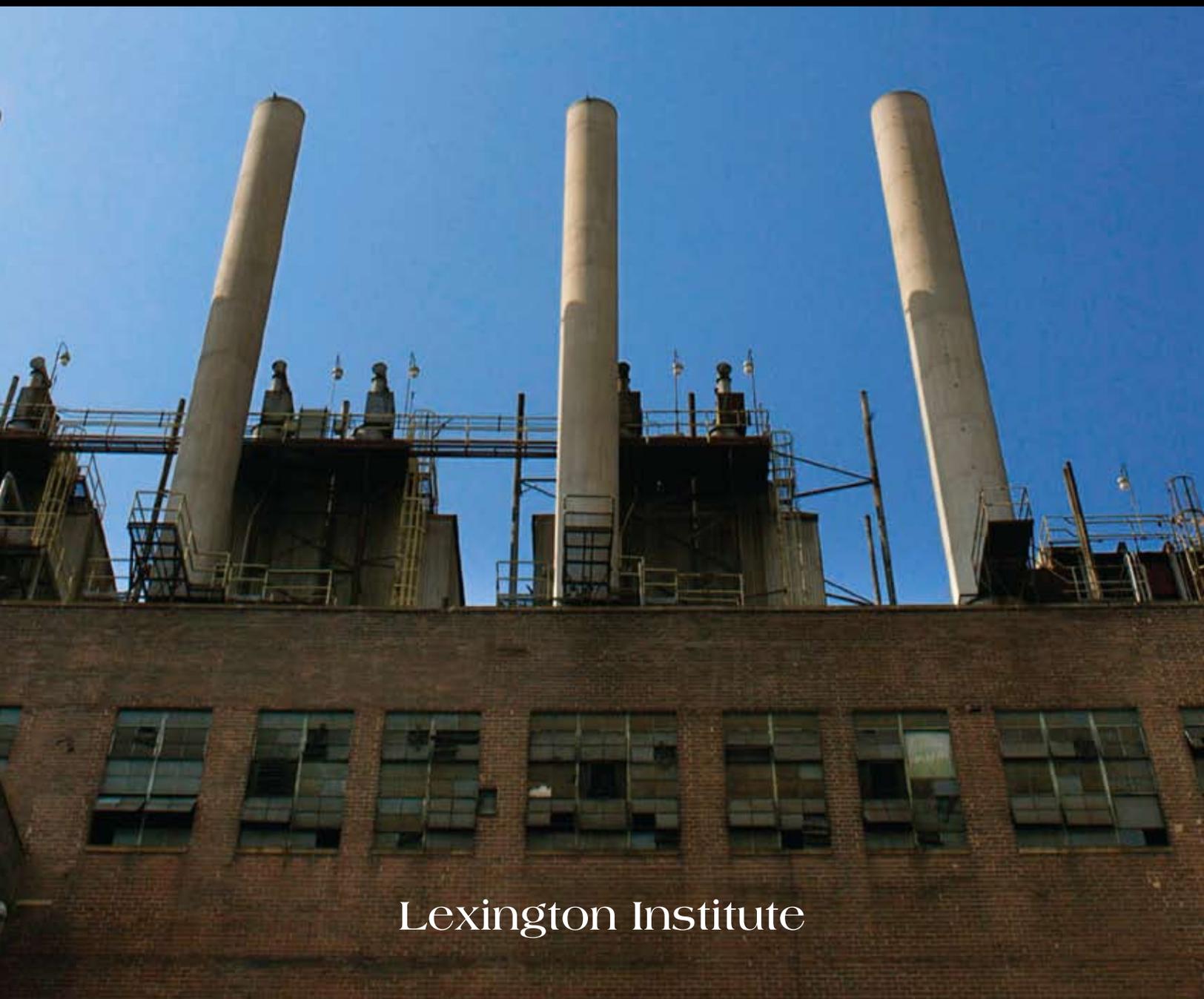


REVERSING INDUSTRIAL DECLINE

A Role For The Defense Budget

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Findings In Brief

After dominating global industrial activity for a century, the United States is losing its edge in manufacturing to other nations. Over the last 30 years, manufacturing has fallen from a quarter to an eighth of the domestic economy, while the share of manufactured goods consumed in America but produced by foreigners has risen from a tenth to a third. The decline of U.S. manufacturing is reflected in record merchandise trade deficits, the loss of over 40,000 manufacturing jobs every month in the current decade, and the shrinking role of American producers in global industries such as electronics, steel, autos, chemicals and shipbuilding.

U.S. manufacturers continue to generate over 20 percent of global industrial output and have increased productivity by a third in this decade, but if current trends continue America will cease to be the biggest manufacturing nation in the near future. Many factors have contributed to the slippage in U.S. standing, including high corporate taxes, burdensome regulations, globalization of the economy, and the efforts of trading partners to protect their economies. Manufacturers frequently cite the failure of public schools to adequately prepare students for jobs in modern manufacturing. However, the nation's declining industrial competitiveness appears to be caused mainly by problems outside the educational system and scientific community.

