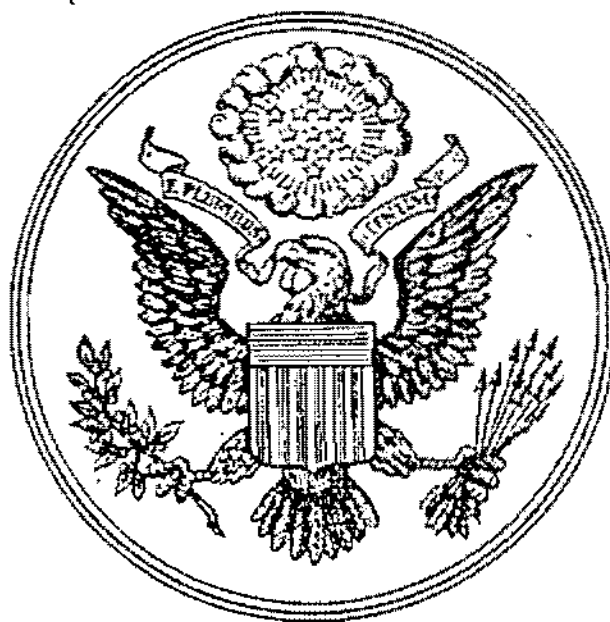


A History of the Council of Economic  
Advisers  
During the Clinton Administration  
1993-2001



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**COUNCIL OF ECONOMIC ADVISERS  
HISTORY PROJECT  
1993 - 2000**

**I. Organizational and Personnel Changes**

**A. Chair and Members of the Council**

The first Chair of the Council of Economic Advisers under President Clinton was Laura D'Andrea Tyson. While chairing the Council, Dr. Tyson was on leave from the University of California at Berkeley where she was Professor of Economics and Business Administration and Director of the Berkeley Roundtable on the International Economy.

The other two members of President Clinton's first Council were Alan S. Blinder and Joseph E. Stiglitz. Dr. Blinder was on leave from Princeton University where he was the Gordon S. Rentschler Memorial Professor of Economics. Dr. Stiglitz was on leave from Stanford University where he was the Joan Kenny Professor of Economics.

In June 1994, Dr. Blinder was appointed as Vice Chair of the Board of Governors of the Federal Reserve System thus creating a vacancy at the Council. Martin N. Baily was named to replace him on June 30, 1995. Dr. Baily was on leave from the University of Maryland where he was Professor of Economics.

On February 21, 1995, Laura D'Andrea Tyson was appointed as Assistant to the President and Director of the National Economic Council and in June 1995, Joseph E. Stiglitz who had been a Member of the Council since 1993 was named Chair of the CEA thus creating a vacancy for a Member. In January 1996, Alicia H. Munnell who had been Assistant Secretary for Economic Policy at the Department of Treasury since 1993 was appointed to the Council to replace Joseph Stiglitz.

In August 1996, Martin Baily resigned to join the Global Institute at McKinsey and Company, Inc. The President appointed Jeffrey A. Frankel in April 1997. He was on leave from the University of California at Berkeley where he was Professor of Economics.

In February 1997, Joseph E. Stiglitz resigned to take a position at the World Bank as Senior Vice President, Development Economics & Chief Economist. On February 18, 1997, Janet L. Yellen, who was a Member of the Board of Governors of the Federal Reserve was appointed.

In August 1997, Alicia H. Munnell resigned and took a position at Boston College as the Peter F. Drucker Chair in Management & Science. Rebecca Blank who was appointed in October

1998 succeeded her. Dr. Blank was on leave from Northwestern University where she was Professor of Economics.

In March 1999, Jeffrey Frankel resigned to take a position at the John F. Kennedy School of Government at Harvard University where he holds the Harpel Chair for Capital Formation and Growth. Robert Z. Lawrence, who is on leave from the John F. Kennedy School of Government at Harvard where he is the Albert L. Williams Professor of International Trade and Investment at the Center for Business and Government, succeeded him.

In July 1999, Rebecca M. Blank resigned to take a position at the University of Michigan where she is the Henry Carter Adams Professor of Policy and Dean of the School of Public Policy. On November 17, 1999 the President nominated Kathryn L. Shaw to succeed Rebecca Blank. Dr. Shaw is on leave from Carnegie Mellon University, where she is Professor of Economics in the Business School.

In August 1999, Janet L. Yellen resigned to return to the Haas School of Business at the University of California at Berkeley. The President appointed Dr. Martin N. Baily on August 12, 1999 to succeed Dr. Yellen. Dr. Baily had served previously as a Member of the Council from June 1995 to August 1996.

## **B. Staff Positions**

In 1993, the new position of Chief of Staff of the Council was created. The first Chief of Staff was Thomas P. O'Donnell, formerly of Patton, Boggs & Blow. He resigned in April 1995 to take a position as Chief of Staff at the National Economic Council. M. Michele Jolin, formerly of Senator Barbara Boxer's office succeeded him. M. Michele Jolin resigned in April 1999 to accept a position as Vice President and Senior Project Manager of Innovative Learning Initiatives at Ashoka: Innovators for the Public. She was succeeded by Audrey Choi, formerly Domestic Policy Advisor to the Vice President.

The Council created a Macroeconomic Forecasting Office headed by a Director, who managed the work of several staff economists and research Assistants, directed and managed the production of the almost daily memoranda to the President on the subject of major economic data releases.

The Council established a position for a Chief Economist who served as editor of the Weekly Economic Briefing (WEB) and directed several research assistants in the preparation of the WEB.

Over the past eight years, CEA has taken on a more technological complex direction. Following the retirement of an administrative support employee in 1997, a research assistant was added to the statistical office to provide more technical support.

Senior staff at the Council during the year consisted of the Chief of Staff, the Senior Statistician, senior economists, staff economists and research assistants. Senior and staff economists and research assistants usually come from academic institutions, research institutions

or other government agencies. The majority of the staff changed every year. The support staff is constant and consists of a Senior Statistician, two Statisticians, a statistical Assistant, a Research Assistant, an Administrative Officer, six Executive Assistants and one Program Assistant.

A contractor, Michael Treadway, provided editorial assistance in the preparation of the *Economic Reports* from 1994 through 2000.

The Council experienced a traumatic period in 1995 when the Senate Committee on Appropriations approved \$3.4 million for the CEA funding for FY'96 and the House of Representatives terminated the funding during its appropriation process. With the help of former Chairmen, academic and business economists and even some journalists defending the Council as an unbiased source of sound economic advice, funding was restored and the Council continued its work as usual.

### C. Mission

The Council was established by the Employment Act of 1946 to provide the President with objective economic analysis and advice on the development and implementation of a wide range of domestic and international economic policy issues.

The Council was involved on every level of economic policy making. All economic policy was coordinated through the National Economic Council, which was established by the President by Executive Order on January 25, 1993. The Chair of the CEA was a member of this Council.

The Council continued to prepare the *Economic Report of the President* and *The Annual Report of the Council of Economic Advisers*.

The Council initiated a new project under this Administration. It was the *Weekly Economic Briefing* for the President, the Vice President and the President's other senior economic and policy advisers. Oral briefings were conducted by the Chair and attended by the two members. The Council, in cooperation with the Office of the Vice President, prepared a written briefing, which provided analysis of current economic developments, more extended discussions of a wide range of economic issues and problems, and summaries of economic developments in different regions and sectors of the economy. The report was distributed Friday of each week and served as a basis for the oral briefings.

In addition to the *Economic Report of the President*, the Council was called upon to prepare numerous other reports analyzing various issues as they affected the economy. They are listed as Appendix A.

## D. Operating Methods

The Chairman represented the Council at Cabinet meetings and various other high-level meetings including those of the National Security Council focusing on economic issues, daily White House senior staff meetings, budget team meetings with the President and many other formal and informal meetings with the President, senior White House staff, and other senior government officials. The Chairman is one of six members of the Principals Committee of the newly established National Economic Council and is a member of the Domestic Policy Council. The Chairman is the Council's chief public spokesperson.

The Chairman and the Members work as a team on most economic policy issues. They participated in the deliberations of the National Economic Council .

The Chief of Staff played a very vital and necessary role in the everyday operation of the Council. The Chief of Staff directed the scheduling, preparation, and production of the *Economic Report of the President*. Regular meetings, weekly amplification and conference calls provided the Chief of Staff with the issues, policy initiatives and legislation that were important to the Administration. The Chief of Staff relayed this information to the Chairman. Press briefings, TV interviews, and speeches were regularly scheduled for the Chairman as a way of presenting the Administration's message on domestic and international policies.

## II. Interagency Relations

During 1993, the Council worked with most all Cabinet Departments in publishing the Economic Report of the President. Their input, comments, suggestions and edits are solicited and implemented during the writing and publishing of this Report.

The Chair and the Members regularly exchanged information and met with the Chairman and Members of the Board of Governors of the Federal Reserve System to discuss the economic outlook and monetary policy.

