Aptitude Test (SAT) declined to 424 in 1990 from 463 in 1969. Likewise, the mathematics score fell to 476 in 1990 from 493. The SAT is the primary college entrance exam in 22 states and is taken each year by more than 1 million candidates for college admission (Cohen; Gordon).

[17] Bishop also presents evidence that declining educational quality was a cause of sluggish productivity growth in the late 1970s and the 1980s.

[18] Research by the Defense Department has typically accounted for more than half of total federal R&D spending since 1960 (Rosenberg). If defense-related spending by the Energy Department and the National Aeronautics and Space Administration is included, defense R&D has totally dominated the federal R&D budget. For example, defense-related projects accounted for 97 percent of federal R&D funds going to industrial concerns in 1982.

[19] In contrast, Japanese managers are said to be more willing to undertake long-term R&D projects. However, such differences between U.S. and Japanese managers may reflect lower capital costs for Japanese companies in the past. Because of their lower cost of capital, Japanese managements discounted expected profits in the distant future less heavily when evaluating long-term R&D projects (Hatsopoulos, Krugman, and Summers). This point may have less force now than in the 1970s and 1980s because recent increases in Japanese interest rates and decreases in U.S. rates have brought capital costs in the two countries closer together.

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