If the erosion of U.S. manufacturing persists, America will become more dependent on offshore sources of goods and the nation's trade balance will weaken. That will undercut the role of the dollar as a reserve currency and diminish U.S. influence around the world. The economy will be less capable of supporting major military campaigns and less resilient in the face of market reverses. Most profoundly, America will become poorer relative to other nations, a trend that the National Intelligence Council says is already under way in its most recent assessment of global trends.

Reversing America's industrial decline will require many changes in policy, particularly with regard to the taxation and regulation of manufacturing enterprises. One tool available to policymakers is the defense budget, which was used throughout the Cold War to stimulate industrial investment and technological innovation. However, the federal government currently lacks mechanisms necessary to coordinate defense spending with economic policies, and as a result military outlays seldom boost the U.S. economy as effectively as they do in other industrialized nations.

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Introduction

America's economy is in decline. The problem is not just a temporary downturn that began in the housing and finance sectors. Even before the downturn began, the economy was steadily losing ground. Since the present decade started, America's share of global economic activity has shrunk each year for eight straight years; average household income has stagnated; and the rate of private-sector job growth has fallen to the slowest pace in half a century. Meanwhile, the gap between what America buys abroad and what it sells ballooned into the biggest trade deficit ever recorded -- anytime, anywhere.

The weakness of the economy has been masked by record borrowing, and by fashionable ideas such as globalization and "supply-side" economics. But the reality is that average Americans are becoming poorer and the government's tax base is eroding even as its future obligations grow by trillions of dollars annually. If these trends persist, the United States will eventually cease to be the dominant economic power in the world -- as the Central Intelligence Agency warned in its most recent assessment of global trends.

Evidence of decline is not spread uniformly across the economy. The United States remains by far the biggest center of scientific research and technological innovation on the planet. But unlike in the past, scientific excellence and technological sophistication are no longer translating into economic growth or trade competitiveness. One reason why is that the U.S. manufacturing base is shrinking. Many domestic manufacturers have been overwhelmed by foreign competition, and many others have shifted production to overseas locations. As a result, the production of goods represents a continuously decreasing portion of national output, and over 40,000 manufacturing jobs have been lost each month since the decade began.

This report describes the extent of America's industrial decline, why it is occurring, and what it means for the nation's future if it is not reversed. However, the main purpose of the report is to set forth a framework for how military investment programs can be carried out so that they help rather than hurt the nation's manufacturing base. For many years, policymakers have assumed that weapons programs could be pursued without much attention to the health of the manufacturing sector. Today that approach is no longer feasible, because the industrial base has declined to a point where it may not be able to meet military needs, and it cannot recover easily from setbacks caused by poorly conceived policies.

A new approach is needed -- one that takes into account the impact of military outlays on industrial vitality, and the impact of industrial vitality on national security. The report does *not* propose that weapons spending should be undertaken simply to bolster the industrial base, but it does argue that research and production funded to meet defense needs should be carried out with due attention to its impact on the broader industrial economy. As the biggest purchaser of advanced technology products in the world, the U.S. Department of Defense has a powerful influence over the business decisions of private-sector companies, and the report argues that the resulting leverage can be used to help rebuild America's industrial might.

American Industry Is Losing Ground

Evidence of America's industrial decline is not hard to find, from a massive merchandise trade deficit to the insolvency of domestic automakers to the overseas exodus of manufacturing jobs. Over the last 30 years, the portion of gross domestic product contributed by manufacturing has been cut in half, from 25% to 12%. During that same period, the share of manufactured goods consumed within U.S. borders that are imported has risen from a tenth to a third. The United States continues to generate 20-25% of all manufactured goods produced globally, but it is steadily losing market share to other countries. Global Insight, a respected economics consultancy, forecasts that China will surpass America in manufacturing output by 2020. Others predict China will pull ahead sooner, and by some measures it already has.

Economists are not in agreement about the meaning of the decline. Many are alarmed by the loss of five million domestic manufacturing jobs in this decade, but others attribute the loss to gains in productivity and point out that a significant portion of imports originate at the foreign subsidiaries of American-owned companies. And while the U.S. balance of trade in advanced technology products has deteriorated continuously since it first turned negative in 2002, some analysts note that the erosion is concentrated in a handful of bilateral trading relationships involving only a few product categories. Even the doubling of the nation's overall trade deficit in the present decade has been dismissed by some experts as a result of rising oil prices rather than lagging industrial performance.

However, with each passing year the loss of American industrial power and competitiveness becomes increasingly apparent. The rate of new factory construction in the United States has fallen to historic lows, while the trade deficit in manufactured goods has approached \$2 billion *per day* in some months. Many domestic industries in which America was once thought to be the global leader have disappeared, or shrunk to a shadow of their former size:

- The U.S. steel industry produced only 7% of global steel output in 2008, compared to 38% for the Chinese steel industry. During the current decade steel imports have risen to nearly a third of U.S. consumption while domestic producers have reduced capacity. As a result, the indigenous industry can only meet two-thirds of domestic demand in normal years, and has ceased to be a significant factor in export markets.
- A study of construction in the global chemical industry at mid-decade found that of the 120 plants worth \$1 billion or more planned for construction around the world, only one was in the United States. China was building 50 such plants. U.S. oil companies have not built a single new domestic refinery since the 1970s despite steadily rising consumption of petroleum products, leaving the nation increasingly dependent on offshore refineries.
- The United States is the biggest consumer of electronic equipment in the world, but it is no longer the biggest manufacturer. That title was claimed by China in 2006, which now out-produces the U.S. industry by a substantial margin. According to the Congressional Budget Office, the number of manufacturing jobs in the domestic computer and electronics industry fell 33% between 2000 and 2008.