The Council worked to improve the quality of government economic statistics. The Council urged increased funding for economic and demographic statistics in interagency discussions and in deliberations over Federal budget priorities.

The Council worked with officials from the Department of the Treasury, the Office of Management and Budget and other members of the President's economic team on macroeconomic policy issues. The Council, the Department of the Treasury, and the Office of Management and Budget (OMB) – the "Troika" produced the economic forecasts that underlie the Administration's budget projections. The Chairman and the Members met regularly with Members of the Federal Reserve Board to discuss the economic outlook and monetary policy.

The Council worked with the Department of Transportation to develop the Administration's Civil Aviation Initiative. At the request of the President, Dr. Tyson also

served on the National Commission for a Strong, Competitive Airline Industry. The Council also assisted in the development of the Administration's Domestic Natural Gas and Oil Initiative, issued by the Department of Energy.

In 1997, the Council worked with the Department of Education, and the Office of Management and Budget to develop reforms of the college financial aid system to make it fairer and more efficient.

### III. 1993

The Council advised the President on all major macroeconomic issues in 1993. The Council prepared for the President, the Vice President and the White House senior staff a comprehensive series of memoranda on the statistical releases that help monitor U. S. economic activity. It also prepared special analyses of economic policy issues and briefing papers on significant economic events, such as the 1993 floods in the Midwest (and the earthquake in southern California early in 1994).

International economic issues were a high priority for the Council in 1993. All three members continued the Council's active role in the Organization of Economic Cooperation and Development (OECD). Dr. Tyson attended the OECD's Economic Policy Committee meeting in Paris in May and served as its Acting Chair in November. Dr. Blinder led the U. S. delegation to the OECD to assess U. S. economic policy and was a member of the U. S. delegation to OECD Working Party 3 on macroeconomic policy coordination. Dr. Stiglitz headed the U.S. delegation to OECD Working Party 1 meetings on microeconomic and structural issues. Senior staff members represented the Council at the semiannual short-term Economic Projections meetings at the OECD in Paris and at the annual Asia-Pacific Economic Experts Meetings in Sydney. The goal of these meetings was to support the coordination of macro-economic policies to promote economic growth. The Chair and the other Members helped formulate Administration policies that brought to completion two major trade agreements, the North American Free Trade Agreement and the Uruguay Round of GATT, and provided economic analyses of the implications of those agreements for the U. S. economy. The Council also participated in formulating other Administration policies in the international arena, including such important initiatives as the National Export Strategy, and the ongoing evaluation of the economic relationship between the United States and the People's Republic of China.

Dr. Tyson and Dr. Blinder were deeply involved in the negotiations of the United States-Japan Framework for a New Economic Partnership, with Dr. Blinder making two trips to Japan as part of the negotiations. The Council also engaged in discussions with Japan's Economic Planning Agency on the current account imbalances and other macroeconomic issues. The Council was involved throughout the year in Administration policies for advancing economic reform in the former Soviet Union. Dr. Stiglitz traveled to Russia and Ukraine and established an official relationship with the Russian Government Working Center for Economic Reform.

The Council provided the President with regular briefings on international developments and was particularly active in the preparations for the Asia-Pacific Economic Cooperation

(APEC) Ministerial meeting and the first-ever APEC leaders' meeting hosted by the President in Seattle.

Dr. Stiglitz played an important role in the development of two Executive Orders – one on regulatory planning and review and another on the Nation's infrastructure. Each order directs executive branch agencies to rely upon cost-benefit analysis when identifying appropriate regulatory approaches and when determining which infrastructure projects should be undertaken. Dr. Stiglitz also served as co-chair of a committee of the Administration's Regulatory Working Group studying cost-benefit analysis methodology and he participated in a number of working groups on financial markets and economic development. Dr. Tyson and Dr. Stiglitz worked closely with the Vice President and other Administration officials in developing legislative proposals for telecommunications regulation. In addition, Dr. Tyson and the other Members were involved in analyzing various proposals for bank regulatory agency consolidation.

The Chair was a member of the Health Care Task Force headed by the First Lady and the Council was involved with the health care reform effort, especially in analyzing the economic effects of reform options. The Council also helped develop the tax, empowerment zone and enterprise communities' provision of the 1993 Omnibus Budget Reconciliation Act (OBRA). Chair Tyson was a member of the President's Community Enterprise Board. In addition, the Council participated in the development of the Administration's work force security and welfare reform initiatives and in the design of the Administration's defense reinvestment initiative. Dr. Tyson was appointed a member of the President's National Science and Technology Council and was appointed the Administration's representative of the Competitiveness Policy Council. Dr. Tyson and Dr. Stiglitz both served on the Administration's Welfare Reform Task Force.

Dr. Stiglitz was particularly active in the Administration's environmental policymaking efforts. He chaired the Subcommittee on Economics Research on Natural Resources and Environment, created to identify key research areas in economics common to many environmental quality and natural resource management issues. He was also actively involved in developing the Administration's proposals for Superfund reauthorization, Clean Water Act reauthorization, and the President's Climate Change Action Plan.

#### IV. 1994

During 1994, the Council continued to prepare for the President, the Vice President, and the White House senior staff a comprehensive series of memoranda monitoring key economic indicators and analyzing current macroeconomic events. The Council also prepared special analyses of economic policy issues and briefing papers on extraordinary economic events, such as California's Northridge earthquake disaster in January and the Mexican financial situation later in the year. Council senior economists also prepared in-depth studies of potential output, structural budget deficits, and a regular monitor of inflationary trends.

The Council played a leading role in discussions of macroeconomic policy issues with officials from the Department of the Treasury, the Office of Management and Budget, and other members of the President's economic policy team, and was a key participant in the formulation



of the Administration's economic policies through various Cabinet and sub-Cabinet working groups. As part of this effort, the Council provided an economic assessment of various policy initiatives that were under discussion in the Congress, including the proposed balanced budget amendment to the Constitution, dynamic scoring of the budget and welfare reform. The Council also carefully monitored the response of the interest-sensitive sectors of the economy to the series of monetary tightening steps taken by the Federal Reserve beginning in February.

International economic issues occupied much of the efforts of the Council in 1994. Dr. Tyson and the other Members helped formulate Administration policies that brought the Uruguay Round negotiations of the General Agreement on Tariffs and Trade to completion and subsequent Congressional approval. The Council also provided analyses of the implications of the Uruguay Round agreements and the North American Free Trade Agreement for the U. S. Economy.

The Council was intensely involved in the preparatory work for the Administration's major regional initiatives at the November Asia-Pacific Economic Cooperation (APEC) meeting in Bogor, Indonesia and the December Summit of the Americas in Miami. Dr. Tyson was actively involved in the negotiations under the U.S.-Japan Framework for a New Economic Partnership and in the ongoing examination of U. S. relations with China and its place in the world trading system.

The Council actively participated in the Organization for Economic Co-operation and Development (OECD). The Council led the U. S. Delegation to the OECD's semiannual Economic Policy Committee meetings and the CEA Chair heads the Committee. The Council was also part of the delegation to the OECD Ministerial meetings, which are held once a year. Both of these meetings are held in Paris, France. The Council actively participated in the preparations for the economic summit of the Group of Seven (G-7) nations in Naples.

Dr. Tyson served on the Community Empowerment Board, the committee responsible for implementation of the empowerment zone and enterprise community provisions of the Omnibus Budget Reconciliation Act of 1993.

Dr. Tyson was a member of the Administration's Health Care Task Force, with particular responsibility for assessing the likely economic effects of various reform options.

Dr. Stiglitz chaired the National Science and Technology (NSTC) Subcommittee on Social and Economic Sciences Research under the NSTC Committee on Environment and Natural Resources. He was an active participant in the Intergovernmental Panel on Climate Change. He also participated in an interagency working group formed to assess the condition of the oil and gas industry.

Dr. Tyson and Dr. Stiglitz also played roles in the Administration's reinventing government efforts, particularly with respect to the Departments of Energy, Transportation, and Housing and Urban Development. Dr. Stiglitz continued as co-chair of the sub-group on benefit-cost analysis of the Administration's Regulatory Working Group and co-chaired the working group on reviewing regulation of financial services. Dr. Tyson and Dr. Stiglitz were active in

the Administration's efforts to formulate policy in telecommunications; in June, Dr. Stiglitz supervised the preparation of a Council White Paper, titled "*Economic Benefits of the Administration's Legislative Proposals for Telecommunications.*"

The Council engaged in a number of efforts aimed at improving the Nation's agricultural and resource management policies. With the support of the Vice President's office, the Council and the Office of Science and Technology Policy initiated an interagency working group on bioenergy. This work included the evaluation of the prospective economic viability of bioenergy in future decades and strategies for research, development, and demonstration. The Council, primarily through Dr. Tyson and Dr. Stiglitz, has been a key participant in Administration deliberations on reauthorization of the farm bill.

#### V. 1995:

In 1995, the Council spent a substantial amount of time on budget and tax issues. The Council participated in the preparation of the President's balanced budget proposal. The Council also participated extensively in meetings on a range of budget issues, including Medicare and Medicaid, discretionary spending priorities, the Administration's tax proposals and the elimination of corporate subsidies and loopholes. In addition, the Council participated in consultations with the Congressional Budget Office (CBO) on the economic assumptions that were developed for the 7-year balanced budget plan.

The Council prepared, with the Department of Labor, a report titled "*Educating America: An Investment for Our Future,*" which presented the overwhelming evidence on the beneficial impact of education on our workers and on our economy. The Council also prepared a report titled "*Supporting Research and Development to promote Economic Growth: The Federal Government's Role,*" which describes the Federal role in research and development (R&D) and the importance of R&D investments to economic growth.

The Council was active in the National Economic Council/National Security Council international economic policy process, providing both technical and analytical support and policy guidance. The Council's role included policy development and planning for the G-7 Economic Summit in Halifax, the APEC leaders meeting in Osaka, the Denver Ministerial for the Hemispheric Initiative and the U.S.-EU Summit. The Council also participated at the policy and analytical level in preparation for trade negotiations, including those with Japan on autos and auto parts, and with China on market access and intellectual property.

The Council focused on the impact of international trade and financial developments on overall U. S. economic performance and on U. S. financial markets. The Council has used its expertise on developments in other countries to identify lessons, successes as well as failures, to be gleaned from policy initiatives undertaken elsewhere. The *Weekly Economic Briefing* regularly included articles on international events and issues.

The Council was an active participant in the Administration's Re-inventing Government" effort which has made government agencies more efficient and more performance oriented and has revised and eliminated thousands of pages of regulations.

The Council was involved in efforts to implement comprehensive and procompetitive reform of telecommunications policy. These efforts are reflected in the sweeping new telecommunications legislation passed by the Congress in early 1996. The Council also played an important role in ongoing efforts to restructure INTELSAT, an international satellite consortium, to promote more competition in the market for satellite communications services while preserving universal access to such services.

The Council was active in various issues affecting natural resources and the environment. The Council assisted the Vice President in developing a program for reinventing environmental regulation. As part of that effort the Council helped to develop options for expanding the use of market-based policies for air pollution control. The Council was involved in addressing administrative and legislative changes to the Nation's programs for managing hazardous wastes and cleaning up contaminated sites. The Council also participated in ongoing assessments of policies for addressing climate change. The Council was actively involved in the preparation of the Administration's positions on reauthorization of the Farm Bill and Dr. Martin Baily chaired an interagency group responsible for developing options to fund land acquisition and restoration projects in the Everglades.

Dr. Stiglitz and Dr. Munnell played key roles in assessing the implications of welfare reform policy, including the consequences of block grants. They also participated in the Administration's efforts to anticipate the impact of welfare reform on child poverty rates. In addition, Dr. Munnell participated in working groups on urban policy and initiatives for children.

## VI. 1996

The Council continued to take part in discussions about the President's balanced budget plan.

The Council, together with the Department of Labor, prepared a report titled "*Job Creation and Employment Opportunities: The United States Labor Market, 1993-1996*," which analyzed the American economy's robust employment growth, the nature of the jobs being created, and the incidence of job displacement. This report concluded that over two-thirds (68 percent) of the net job growth in full-time employment between February 1994 and February 1996 occurred in industry/occupation categories that paid above-median wages. The Council also prepared a background report titled "Promoting Economic Growth," which discussed the challenge of increasing the underlying productivity growth rate of the U. S. economy.

The Council was an active participant in the international economic policymaking process through the National Economic Council and the National Security Council, providing both technical and analytic support and policy guidance. The Council engaged in interagency discussions dealing with such topics as U. S. Trade remedy laws (antidumping, countervailing duties, safeguards, and Section 301 actions) the U. S. balance of payments; cross-border investment; international aspects of telecommunications and information technology; integrating Russia, China and other newly market-oriented economies into the world economic order, and

the agendas of multilateral and regional fora such as the World Trade Organization, the Asia-Pacific Economic Cooperation forum, and the North American Free Trade Agreement.

Dr. Stiglitz led a U. S. delegation to the Information Society and Development (ISAD) Conference in South Africa. The ISAD Conference, which followed the 1995 G-7 Ministerial Conference on the Information Society held in Brussels, was designed to extend acceptance of the Global Information Infrastructure principles, first articulated by the Vice President in 1994 to the developing world. Dr. Stiglitz also led a U. S. delegation to China, where he met with top Chinese officials to initiate a dialogue on economic issues between the Council and China's State Planning Commission.

The Council was involved in efforts to implement the 1996 telecommunications reform bill. The Council worked with the Vice President, the National Economic Council and the Departments of Justice and Commerce to develop Administration policies regarding interconnection of telephone competitors. Dr. Timothy J. Brennan, the senior economist on Regulation, Industrial Organization, and Antitrust, participated in economists' forum at the Federal Communications Commission to examine various aspects of allowing local telephone companies to provide long-distance service. The Council also promoted participation in spectrum auctions held by the Federal Communications Commission and played an important role in ongoing efforts to restructure INTELSAT and Inmarsat (the international satellite consortia).

The Council participated in the ongoing assessment of global climate change policies. The Council was also active in discussions on the Superfund program and other issues relating to the management of hazardous wastes. The Council helped assess the reauthorization of the Clean Water Act and the Safe Drinking Water Act and evaluated the drafts of the Environmental Protection Agency's Mercury and Utility reports required by the Clean Air Act Amendments of 1994.

The Council played an important role in agricultural policy reform, most notably the Administration's continuing efforts to implement the 1996 Farm Act. The Council also advised on the operation of agricultural trade programs, including the sugar program and various farm export subsidy programs.

## VII. 1997

The Council continued to take part in discussions about the President's balanced budget plan. The Council also participated in meetings on a range of budget issues including Medicare reform, discretionary spending priorities, and the Administration's tax proposals. The Council participated in discussions regarding proposals to strengthen the Social Security system, and in an interagency effort to develop a package of proposed reforms to the private pension system to promote higher rates of national savings and greater retirement security.

The Council participated in the Working Group on Financial Markets, and interagency group that monitors developments related to financial markets and the banking sector.

The Council continued to be an active participant in the international economic policymaking process through the NEC and the National Security Council. The Council helped assess the economic impact of international sanctions against foreign nations, and the efficacy of relaxing restrictions in the U.S.-Japan civil aviation market. The Council took an active role on a range of other international economic issues, including evaluating and explaining the case for trade liberalization, the Administration's policy approach to Asia's financial turmoil, U. S. trade remedy laws (antidumping, countervailing duties, safeguards, and Section 301 actions) and the agendas of multilateral and regional forums such as the World Trade Organization, the Asia-Pacific Economic Cooperation forum, and the proposed Free Trade Area of the Americas.

The Council played a significant role in preparing both the Administration's *1997 Study on the Operation and Effects of the North American Free Trade Agreement* and the *1997 APEC Economic Outlook*.

The Council was actively involved in the President's Initiative on Race and coordinated a document that presented important indicators of social and economic well being by race and ethnicity for use by a national audience including educators and policymakers.

In May, the Council issued a report titled *Explaining the Decline in Welfare Receipt, 1993 to 1996*.

The Council was involved in White House conferences on early childhood development and childcare. In conjunction with the early childhood development conference, the Council released a white paper titled *The First Three Years: Investments That Pay*.

As a follow-up to the White House child care conference, the Council issued a report titled *The Economics of ChildCare*.

In the areas of regulation and competition policy, the Council helped develop important Administration initiatives to improve the performance of markets, both domestically and internationally. On the domestic front the Council took part in interagency efforts to increase competition in electric power market in a manner consistent with important environmental and social objectives. The Council contributed to the Administration's analysis of whether and how much to reform product liability law, and to discussions of the Federal Communications Commission's methods for pricing telecommunications services. The Council also worked with the Federal Trade Commission, the Department of Justice, and the Department of the Treasury to consider questions raised by the proposed industry-wide tobacco settlement.

The Council took part in the interagency evaluation of National Ambient Air Quality Standards for ozone and particulate matter under the Clean Air Act and the implementation plans for the revised standards. The Council was actively involved in the development and analysis of the Administration's global climate change policy.

### VIII. 1998:

The Council participated in the Working Group on Financial Markets, an interagency group that monitors developments related to financial markets and the banking sector. The group included representatives from the Treasury, the Federal Reserve, the National Economic Council, and various regulatory agencies.

The Council took an active role in developing policies to respond to financial turmoil in Asia, Russia, and Latin America, including, for example, the Asian Growth and Recovery Initiative, designed to accelerate the restructuring of bank and corporate debt in some countries affected by the Asian crisis. The Council also monitored closely the effects of the Asian crisis on U. S. trade. In addition, the Council actively participated in the development of proposals to reform the international financial architecture.