- The U.S. commercial shipbuilding industry collapsed following the elimination of federal construction subsidies in the 1980s. As a result, the world's biggest trading nation no longer produces tankers and freighters for use on international routes. Its shipbuilders have become dependent on business with the U.S. Navy and Coast Guard, supplemented by orders from companies operating in the protected domestic market.



An oil refinery in Baton Rouge, Louisiana. No new refineries have been built in the United States in the last 30 years.

- The U.S. automobile industry was driven to the brink of bankruptcy in 2008 by a combination of record gas prices and frozen credit markets. While the economic conditions surrounding the industry's insolvency were nearly unique, it had been losing ground in its home market for 30 years. The industry is struggling to hold onto the half of the domestic market it has not lost, but much of it would cease operations if federal subsidies ended.
- The U.S. pharmaceutical industry has begun to falter after many years of global dominance. A lack of new products coupled with increased dependence on foreign suppliers has gradually hollowed out the sector. The United States continues to consume half of all the drugs in the world by dollar value, but domestic manufacturers are no longer able to make antibiotics like penicillin without supplies from China and other overseas sources.

The cumulative effect of these and other negative trends in U.S. industrial competitiveness has been to undermine the nation's global economic standing. Since the decade began, the U.S. trade deficit in manufactured goods with China alone has been well in excess of a trillion dollars, and sizable imbalances now exist with every other industrialized country in East Asia. The resulting accumulation of U.S. dollars in foreign hands has put downward pressure on the nation's currency, and made Americans increasingly dependent on trading partners to finance high levels of debt. A recent trend assessment by the federal government's National Intelligence Council found that, "In terms of size, speed and directional flow, the transfer of global wealth and economic power now under way -- roughly from West to East -- is without precedent in modern history."

The erosion of American economic power cannot be arrested unless there is a reversal of the trends undermining the nation's industrial competitiveness. Although the United States has a positive balance of trade in services, trade flows are dominated by manufactured goods and commodities that play a larger role in international commerce. Since history records no recent example of

a major military power that lacked a robust manufacturing base, halting the nation's industrial decline is also important to national security. But the problem cannot be fixed unless it is first understood, and so it is important to understand not only what has gone wrong, but also what is going well.

Science And Education Are Not The Main Problem

Many policymakers and economists now recognize that the U.S. industrial base is losing ground at a pace that would have been nearly inconceivable a generation ago. Even among those who acknowledge the severity of the decline, though, there is little agreement about what is causing it. The debate about causes often becomes entangled in other controversies concerning the competitiveness of American science, or the quality of American schools. One reason these issues get confused is that experts believe there is a close relationship between technological innovation and economic growth. That linkage was first explained by economist Robert Solow in 1956 and it has since become the prevailing view among mainstream economists. Economists now estimate that about half of the growth and most of the productivity gains in the U.S. economy since World War Two were made possible by technological innovation.

Given this well-documented linkage, it is reasonable to suspect that loss of economic growth due to declining competitiveness in manufactured goods might be traceable to waning investment in science, or mediocre schooling. However, an examination of relevant data does not support the thesis that America's industrial decline is being driven by problems in those areas. According to a 2008 study entitled "U.S. Competitiveness in Science and Technology" by Titus Galama and James Hosek of the RAND Corporation, the United States continues to greatly outperform other countries in most measures of scientific and technological achievement:

- Although only 5% of the world's population lives in the United States, it accounts for 40% of global research and development (R&D) spending and generates a similar share of patented inventions. Over the last 20 years, the United States has devoted a larger portion of its economy to R&D than any other industrialized country except for Japan, which spends considerably less than America in absolute terms.
- While the United States, Japan and the European Union collectively account for three quarters of global research and development outlays, the rate of increase in U.S. spending far exceeds that in the other two regions. In the most recent ten-year period for which data were available, Japanese spending on R&D rose at an annualized rate of 4.2%, European Union spending rose 4.9%, and U.S. spending rose 5.8%.
- The biggest component of U.S. science and technology spending is industrial research conducted in the private sector, which grew at an annualized rate of 5.4% over the last 50 years, with little evidence of slowing in recent years. Most of the growth in U.S. science and technology spending since the 1950s has occurred in private industry, although spending by the federal government (30% of the total) has risen steadily and will continue to do so under President Obama.

- The size of the U.S. science and technology workforce far surpasses that of other industrial nations. The United States employs 1.4 million full-time-equivalent researchers, compared with a million in the European Union and 650,000 in Japan. America has fared better than other nations at attracting top-notch scientific talent from abroad, which reduces the danger of shortages in key disciplines; 70% of all Nobel Prize winners are employed in the U.S.