The Council was involved in a range of other international economic issues, including evaluating and explaining the case for trade liberalization, U. S. trade remedy laws (antidumping, countervailing duties, safeguards, and Section 301 actions), sanctions policy, and the agendas of multilateral and regional forums such as the World Trade Organization and the Asia-Pacific Economic Cooperation forum. Dr. Yellen testified before the Senate Finance Committee on the causes and consequences of the U. S. Trade deficit.

The Council continued its annual meetings with the Economic Planning Agency of Japan and the State Development and Planning Commission of China, the Council's counterparts in those countries and began to meet with France's new Council of Economic Analysis. In May of 1998, Dr. Yellen led a delegation of U. S. economic officials, including representatives of the Department of Commerce and Treasury and the Board of Governors of the Federal Reserve System, to China to continue discussions about China's economy and economic reforms. Dr. Yellen also participated in the President's trip to China in June and in November, she traveled to Japan, as part of the President's official visit, to discuss Japan's economy and economic reforms.

The Council continued its active involvement in the President's Initiative on Race. It coordinated the production and release of a document presenting important indicators of social and economic well being by race and ethnicity for use by a national audience including educators and policymakers. The Council helped coordinate a major conference on racial trends in the United States, sponsored by the President's Initiative on Race and organized by the National Research Research Council.

In June 1998 the Council issued a report titled *Explaining Trends in the Gender Wage Gap*. The report concluded that although the gap between women and men's wages has narrowed substantially since the signing of the Equal Pay Act in 1963, a significant wage gap remains, which cannot be explained by differences between male and female workers in labor market experience and in the characteristics of jobs they hold.

In the areas of regulation and competition policy, the Council helped develop important Administration initiatives to improve the performance of markets, both domestically and internationally. On the domestic front the Council provided background information for and participated in a review of merger effects and related policy issues, and participated in interagency reviews of competition and pricing in various sectors of the transportation market. The Chair testified before the Senate Judiciary Committee on the economic impact of mergers in the United States. The Council also participated in a working group on consumer privacy policy and in another group on natural disaster insurance. The Council worked to consider questions raised by proposed tobacco legislation. It was also engaged in issues related to the privatization of the U. S. Enrichment Corporation.

The Council was active in discussions on natural resources and the environment, including implementation of the Clean Air Act, as it applies to automobiles, power plants and other pollution sources. It was involved in the development and analysis of the Administration's global climate change policy. After the negotiation of the Kyoto Protocol, the Council responded to requests from the Congress and the public to analyze the economic impact of the climate change agreement. The Council led the preparation and release of the Administration's economic analysis, titled *The Kyoto Protocol and the President's Policies to Address Climate Change: Administration Economic Analysis*, which was released in July. Dr. Yellen testified on six occasions before several House and Senate committees regarding the Administration's findings. The Council has been active in developing and promoting plans for the international trading of emissions permits and other market mechanisms to achieve the targets of the Kyoto Protocol most efficiently. To advance these plans, Members and staff traveled to and consulted with officials from Argentina, China, France, and the Republic of Korea.

#### IX. 1999:

The Council took an active role in developing policies to respond to financial turmoil in Latin America and elsewhere, continuing the role it has taken following the series of emerging market financial crises that began in 1997. The Council also monitored closely the effects of the Asian crisis on U. S. trade and actively participated in developing proposals to reform the international financial architecture.

The Council played an important role in evaluating and explaining the case for trade liberalization and U. S. participation in the multilateral trading system. Its involvement included writing a white paper on *America's Interest in the World Trade Organization*. The Council was also involved in a range of other international economic issues, including U. S. trade remedy laws (antidumping, countervailing duties, safeguards, and Section 301 actions) and sanctions policy. Dr. Lawrence testified before the Trade Deficit Review Commission of the Senate on the causes and consequences of the U. S. trade deficit.

Council members regularly met with representatives of the Council's counterpart agencies in foreign countries, as well as with foreign trade ministers, other government officials and members of the private sector. The Council often represents the United States at international meetings and forums, such as meetings of the Economic Committee of the Asia Pacific.

The Council continued to be a leading participant in the Organization for Economic Cooperation and Development (OECD), the principal forum for economic cooperation among the high-income industrialized countries. The Council heads the U. S. delegation to the semiannual meetings of the OECD's Economic Policy Committee. Dr. Lawrence participated in the OECD's Working Party 3 on macroeconomic policy and coordination. Charles F. Stone, Chief Economist at the Council, participated in the OECD's Working Party 1 meeting on structural issues and attended the OECD's workshop "Making Work Pay". Dr. Lawrence also participated in a meeting of suburbanite officials from the United States and Japan and was a member of the Joint Economic Development Group meeting with the Israeli government.

The Council was actively involved in reviewing and analyzing progress in the telecommunications industry and other growing sectors of the digital economy. The Council was active in ongoing interagency discussions involving the digital economy and took a leading role in facilitating work on the topic. Work included reviewing and improving data collection activities to better assess the growth of electronic commerce; participation in the new OECD Growth Project initiated at the May 2000 meeting of the OECD Council at the Ministerial level; and economic analysis of policy-related costs and barriers to electronic commerce.

The Council also participated actively in interagency discussions on regulation and competition policy. On the Domestic front, the Council was involved in discussions about merger policy, rail policy regarding interconnections, and the performance of agricultural markets. Discussions regarding regulatory reform in the broadcast industry and in the air traffic control system was also ongoing as was the monitoring of issues related to the privatization of the U. S. Enrichment Corporation. The Council was also actively involved in several issues relating to international regulation and competition, including the effects of gray market imports, and has undertaken interagency discussions regarding the role of competition policy in the World Trade Organization.

The Council was active during 1999 in a range of policy discussions on natural resources and the environment, including implementation of the Clean Air Act as it applies to automobiles, petroleum refineries, power plants, and other pollution sources. Council Members and staff participated in several Administration efforts to assess oil supply issues, including the effects of oil imports on the U. S. economy and planning for potential Y2K oil supply disruptions. The Council has also contributed to Administration initiatives on national forest management.

The Council continues its involvement in the analysis of the Administration's global climate change policy, and Dr. Yellen testified on two occasions before Senate and House committees on the economic implications of the Kyoto Protocol. At a high-level OECD meeting on Climate change, Dr. Lawrence participated in a discussion on developing country participation in the Kyoto Protocol. The Council was active in developing and promoting plans for the international trading of emissions permits and other market mechanisms to achieve the protocol's targets as efficiently as possible. It also worked with a number of developing countries to identify opportunities for them to further contribute to the global effort to address climate change. To advance these plans, Members and staff consulted with officials from a number of these countries and organizations, including Argentina, Australia, Bolivia, Canada,



China, Colombia, the European Union, Japan, Kazakhstan, Mexico, the OECD, and the Russian Federation. In addition, the Council evaluated trends in U. S. carbon dioxide emissions and participated in Administration efforts to promote energy efficiency in the Federal Government.

#### X. 2000

The Council took part in discussions on a range of macroeconomic issues, with particular focus on the markets for energy and capital. The Council engaged in discussions with other agencies concerning pressures in the market for oil and quantifying possible effects for the U. S. economy. The Council continued to participate in the President's Working Group on Financial Markets, an interagency group that monitored developments related to financial markets and the banking sector. In 2000 this group emphasized continuing deregulation of capital markets, increasing international harmonization across markets, and regulation of new financial instruments. The Council continued to study a range of budget and tax issues, including the positive effects of continued fiscal discipline for the economy. The Council worked closely with OMB, Treasury, the Federal Reserve, NEC, as well as other government agencies in providing analyses to the Administration on these topics of concern.

Over the past year, the Council released several research papers on microeconomic policy issues.

In April 2000, the Council released a report titled *The Uses of Census Data: An Analytical Review*. This report examines the many ways that Census Bureau data is used by the Federal government, state and local government, business users, community groups, individuals, and academic researchers.

In May 2000, the Council released a report titled *Teens and Their Parents in the 21<sup>st</sup> Century: An Examination of Trends in Teen Behavior and the Role of Parental Involvement*. This report analyzes key trends in teen behavior and demonstrates that teens are more likely to maximize opportunities and avoid risks when parents are involved in their lives.

Also in May 2000 the Council released a report titled *Opportunities and Gender Pay: Equity in New Economy Occupations focusing on women in IT occupations*. The report finds that careers in five key rapidly growing IT-related occupations provide excellent pay for both men and women. However, the report shows that important employment and pay gender gaps exist in these IT occupations, and concludes that policies that assist young women in their career development, such as on-the-job training and mentoring, could help close these gender gaps.

In June 2000, the Council released a report titled *Educational Attainment and Success in the New Economy: An Analysis of Challenges for Improving Hispanic Students' Achievement*. It documents the gaps in educational outcomes between Hispanics and non-Hispanic whites. The study also provides evidence about the increasing importance of education in the economic success of Hispanics in the new economy.