Although American science seems to be thriving, there is some evidence that the public education system is undermining industrial competitiveness. According to a recent report by the National Association of Manufacturers, the education system is not doing an adequate job of equipping students with the skills needed to participate in high-technology manufacturing. More generally, the association notes, the performance of U.S. public school students on standardized tests does not compare favorably with that of students in other major manufacturing nations. However, the fact that U.S. manufacturing productivity has increased by about a third since 2000 suggests that educational shortfalls are not at present a major drag on industrial competitiveness. Furthermore, manufacturing differs from other economic sectors in employing both manual labor and large numbers of technical specialists such as engineers; while the failings of public education in grades K-12 are well documented, the U.S. higher education system that trains scientists and engineers is by far the best in the world.

Recent surveys have found that the United States is home to 58% of the world's top 100 universities -- and 75% of the top 40 institutions -- which would appear to make higher education a major contributor to national competitiveness rather than a drag. And while some studies have found an alarming disparity between the rates at which China and America are graduating students in technical fields, when the findings are adjusted to compensate for different methods of measuring educational attainment, the U.S. seems to be at least matching China. According to economist Robert J. Samuelson, "Per million people, the United States graduates slightly more engineers with four-year degrees than China and three times as many as India."

So while Americans seem to be in a state of continuous distress about the quality of their schools and the productivity of their scientists, there simply isn't much evidence those areas are contributing to the nation's industrial decline. The source of the problem appears to lie elsewhere -- in market mechanisms, in government policies, and perhaps in cultural values.

The Real Causes Of Industrial Decline

Although the notion of "de-industrialization" has been around for some time, the metrics for measuring it are not well developed. The most commonly used indicators are manufacturing employment, trade flows in manufactured goods, and the portion of gross domestic product dedicated to manufacturing activity. These measures are imprecise at best: manufacturing employment can shrink in response to both positive and negative economic developments; surging imports can originate at both foreign-owned and American-owned factories; and the contribution

of manufacturing to gross domestic product can change for reasons unrelated to industrial competitiveness. Without better indicators, the significance of industrial trends will always be subject to debate.

However, there is broad agreement among experts that the U.S. manufacturing sector is not faring as well today as it did in the past, and that recent trends in employment, trade and economic performance reflect that fact. Americans today consume a larger share of their manufactured goods from overseas than ever before, and are less likely to be employed in manufacturing than at any other time in the last hundred years. A number of explanations have been advanced to explain these trends:

- Trade liberalization since World War Two has eliminated many of the barriers to acquiring goods from overseas, and also the barriers that impeded investment in other countries. The tariffs that the U.S. imposed on imports prior to World War Two are largely gone, as are many of the legal constraints on trade with Russia and China maintained during the Cold War.
- The information revolution has accelerated globalization of the economy, enabling corporate managers to treat the world as a single integrated market. Geographical distances have a diminishing impact on investment and sourcing decisions because the entire global economy is connected by digital networks that minimize delays in execution.



A Ford assembly line in 1928. America once led the world in automobile manufacturing, but 80 years after this picture was taken the industry nearly collapsed due to poor management and a weak economy.

- The information revolution has also enabled U.S. manufacturers to greatly improve productivity by substituting technology for other production inputs such as raw materials and labor. One consequence of this process is that factories are able to meet production goals with fewer workers, so the ranks of those employed in domestic manufacturing have thinned over time.
- With most of the geographical and legal barriers to trade removed, U.S. manufacturers have lost protections they once had against foreign competitors. Overseas competitors often enjoy comparative advantages in labor costs and other production inputs that allow them to win market share from U.S. manufacturers at home and abroad, resulting in further domestic job losses.
- Although the United States championed trade liberalization, it has lagged in adjusting to the new competitive landscape. U.S. corporate income tax rates are the second highest in the world, and regulatory burdens at the federal, state and local levels add to the costs of domestic manufacturers at a time when it is easier than ever before to move operations offshore.
- The role of the United States as the world's biggest economic and military power has tended to keep the dollar strong in global currency markets despite faltering trade performance. The strength of the dollar makes U.S. goods more expensive in foreign markets and foreign goods cheaper in the U.S. market, further eroding the competitive position of domestic manufacturers.
- Some countries have taken advantage of the more open trade environment to pursue export-driven growth strategies, while still practicing protectionism to shield their domestic industries. For example, China's government has suppressed the value of its currency and provided subsidies to manufacturers -- measures that enhance the appeal of Chinese exports while limiting imports.

As this compendium of explanations makes clear, many of the factors influencing U.S. industrial competitiveness are homegrown, and they aren't all negative. The loss of manufacturing jobs is driven as much by productivity gains as foreign competition. But at least some of the destructive influences at work reflect the protectionist policies of foreign governments, and chief among these is what economic commentator Martin Wolf calls China's "inordinately mercantilist currency policies." By preventing market forces from setting the proper relationship between the yuan and the dollar, China has fostered huge trade imbalances that have severely harmed U.S. manufacturers. The Economic Policy Institute describes the situation in these terms:

A major cause of the rapidly growing U.S. trade deficit with China is currency manipulation. China has tightly pegged its currency to the dollar at a rate that encourages a large bilateral surplus with the United States. Maintaining this peg required the purchase of about \$460 billion in U.S. treasury bills and other securities in 2007 alone. This intervention makes

the yuan artificially cheap and provides an effective subsidy on Chinese exports. The best estimates place this effective subsidy at roughly 30%, even after recent appreciation of the yuan.