In September 2000, the Council released a report titled *Reaching the Uninsured: Alternative Approaches to Expanding Health Insurance Access*. The report evaluated the

efficacy and efficiency of tax deductions, tax credits and government provided health care in expanding health insurance coverage. The report found that direct provision of health insurance through public programs is the most efficient way of expanding health insurance to low-income families.

The Council also released a report titled *The Economic Impact of Third-Generation Wireless Technology*. This report documented the expected benefits on a new generation of wireless technologies that provided high-speed mobile access to the Internet and other communications networks, and explained why adequate spectrum is needed to provide these services efficiently. The report was released in conjunction with a Presidential Memorandum directing Federal agencies to work together with the private sector to identify suitable spectrum for these new services.

In December 2000, the Council release a report titled *Philanthropy in the American Economy*. This report was requested by the President as a follow-up to the *1999 White House Conference on Philanthropy*. It discusses trends in giving over the past several decades and highlights the economic explanations behind the increase in donations. It finds that increases in both the income and wealth of Americans played significant roles in the record high level of philanthropy recorded in 1999. The report concludes with a discussion of opportunities to increase giving further in coming years.

The Council also participated in Administration working groups on several issues. The Council provided analytical assistance to the National Economic Council (NEC) for a report on the minimum wage. The Council participated in the review of the Occupational Safety and Health Administration's proposed workplace ergonomic rules. The Council also worked with the Department of Health and Human Services and OMB in preparing an economic Impact analysis of the potential need for setting standards covering the electronic transmission of many administrative and financial transactions between insurers, providers and other health care institutions. The Council's economists participated in a series of inter-agency working groups focusing on the Administration's New Markets initiatives to create opportunity in impoverished communities and the President's Interagency Task Force on Nonprofits and Government. Additionally, the Council participated in a working group, organized by the Office of the Vice President, to coordinate Federal Empowerment Zone and Enterprise Communities activities. In June 2000, the Community Empowerment Board held its annual conference on Community Empowerment, and Council member Kathryn Shaw attended and spoke in a breakout session.

The Council also participated actively in interagency discussions on regulation, privatization, and competition policy. Domestically the Council was involved in discussions related to mergers, telecommunications policy, air traffic control, airline reservation systems, and the effects of government ownership on competition. The Council also continued to participate in the Digital Working Group, to discuss such issues as business-to-business electronic commerce and the role of venture capital in fostering innovation.

The Council continued its annual meetings with the Economic Planning Agency of Japan and the State Development and Planning Commission of China, the Council's counterparts in

those countries. The Council also met with Members of the State Council Office for Restructuring the Economic System (SCORES) Delegation to discuss how information flowed in a market economy. The Chairman of the Council continued to chair the Economic Policy Committee meetings of the OECD and continued to be a part of the U. S. Delegation to the OECD's Ministerial meetings. Dr. Kathryn Shaw participated in the Working Party 1 meetings of the OECD while Dr. Robert Lawrence participated in the Working Party 3 Meetings as well as the Economic Development Review Committee (EDRC). The Chairman participated in a brainstorming session hosted by the Prime Minister's office on the New Economy in the United Kingdom and continued his regular, high level contacts with senior economic policy makers in the U.K. Dr. Baily being the highest-ranking British-born member of the Administration and the only Cabinet Member who was a naturalized immigrant from Britain was a natural to accompany the President on his trip to the United Kingdom and Ireland to advise the President on economic issues and set up meetings with Irish and UK economic policymakers. This was one of the Chairman's final acts in this Administration, the other being the publication of the 2001 *Economic Report of the President*.

#### XI. Legislative Relations

The Council maintained a working relationship with the Legislative Branch and the Chair/Chairman testified before the various Senate and House Committees or Subcommittees whenever they were requested to do so. The Council also responded to numerous requests for documents on the Administration's analysis of the economic effects of global climate change. The Council made every effort to respond as quickly and efficiently as possible. The Chairman, Dr. Janet L. Yellen was asked and did testify thirteen (13) times before various House and Senate Committees on this subject. Copies of the testimony are listed as Appendix B. It was virtually the same testimony before each committee.

#### XII. External Relations

In 1993 the Council worked to improve the public's understanding of economic issues and the quality of economic information through regular briefings with the White House financial and general press corps, periodic discussions with distinguished outside economists. And meetings with leading business executives. The Chair and the other Members made numerous presentations to outside organizations to explain the Administration's economic strategy and policies.

In 1994, the Council established the President's Economic Policy Advisory Board, comprised of distinguished academic and other private sector economists. Members of the Board are recognized scholars in the fields of international trade, macroeconomics, microeconomics, labor markets, and financial markets. The Board met approximately every 6 months to advise the Council and other high-ranking members of the Administration's economic policy team on current policy issues. The Members of the Board were: Henry Aaron, The Brookings Institution; Carliss Baldwin, Harvard Business School; Rudiger Dornbusch, Massachusetts Institute of Technology; Jeffrey Frankel, Institute for International Economics;

Paul Joskow, Massachusetts Institute of Technology; Charles Schultze, The Brookings Institution and Robert M. Slow, Massachusetts Institute of Technology.

In 1999, the Council met with policy analysts of the AFL-CIO to share their understanding of the state of the manufacturing sector and its importance to the economy. There were also discussions on why manufacturing was important to the economy and policies to aid the manufacturing sector.

Selected speeches by Chairs, Laura D'Andrea Tyson, Joseph E. Stiglitz, Janet L. Yellen and Martin N. Baily are listed in Appendix C.

Appendix A  
Appendix B  
Appendix C

## Appendix A

- June 14, 1994 – Economic Benefits of the Administration's Legislative Proposals for Telecommunications.
- October 1995 – Supporting Research and Development to Promote Economic Growth: The Federal Government's Role.
- November 9, 1995 – U. S. Trade Policy with Japan: Assessing the Record
- September, 1995 – Educating America: An Investment for Our Future
- October 1995 – To "Save" One Dollar...
- April 10, 1996 – U. S. Trade Policy with Japan: Assessing the Record
- April 23, 1996 – Job Creation and Employment Opportunities: The United States Labor Market, 1993 – 1996
- July 31, 1996 – Promoting Economic Growth: Background Briefing Paper
- September 1996 – The NAIRU as a Policy Target: Refinements, Problems and Challenges
- April 17, 1997 – The First Three Years: Investments that Pay
- May 9, 1997 – Explaining The Decline in Welfare Receipt, 1993-1996
- December 1997 – The Economics of Child Care
- June 1998 – Explaining Trends in the Gender Wage Gap
- The Kyoto Protocol and the President's Policies to Address Climate Change: Administration Economic Analysis
- September 1998 -- Changing America: Indicators of Social and Economic well being by Race and Hispanic Origin.
- December 1998 – Good News for Low Income Families: Expansion in the Earned Income Tax Credit and the Minimum Wage
- January 8, 1999 – Latest Jobs Report Indicates That the Current Expansion Has Achieved Record Length

- February 8, 1999 – Progress Report: Growth and Competition in U. S. Telecommunications 1993 – 19998
- May 1999 – Families and the Labor Market; 1969-1999: Analyzing the “Time Crunch”
- August 3, 1999 – The Effects of Welfare Policy and the Economic Expansion on Welfare Caseloads: An Update
- November 16, 1999 --America’s Interest in the World Trade Organization: An Economic Assessment
- December 3, 1999 – 20 Million Jobs: January 1993—November 1999
- April 1, 2000 – The Uses of Census Data: An Analytical Review
- May 11, 2000 – Opportunities and Gender Pay Equity in New Economy Occupations
- May 2000 – Teens and Their Parents in the 21<sup>st</sup> Century: An Examination of Trends in Teen Behavior and the Role of Parental Involvement.
- June 15, 2000 – Educational Attainment and Success in the New Economy: An Analysis of Challenges for Improving Hispanic Students’ Achievement.
- September 2000 – Reaching The Uninsured: Alternative Approaches to Expanding Health Insurance Access
- October 2000 – The Economic Impact of Third-Generation Wireless Technology
- November 25, 2000 – Philanthropy in the American Economy

## Appendix B

### **Laura D'Andrea Tyson testified before the following committees:**

- February 22, 1993 --Testified before the Joint Economic Committee re the President's Economic Plan.
- March 16, 1993 --Testified before the House Science, Space & Technology Committee, Subcommittee on Technology, Environment & Aviation re Trade Policy and Technology Policy.
- May 20, 1993 --Testified before the Senate Labor & Human Resources Committee re Health Care Costs and the Economy.
- June 21, 1993 --Testified before the Joint Economic Committee re Technology Policy and Economic Competitiveness.
- October 21, 1993 -- Testified before the House Committee on Education & Labor, Subcommittee on Labor-Management Relations.
- October 26, 1993 -- Testified before the Senate Committee on Banking, Housing, and Urban Affairs re Fair Trade in Financial Services Act.
- February 10, 1994 -- Testified before the Senate Committee on the Budget re the economic outlook.
- February 7, 1995 --Testified before the Committee on the Budget, United States Senate

### **Chair Janet L. Yellen testified before the following committees:**

- July 15, 1997 -- Testified before the House Commerce Subcommittee on Energy and Power re economics of global climate change.
- June 11, 1998 -- Testified before Senate Finance Committee on Trade.
- June 16, 1998 -- Testified before the Senate Committee on the Judiciary on Mergers.