Since 99% of China's exports to the United States are manufactured goods such as computers and electronic equipment, its currency policies have had a decidedly negative impact on American manufacturers. When combined with China's other industrial subsidies and vast reservoir of cheap labor, the currency imbalance makes it nearly impossible for U.S. manufacturers to compete against Chinese producers.

Some observers contend that de-industrialization reflects the natural evolution of economies as living standards rise. They argue that factory work tends to be highly repetitive and physically demanding, so industrial jobs lose their appeal as populations grow more affluent and educated. However, manufacturing also employs many scientists and engineers, and the physical aspects of production are gradually being automated in advanced countries. Whatever the causes of de-industrialization in America, the process has now progressed to a point where it poses a real danger to the long-term economic and military security of the nation.

What Continued Decline Would Mean For America

Policymakers have difficulty distinguishing transient economic developments from long-term trends. The symptoms of a cyclical downturn in the industrial sector look similar to those of a secular decline, so it may take many years before leaders grasp that the economy is undergoing major transformation. Like the gradual shift of climate conditions caused by global warming, the character of a nation's economy typically changes slowly -- at least until a tipping point is reached where previously unthinkable events suddenly become highly likely. But all countries eventually reach such a threshold, which is one reason why the vast majority of civilizations built up since the dawn of man no longer exist.

For America, global power and prestige are inseparable from economic prowess. The United States has been the biggest economy in the world for so long that no one alive today can recall a time when it was not Number One. During the 20th Century -- the "American Century" -- economic strength was defined largely in terms of industrial output, and the United States led the world in manufacturing from 1900 to the beginning of the new millennium. It is now fashionable to describe the national economy as service-based because manufacturing has shrunk to barely 12% of gross domestic product, but few policymakers have thought through what the waning of industrial America might mean for the nation's broader welfare or standing in the world. Neither political party seems intellectually or emotionally equipped to confront the possibility that declining industrial strength might signal the end of American influence around the globe. However, that could really happen if current trends persist, so it is important to reflect on what continued erosion might mean for America:

- The most obvious consequence is that the United States would become more dependent on offshore sources of goods, including those containing advanced technology. Some of the

countries supplying said goods might oppose U.S. diplomatic or military goals, creating the danger that access to vital items could be used for political leverage by foreign governments or even cut off in a national emergency.



Snow covers books in an abandoned and vandalized Detroit public school. The decline of manufacturing in places like Detroit has been accompanied by rampant crime and social decay.

- A second consequence is that the industrial mobilization potential of the U.S. economy, which once earned it the label “arsenal of democracy,” would be weakened. That problem is already quite real: when the Pentagon sought to surge production of armored vehicles for the Iraq war in 2007, it was forced to rely on foreign companies for high-strength steel, tires and other production inputs.
- A third consequence is that private industrial research and development -- the biggest category of R&D in the U.S. economy -- would wane as science and engineering jobs are moved closer to offshore production sites. Many of the nation’s biggest industrial companies are already building overseas research centers to tap foreign technical talent and support local production facilities, often with the encouragement of host countries.
- A fourth consequence is that the trade competitiveness of the U.S. economy would be further diminished, putting downward pressure on the dollar and eventually destroying its status as a preferred reserve currency. America remains a big net exporter of agricultural goods and technical services, but those items by themselves cannot compensate for the huge cost of importing fossil fuels and an ever-increasing portion of manufactured goods.

- A fifth consequence is that the overall resilience of the U.S. economy to a wide variety of setbacks would be diminished. The strength of the economy today results in part from its diversity, which enables capital and labor to respond rapidly to shifts in global conditions, but if the nation lacked a sizable industrial sector then there would be fewer options for adapting to future economic challenges.
- A sixth consequence is that the middle class would be placed under greater pressure due to the disappearance of well-paying jobs that do not require a college degree. Most Americans do not have college degrees and most manufacturing jobs do not require them, but in places like Detroit where such jobs are being eliminated, there are many signs of social decay arising from the dearth of employment alternatives.
- A seventh consequence is that the United States would gradually lose diplomatic leverage as its economy was seen to be incapable of sustaining current overseas commitments. Much of America's influence around the world today is a reflection of its economic strength, so further deterioration in technology and trade performance would reduce Washington's ability to have its way in the world on issues ranging from intellectual property to global warming.
- A final consequence, probably the most profound, is that America as a nation would become poorer. It will be a long time before countries such as China and India can aspire to the kind of affluence that many Americans today take for granted; however, the expectations of U.S. citizens are correspondingly high, so it would not take long for the deterioration in living standards to poison political debate and social relations.

The negative implications of waning industrial strength for American power and influence were noted in the National Intelligence Council's "Global Trends 2025: A Transformed World," which was published in November 2008. The council's assessment reported that "relatively low labor costs combined with certain government policies have shifted the locus of manufacturing and some service industries to Asia." It went on to observe that "these shifts in demand and supply are deep and structural, which suggests that the resulting transfer of economic power we are witnessing is likely to endure." The intelligence council predicted that American influence in the global system would wane in the years ahead -- a departure from previous assessments, which assumed continued American dominance.

However, there is nothing inevitable about the decline of U.S. industrial strength. It is driven by circumstances and policies that can be reversed. The future of America's industrial power will be determined mainly by whether the federal government abandons policies that are not working. Unfortunately, the political system responds much more strongly to near-term pressures than long-term needs, and in the near term there will be many other concerns competing for attention. Furthermore, as noted above, policymakers are not very good at distinguishing temporary economic developments from long-term trends. So they may interpret the rapid shrinkage of trade deficits during the economic downturn in 2008-2009 as a long-term improvement that lessens the need for policy changes, when it is more likely to be a brief respite from the secular trend.

If, on the other hand, the numerous signs of industrial decline finally foster a consensus for political action, then there are many things the federal government can do to spark a recovery, from reducing taxes to lessening regulation to enforcing free trade standards. The next section of this report looks at one area that has been popular with policymakers in the past -- using the defense budget to stimulate industrial investment and innovation.

Defense Spending And Industrial Strength

Military spending has a major impact on industrial innovation and investment in the United States. The U.S. accounts for nearly half of all global defense outlays -- \$700 billion out of \$1.5 trillion -- and much of that money is spent on developing, manufacturing and maintaining military equipment. The Obama Administration's first defense budget proposed allocating \$210 billion to the purchase of new equipment in fiscal 2010, with many additional billions set aside for the maintenance and modification of equipment already in the force. Further equipment outlays were contained in the budget requests for the Department of Homeland Security (which manages the Coast Guard) and the Department of Energy (which manages nuclear weapons programs). When all of the administration's proposed security expenditures with potential to generate industrial demand are added together, they total over a quarter of a trillion dollars per year.



A B-29 bomber plant during World War Two. Much of the weapons production during the war was carried out in converted commercial plants.

The vast preponderance of this funding will be spent within U.S. borders, and most of it will ultimately find its way to the private sector. The defense department and other federal agencies with security responsibilities thus play an important role in sustaining the nation's industrial base. In many states, facilities dedicated to defense production such as shipyards and aircraft plants are the biggest source of industrial employment, and they sustain skills that might otherwise have long since moved offshore. With defense goods constituting nearly a tenth of all domestic industrial output -- and much more in some key industries -- military demand has a powerful impact on industrial research and investment decisions. It also materially impacts trade balances, since the United States is by far the largest exporter of weapons in the world.

The impact of military demand on the rest of the economy is seldom analyzed in any detail, and prior to World War Two it was barely noticed at all. The nation traditionally maintained a modest defense posture between wars, turning to private industry for military goods when threats arose. This commercial mobilization model often did not work well -- none of the thousands of aircraft

produced for the military in World War One actually made it to the front before the war ended -- but it enabled the nation to avoid the expense of sustaining a sizable defense industry. That approach began to change after World War Two, though, because the persistence of the military threat posed by the Soviet Union forced the government to maintain a big military establishment even though the country was not at war, and a dedicated industrial sector that could support it.

Without the elevated levels of peacetime defense spending that prevailed in the Cold War, it would not have been possible for the modern defense industry to emerge. But because military expenditures averaged between eight and ten percent of national wealth in the 1950s and 1960s, war production became a seemingly permanent feature of the economy. Defense spending remained high in the 1970s and 1980s, claiming an average six percent of national wealth in both decades despite the fact that the economy had grown much bigger than it was in the early postwar years. Even today, 20 years after the collapse of communism, military spending still represents over four percent of all economic activity in the United States.

With so much money being expended on military purposes, its economic impact is hard to ignore. Even before a large defense industry emerged in the 1950s, many economists had noted the stimulative effect of military spending during World War Two in helping to end the Great Depression. The war also accelerated development of many new technologies with commercial applications, from antibiotics to plastics to nuclear power. When Soviet development of atomic weapons and ballistic missiles in the early postwar era signaled that the U.S. was in a race with Russia for technological supremacy, the federal government resumed pouring money into technologies deemed important to national security. A brief review of U.S. technological progress during the Cold War illustrates how important military research was to national industrial strength:

- The first electronic computer was developed for the Army's ordnance division during World War Two, and the military remained deeply involved in the funding of computer technology throughout the Cold War, most notably through the Advanced Research Projects Agency. The Semi-Automatic Ground Environment (SAGE) developed to provide an integrated air defense of the U.S. in the 1950s was the biggest computer programming effort that had ever been undertaken.
- Development of more powerful software for signal processing, weapons design and other military applications was a persistent focus of defense research during the Cold War. In 1952 a Navy officer named Grace Hopper developed the first computer compiler that could utilize software written in user-friendly language similar to English rather than machine code; that breakthrough and later efforts led to the development of programming language such as Cobol that became standard in both military and commercial applications.
- New materials with novel properties and applications were developed in part as a consequence of military research on advanced aircraft, missiles, engines and armored vehicles. The military funded investigations into the formulation and machining of materials such as graphite-epoxy composites for airframes, ceramics for armor, gallium arsenide for semiconductors, and new metal alloys for engine parts -- in the process, helping to revolutionize the material sciences.