## Appendix C

### **Selected Speeches given by Chair Laura D'Andrea Tyson are listed below:**

- February 14, 1994 – Speech before the Center for National Policy on the release of the Economic Report for 1994.
- May 30, 1996 – Women's Economic Summit

### **Selected Speeches given by Chairman Joseph E. Stiglitz before various organizations**

- September 23, 1995 – Speech to USA-ROC Economic Council Plenary Session, Anchorage, Alaska
- October 8, 1995 – Speech to Institute of International Finance re G-7
- February 15, 1996 – Speech to Brookings Institution on Tax Reform
- February 26, 1996 – Speech to Yeshiva University
- April 26, 1996 – World Bank Speech
- May 13, 1996 – Speech at ISAD Conference, South Africa

### **Selected speeches given by Janet L. Yellen**

- April 10, 1997 – National Policy Association
- April 18, 1997 – French-American Chamber of Commerce of Washington, D. C.
- May 19, 1997 – Center for National Policy "Squaretable" Washington, D. C.
- May 20, 1997 – Eli Segal Breakfast – Making Welfare Work
- September 11, 1997 – Smith-Barney Washington Conference
- December 2, 1997 – USA-ROC Economic Council Plenary Session
- January 14, 1998 --Racial and Ethnic Economic Inequality: How much Progress?
- February 10, 1998 – Center for National Policy



**Selected speeches given by Martin N. Baily**

- September 2, 1999 – American Association for the Advancement of Science
- February 10, 2000 – Center for National Policy
- June 28, 2000 – Speech on New Economy in Munich, Germany



EXECUTIVE OFFICE OF THE PRESIDENT  
COUNCIL OF ECONOMIC ADVISERS  
WASHINGTON, D.C. 20500

**Economic Benefits of the  
Administration's Legislative Proposals  
for Telecommunications**

**June 14, 1994**

Economic Benefits of the Administration's  
Legislative Proposals for Telecommunications

June 14, 1994

Summary

The Administration's legislative proposals have the potential to add in cumulative value more than \$100 billion (in 1994 dollars) to Gross Domestic Product (GDP) over the next decade.

New legislation can add to GDP by creating a regulatory environment in which the following trends will accelerate:

- Productivity will increase throughout the economy as new ways of working, new ways of doing business, and valuable new services are developed.
- Jobs and other resources will shift into the telecommunications and information sector as regulatory barriers are removed. The productivity of a new job in this sector exceeds the economy-wide average.
- Increased private sector investment in an advanced telecommunications infrastructure will create a short-term increase in aggregate demand, accelerating the rate at which the economy approaches full employment.

The new regulatory environment will accomplish this by:

- reducing uncertainty about the course of regulation
- promoting competition throughout the telecommunications and information industries, and
- providing a mechanism for removing existing regulatory restrictions as the development of competition makes them unnecessary.

With the Administration's legislative proposals, the telecommunications and information sector of the economy could nearly double its share of GDP by 2003.

If this occurs, employment in the sector could rise from 3.6 million workers today to more than 5 million workers in 2003. Most of these jobs would be shifted from other economic sectors in a full-employment economy.

To the extent enactment of the Administration's legislative proposals stimulates an acceleration of private investment, and if the economy remains below full employment through 1996, the economy as a whole could add a total of 500,000 new employment opportunities during the years 1994 to 1996.

To improve the nation's emerging National Information Infrastructure (NII) with technologies that enhance existing telephone and cable television services, the private sector may make capital investments over the next decade valued substantially in excess of \$75 billion (in 1994 dollars). These investments will occur earlier with the Administration's legislative proposals than without.

## Economic Benefits of the Administration's Legislative Proposals for Telecommunications

June 14, 1994

In September 1993, the Administration announced a National Information Infrastructure Initiative (NII) to "help unleash an information revolution that will change forever the way people live, work, and interact with each other." To accomplish this end, Vice President Al Gore has proposed legislative and administrative reform of telecommunications policy. The Administration's proposals are based on the following five principles:

- encouraging private investment in the NII,
- promoting and protecting competition,
- providing open access to the NII for consumers and service providers,
- preserving and advancing universal service to avoid creating a society of information "haves" and "have nots," and
- ensuring flexibility so that the newly-adopted regulatory framework can keep pace with the rapid technological and market changes that pervade the telecommunications and information industries.

This document illustrates the great economic benefits to the nation that could be achieved through new legislation to accomplish these ends.

### I. The Potential for Economic Growth

The telecommunications industry plays a crucial role in our economy. Like the railroad and highway infrastructures built in earlier generations, our telecommunications infrastructure brings people together and helps firms reach their customers and suppliers quickly and cheaply. As a result, our lives are enriched and our firms and workers are more productive.

Even without new legislation, the vast opportunities created by advances in communications and information technology will likely transform the economy and the way we live and work.<sup>1</sup>

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<sup>1</sup>The analogy to the railroad and highway networks may not be helpful in understanding the effect of the NII on industrial structure. The transportation network encouraged the development of large industrial firms by making it easier to obtain scale economies. In contrast, an advanced communications network may particularly favor small firms serving narrow market niches.

Innovation in the telecommunications and information sector is already occurring at a rapid rate. In the past decade, the facsimile machine has shifted from a curiosity to a commonplace, and the cellular telephone does not lag far behind. Television news is now transmitted instantaneously from the field to the studio by satellite. Internet use is moving beyond government and academic researchers to involve other government functions, private individuals and private sector firms as well. The number and variety of cable television channels has been growing. More and more, people work from home or the road by computer and modem, away from their physical office. The power and sophistication of personal computers in homes and offices, and what can be accomplished using them, has grown by leaps and bounds.

It is widely recognized that equally important advances in technology are on the horizon. Technical change will permit private industry to make new products and services available and affordable.<sup>2</sup> We can be confident that a telecommunications and information revolution is upon us, even though we do not yet know the details. Two way, interactive, broadband service will someday be the norm, although we cannot now know whether the emerging broadband network will be formed from wires, fiber optic lines, wireless technologies, or hybrids of these alternatives. And we can be confident that the computing power available to consumers of the multimedia services provided by the emerging information infrastructure will rise, even though we cannot predict whether that power will be lodged in a server outside the house or office, or in the home and office through a personal computer or a set top box connected to a television.

The Administration's legislative proposals will accelerate the rate at which the telecommunications and information revolution arrives in three ways: by reducing uncertainty about the course of regulation, by promoting competition throughout the telecommunications and information industries, and by providing a mechanism for removing existing regulatory restrictions as the development of competition makes them unnecessary. Private industry will be encouraged to invest more rapidly in the nation's emerging information infrastructure, and to develop new services more rapidly. The legislative proposals also reduce the likelihood that regulation will distort the choice of technology or other investment decisions. These effects on private investment, combined with the price reductions that will flow from new entry and greater competition, will accelerate the

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<sup>2</sup>Separately from its legislative proposals for regulatory reform, the Administration is funding a wide range of research and development projects, many in collaboration with industry, to improve the information infrastructure and develop improved applications.

development of new services, the creation of new jobs, and the growth of productivity for the rest of the economy.

The precise contours of the new telecommunications and information marketplace cannot be predicted because they depend on innovations not yet developed and the details of legislation not yet enacted. Because of these uncertainties, it is qualitatively more difficult to forecast the development of this sector, and the consequences of regulatory reform legislation for economic growth, than to predict, for example, the consequences for GDP of changes in the tax code or the monetary base. Accordingly, the estimates provided in this document are not comparable to the economic forecasts routinely published by the Administration. The estimates depict one plausible scenario for the development of the telecommunications and information sector, and the effects of new legislation on that development. They should be interpreted as illustrative of the character of the likely economic consequences of the new legislation rather than as a forecast of those consequences.

## II. Methodology and Results

### A. Baseline Scenario

The CEA estimates were made against a baseline description of the likely growth of revenues in the telecommunications and information sector in the absence of the Administration's legislative proposals. The baseline scenario was developed from recent trends, and private sector and government estimates.<sup>3</sup>

In making these estimates, the telecommunications sector was divided into three major components: (1) "conduit" (local and long distance telephone; cable television; wireless services; emerging services that combine data, voice and image transmissions; multimedia services such as pay per view and videoc on demand; and communications equipment), (2) "content" (broadcast television and radio, newspapers and magazines, motion pictures and home video, books and prerecorded music), and (3) "computers" (computer hardware and software, and computing and

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<sup>3</sup>If sector prices fall more rapidly than expected as a result of competition and innovation, and if the lower prices do not immediately lead to a substantial increase in demand, sector revenues could be significantly less than described in the scenario in the near term. Yet if sector prices are lower than expected because of cost-saving innovations, GDP growth would likely be greater in the long run.

data processing services).<sup>4</sup> In the baseline scenario, these sectors will experience significant growth in the next decade (Figure 1).

A similar baseline was created for investment in the telecommunications services component (the "conduit" category) (Figure 2). Some of this investment is needed to maintain the existing level of service when equipment breaks or becomes obsolete, or when population grows. The rest will make available the enhanced telecommunications services (e.g. switched broadband services, tele-medicine, and expanded electronic commerce) and the new information services (e.g. real-time multimedia services, electronic dissemination of government information, and "virtual" field trips for school children) that will be available on the information superhighway of the future. The bulk of the investments needed to do so will be put into place by 2003, in the baseline scenario.<sup>5</sup>

Only a portion of the investment depicted in Figure 2 will be dedicated to the development of enhanced services. This portion can be estimated by subtracting the current level of accounting depreciation recorded by the providers of telecommunications services--a measure of the real investment level required to maintain existing services--from the projected gross investment levels. Applying this methodology, the present value of these incremental capital investments over the next decade is approximately \$75 billion in 1994 dollars.<sup>6</sup> This is

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<sup>4</sup>These definitions exclude some activities that other definitions of the telecommunications and information sector have included. For example, the "content" component excludes commercial printing and greeting cards, and the "computers" component excludes consumer electronics other than communications equipment.

<sup>5</sup>The estimates illustrated in Figure 2 do not account for investments made by firms in the "content" or "computers" segment of the telecommunications and information sector, nor investments by firms elsewhere in the economy that will obtain access to new markets and new ways of providing their services from the creation of the NII. These figures also do not account for human capital investments in education and training, as workers learn to use the NII to become more productive.

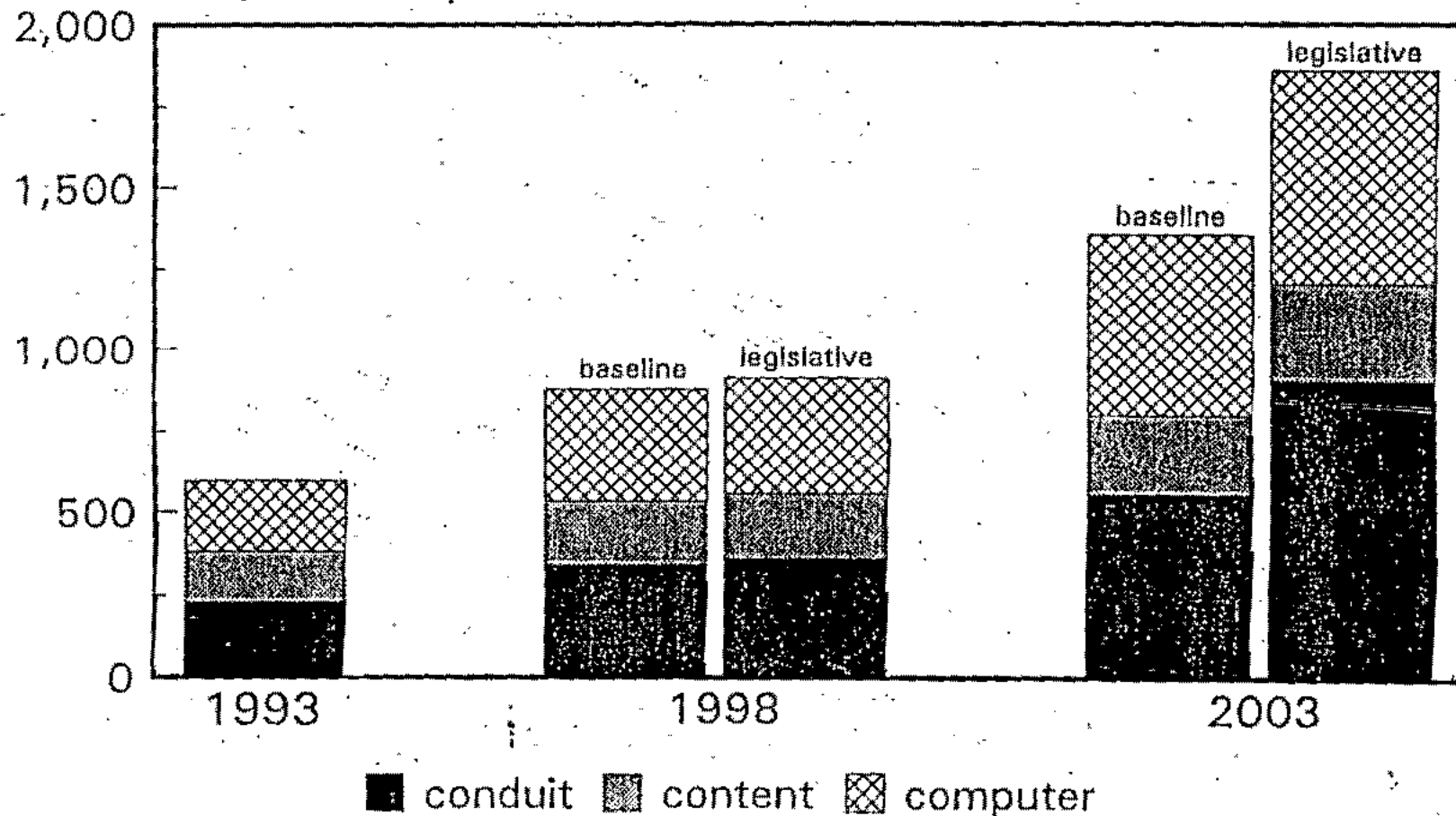
<sup>6</sup>This figure assumes that the transmission infrastructure will be built as a hybrid combination of fiber optic lines, coaxial cable, copper telephone wire, and wireless transmission. If this portion of the new infrastructure were instead to be built entirely of fiber optics, replacing rather than upgrading the existing telecommunications network, the total cost could easily exceed \$100 billion, according to private sector



Figure 1

# Baseline and Legislative Scenario Revenues

Revenues (billions of dollars)