- Nuclear energy research got a big boost from the Manhattan Project to develop nuclear weapons and postwar efforts to harness the atom for propulsion of warships. The U.S. Navy launched the world's first nuclear-powered submarine in 1954 and remained in the forefront of reactor design after commercial interest waned; the Navy Nuclear Propulsion Program pioneered development of nuclear technologies such as uranium dioxide fuel systems and zirconium alloys.
- The first working laser was demonstrated in 1960 by Dr. Theodore Maiman of the Hughes Aircraft Company, a major military contractor. Lasers later were used in fiber-optic communications, storage of digital information, logistics tracking, medical surgery and a host of other commercial applications, but much of the early research on the technology was funded by military organizations interested in its use for purposes such as missile guidance and defense against nuclear attack.
- The Internet traces its origins to work supported by the Advanced Research Projects Agency in the 1960s, when it formulated the vision of a worldwide network and then applied the new technology of packet-switching to bring the vision to fruition. Later innovations such as email and the Worldwide Web enabled what was originally called ARPANET to mushroom into a global communications tool that would transform every facet of commerce and culture, including the conduct of war.

It is now widely recognized that military investment in areas such as computers and aerospace during the early postwar period provided American companies with a major competitive advantage as they sought to carry the same technologies into the commercial marketplace. President Obama noted the importance of government science and technology investments during the Cold War in his first budget message to Congress, comparing them to previous investments that improved prospects for economic growth such as the transcontinental railroad during the Civil War and rural electrification during the Great Depression.

While it is indisputable that government technology investments have produced useful commercial “spinoffs,” many economists question the desirability of organizing federal spending with the deliberate goal of stimulating economic activity beyond areas of direct government responsibility. Skepticism has been especially strong since the advent of the “Reagan Revolution” in the 1980s, when proponents of free markets sought to roll back the influence of government over the economy, arguing that it was distorting the interplay of market forces in ways that would lead to waste and inefficiency. The Clinton Administration sought to moderate anti-government impulses, and in the years immediately following the collapse of communism it gave considerable attention to how industrial skills and facilities no longer needed for war production might be redirected to commercial uses. Although the administration's predictions about the coming contraction of the defense industry proved to be accurate, its “swords into plowshares” initiatives yielded only modest results and were soon eclipsed by the dot.com boom. Economic and social trends were so positive during the late 1990s that there was little incentive for the administration to argue with free-market purists about the future disposition of industrial infrastructure acquired during the Cold War.

However, the first decade of the new millennium presented a starkly different situation. It began with a stock market sell-off as the dot.com boom went bust, and that was followed by the shock of terrorist attacks on 9-11. The administration of George W. Bush cut interest rates and taxes in an effort to revive the economy while greatly increasing defense outlays to conduct a “global war on terror.” This combination of policies initially seemed to have a strong stimulative effect on economic activity, but after a few years of moderate growth the economy weakened again in response to the sub-prime mortgage crisis. By the time Bush left office, the trade deficit had doubled to nearly \$800 billion annually, the national debt had doubled to over \$10 trillion, and the manufacturing sector was in rapid decline. Against this backdrop, the nation elected a new president more inclined to use the power of government to reshape the economy. As President Obama’s budget message to Congress put it, “Investing in the future has been critical to long-term economic growth and creating high-paying jobs for our people throughout our history.” Obama left little doubt that while he was in the White House, government would take a leading role in making such investments.



A Boeing assembly line. Aerospace is one of the few high-tech areas where America is still a global leader in manufacturing.

What remains unclear is the role that defense spending might play in stimulating industrial recovery. While President Obama has committed his administration to maintaining defense outlays at relatively high levels, there is little evidence of a departure from the view of the Bush Administration that military investment decisions should be made without much thought as to their economic consequences. In fact, the Pentagon’s new comptroller stated that no consideration was given to such impacts when proposing cuts to weapons programs in the fiscal 2010 budget request. This was a curious approach to take given the very large size of the proposed defense budget and the dearth of other tools available for preserving industrial jobs at a time when the federal government was facing record budget deficits. With the automobile industry on the verge of collapse and other essential industries such as electronics and chemicals in decline, the administration may have to rethink

its attitude towards the economic impact of defense spending, following the same route as other recent administrations in using defense outlays to stimulate industrial innovation and investment.

What Role For Defense In Revitalization?

In the years since the Cold War ended, U.S. policymakers have been surprisingly sanguine about the loss of industrial capabilities that once would have been considered central to American power and prosperity. One reflection of their detachment has been the persistent failure of the defense department to seriously consider the economic consequences of major spending decisions. Year after year, the department spends hundreds of billions of dollars on goods and services without any real effort to determine whether the way in which the money is distributed might have some significant bearing on the health of the nation's industrial base. Dick Cheney terminated a hundred major weapons programs during his four years as defense secretary and yet never ordered a detailed industrial impact assessment, despite the fact that the economy was in recession. Secretary Gates is doing much the same thing today.

No other country in the world makes defense investment decisions in this manner. The reason America does derives partly from its experience as a nation and partly from political ideology. With regard to experience, policymakers and politicians from both parties are so accustomed to the United States being an unrivaled industrial colossus that they simply assume it will always be so -- despite growing evidence to the contrary. With regard to ideology, strongly-held beliefs in limited government, free trade, economic globalization and related concepts have discouraged both parties from looking closely at the connection between economic trends and national security. Instead, there is a continuous flow of government-sponsored forums and studies propounding views like that expressed in a 2008 report by the Defense Science Board on the future industrial base, which stated "foreign dependency need not mean vulnerability." In fact, it means precisely that -- losing control of skills and resources that may one day be essential to national survival.

As described in the previous section, U.S. policymakers took a very different approach during the Cold War when national survival was in doubt and the source of danger was a rival industrial power. Today's challenges are so different that the linkage between industrial strength and national security is much less apparent. Eventually, the political system has to face up to the reality that global peace and prosperity cannot be maintained by a country facing massive trade deficits and industrial decline. Hopefully that realization will arrive before America encounters another threat similar in scale to imperialism, or fascism, or communism. Whenever the epiphany comes, though, it is nearly inevitable that policymakers will turn to the defense department as the one federal agency best equipped to directly stimulate industrial innovation and investment. A few administrative steps today would help clear the path for a more industrially conscious Pentagon tomorrow:

- Congress and/or the President need to convene a panel of nationally recognized experts to honestly assess what recent trends in U.S. industrial competitiveness portend for the future. In particular, the panel should focus on the impact that adverse trends will have on the

strength of the dollar, the sustainability of the nation's defense posture, and the affordability of social welfare programs.

- The President needs to create within the Executive Branch a mechanism for analyzing the impact of defense spending on the nation's economy, and coordinating defense investment decisions with the other facets of federal expenditure aimed at promoting economic strength. In particular, the mechanism needs to assure that defense outlays are distributed in a manner consistent with federal goals for global trade, industrial competitiveness and technological innovation.
- The Secretary of Defense needs to establish within his department a professional staff capable of rigorously assessing trends within the defense industrial base (broadly defined), and understanding how major investment decisions might impact on that base. In particular, said staff must be able to understand the warfighting implications of U.S. dependency on foreign sources of pharmaceuticals, specialty metals, software and other vital industrial items.
- The Secretary of Commerce or an official of similar responsibility needs to establish within his department a professional staff capable of rigorously assessing the impact of military spending decisions on the health of industries essential to the nation's trade competitiveness and overall industrial strength. In particular, said staff must be able to analyze the impact of defense demand (or lack thereof) on so-called dual use technologies such as electronics and aerospace that are important for both military and commercial uses.

These are, at best, preliminary steps. The federal government will eventually have to pass legislation and establish procedures for assuring that defense expenditures are consistent with broader economic goals. But there is no point in pursuing more aggressive steps until the nexus between defense spending and industrial strength is understood in greater detail. The defense department and other cabinet agencies have offices that ostensibly track the relevant data, but there is little evidence that it ever comes together in useful analytic products, and even less evidence that it informs the deliberations of policymakers. Today, defense investment decisions are made with almost no attention to industrial consequences unless Congress intervenes.

Part of the problem in leveraging military outlays for industrial benefit is that the global economic system has changed so rapidly in recent years. A generation ago, policymakers could stimulate industrial research confident in the expectation that companies would turn the resulting innovations into exportable goods. Today, the linkage between innovation and exports has broken down, because so much manufacturing capacity has moved offshore. Thus, it is not enough to bolster spending on research and development; the government must seek to revive domestic manufacturing. Defense spending is only one tool among many that might be used to achieve that goal, but with the "arsenal of democracy" in decline, it is clear that the days of making defense decisions without thinking through economic consequences are coming to an end.

Epilogue

On June 26, 2009, the Chairman and Chief Executive Officer of the General Electric Company, Jeffrey R. Immelt, addressed the Detroit Economic Club. Immelt called for a revitalization of U.S. manufacturing, and warned that continued erosion of the nation's industrial might would make America a poorer, less powerful nation. Here are some excerpts from his remarks:

“... Throughout my career, America has seen so much economic growth that it was easy to take it as a given. We prospered from the productivity of the information age. But, we started to forget the fundamentals and lost sight of the core competencies of a successful modern economy. Many bought into the idea that America could go from a technology-based, export-oriented powerhouse to a services-led, consumption-based economy – and somehow still expect to prosper.

“That idea was flat wrong. And what did we get in the bargain? We’ve seen a great vanishing of wealth. Our competitive edge has slipped away, and this has hit the middle class hard.

“As a nation, we’ve been consuming more than we earn, saved too little and taken on far too much debt. Growth in research and development has slowed. Our country has made too little progress on some of the defining challenges of our time – like clean energy and affordable health care. Our budget and trade deficits have reached levels that are clearly not sustainable. ...”

“... We must make a serious commitment to manufacturing and exports. This is a national imperative. We all know that the American consumer cannot lead our recovery. This economy must be driven by business investment and exports.

“We should set a national goal to create high value added jobs and have manufacturing jobs be no less than 20 percent of total employment, about twice what it is today. And we should commit ourselves to compete and win with American exports.

“I’ve had people explain to me the Darwinian nature of markets. They tell me that America has seen a natural evolution from farming to manufacturing to services. After all, they say, this has happened in other mature economies. But there is nothing predestined or inevitable about the industrial decline of the U.S., if we as a people are prepared to reverse it. ...”

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