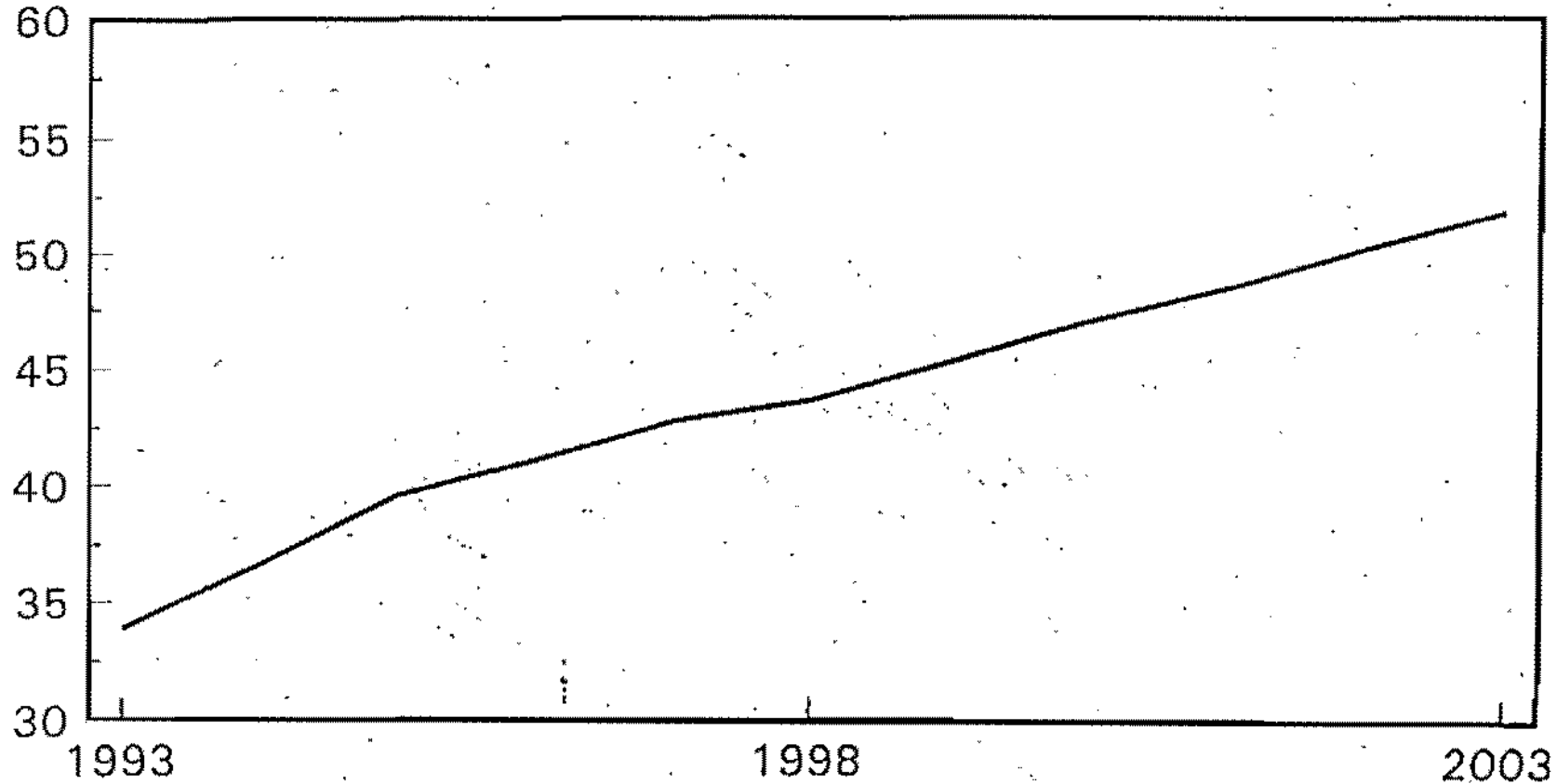


CEA Estimates

Figure 2

# Telecommunications Services Sector Investment Baseline Scenario

billions of dollars



CEA Estimates

likely an underestimate of the total cost of providing advanced services because it ignores investments firms have already made and it ignores those investments that the baseline scenario contemplates would not be made until after 2003.<sup>7</sup>

#### B. Legislative Scenario

The effect of the legislative package can be understood as allowing the telecommunications and information sector to achieve certain revenue levels years earlier than under the baseline scenario, and this is how it is modeled here. The legislative projections, illustrated in Figure 1, assume that the "conduit" and "content" industries in the telecommunications and information sector will achieve by 2003 revenue levels that they would not reach until 2008 in the baseline, and that the "computer" industries will achieve by 2006 revenue levels they would not otherwise reach until 2008.<sup>8</sup> Moreover, the projections assume that revenues do not begin to respond to new legislation until 1998. This assumption, which may be conservative, reflects the time that may be needed for firms to adjust capital spending to the new regulatory framework and for regulators to develop the rules necessary to implement the new legislation.

Similarly, the legislative package is assumed to accelerate

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estimates.

<sup>7</sup>This figure is an overestimate, however, to the extent some investments will turn out to have been spent on technological dead ends or otherwise wasted.

<sup>8</sup>The assumption that new legislation to remove regulatory barriers and encourage competition will accelerate revenue growth in this manner is broadly consistent with the predictions of a recently-conducted "Delphi survey." The respondents agreed, for example, that by 1998-2000 interactive multimedia services and products will have widespread consumer acceptance in the home. The survey found that this transformation will occur five to twenty years sooner than most other projections for the growth of the information superhighway. The respondents also agreed that business and regulatory barriers, not technology, are the most critical problems for the deployment of the necessary technologies. These results appear consistent with the modeling strategy adopted here: they suggest that new legislation to remove regulatory barriers and encourage competition will accelerate sectoral growth and investment, relative to forecasts based on current trends. Dwight L. Allen, Jr., H. William Ebeling, Jr., and Lawrence W. Scott, "Perspectives on the Convergence of Communications, Information, and Entertainment: Speeding Toward the Interactive Multimedia Age," Deloitte & Touche, 1994, pp. 13-14.

the rate of private sector investment in the narrowly-defined telecommunications industry. The estimates assume that 40 percent of the infrastructure investment made between 2001 and 2003 in the baseline case will instead be put into place between 1994 and 2000 with new legislation. The 40 percent figure recognizes the difficulty of accelerating investment that replaces depreciated capital stock and investment that cannot be put into place until other investments have been made. Under these assumptions, private investment will become \$9 billion greater each year than the baseline projects (except half that amount in 1994).<sup>9</sup>

### C. Consequences for GDP Growth

By accelerating private investment in the information infrastructure and accelerating the availability and development of new services, GDP will increase. The three transmission mechanisms involved are discussed in turn.

#### 1. Multiplier Effect of Increased Investment

Every dollar of increased domestic investment before the year the economy is projected to reach full employment is assumed to increase GDP by \$1.60 during the year it occurs. This multiplier is consistent with the predictions of most large-scale macroeconomic models for periods in which the economy is below full employment. In recognition of the leading position of U.S. manufacturers in producing the sophisticated capital equipment required to build an advanced telecommunications infrastructure, the analysis treats all such investment spending as domestic.

#### 2. Shifting Inputs into a High Value-Added Sector

A new job in the telecommunications and information sector will produce greater output per labor input than the average new job in the economy. Thus, when the economy shifts inputs, especially workers, into this high value-added sector, national wealth increases even at full-employment. This cannot happen today because regulation restricts entry and otherwise creates distortions limiting sector output. Much of that regulation was necessary in the past in order to prevent the even worse distortions resulting from the exercise of market power by a natural monopolist. But as developments in technology shrink the scope of potential monopoly power in telecommunications, and as

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<sup>9</sup>The projections assume that new legislation will not begin to affect private investment decisions before mid-1994. This assumption is conservative to the extent investment has already begun to accelerate in anticipation of the legislative enactment.

regulatory reforms encourage the development of competition,<sup>10</sup> the economy can shift resources into this more productive sector, and so increase social wealth.<sup>11</sup>

The GDP projections assume, based on the results of a recent academic study,<sup>12</sup> that labor inputs will initially produce approximately 10 percent more output if shifted from the average sector into "conduit,"<sup>13</sup> approximately 3 percent more output if shifted into "computers," and no additional output if shifted into "content." These estimates are conservative to the extent workers shifting to the new jobs would come disproportionately from sectors of the economy with below average value added. The projections also assume that non-labor inputs would become more productive if shifted into the telecommunications and information sector to the same degree as workers.

The benefit derived from the additional shift of economic activity into the telecommunications and information sector (relative to the baseline case) that will result from the Administration's legislation is assumed to begin in 1998. As regulatory distortions are removed and resources shift into this sector, however, the sector's productivity advantage will decline. This decline is assumed to occur at a rate that would end the productivity advantage of the telecommunications and information sector by 2008.

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<sup>10</sup>The Administration's legislative proposals will encourage the development of competition by, for example, allowing cable firms to offer telephone service and vice versa, unbundling local telephone services, creating a level playing field for all service providers (including wireless providers), guaranteeing all providers open access to the network on nondiscriminatory terms, and ending rate regulation of firms lacking market power.

<sup>11</sup>More technically, the marginal productivity of labor and other inputs in this sector is higher than the economy-wide average because regulation intended to protect against monopoly abuses cannot perfectly substitute for competition. Legislation that encourages greater competition and the removal of unnecessary regulation will allow inputs to shift into this sector, increasing social wealth.

<sup>12</sup>William T. Dickens, "Good Jobs: Increasing Worker Productivity with Trade and Industrial Policy," working paper, University of California, March 11, 1992.

<sup>13</sup>This figure is for the conduit component excluding telecommunications equipment; the initial productivity gain for shifting resources into telecommunications equipment is taken to be only 8.4%.

### 3. Greater Economy-Wide Productivity

The new information infrastructure will boost the economy's productivity.<sup>14</sup> Productivity gains arise for at least two reasons: geographically distant firms will be able to behave in more ways as though they were neighbors, and changes in the innovation process arising from new ways of working will increase the likelihood of future innovations. If the investments that will develop the NII are accelerated, so services come on line more quickly than in the baseline case, these productivity gains will commence more quickly than under the baseline scenario.

The GDP estimates below assume that a productivity boost from the new infrastructure begins in 1998 under the Administration's legislation. The incremental productivity gain is assumed to be 0.03 percent per year, commencing in 1998. This figure is consistent with other estimates of the productivity gains from infrastructure investments, and excludes productivity gains already captured by virtue of the shift of workers to high value-added industries.

The productivity rate is assumed to revert to the baseline trend between 2000 and 2008. This treatment of the productivity increase is conservative because it ignores the possibility that the productivity rate increase will instead persist.

### 4. GDP Projections

Taking into account all three transmission mechanisms, the new legislation is projected to create a stream of annual GDP increases over the next decade with a present value of more than \$100 billion. More than \$30 billion of the increases will come from the multiplier effect of increased investment. Economy-wide productivity increases account for more than half of the remainder.

#### D. Consequences for Employment

An increase in GDP that takes place when the economy is operating below full employment will create new jobs. (In contrast, no new jobs are available at full employment even if

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<sup>14</sup>Productivity gains of this sort are plausible. For example, one study found a large social gain to computerization in the finance services industry not captured by the manufacturers of computers. The downstream benefits of technical progress in mainframe computers between 1958 and 1972 were estimated as at least 1.5 to 2 times the level of expenditures in this sector. Timothy F. Bresnahan, "Measuring the Spillovers From Technical Advance: Mainframe Computers in Financial Services," *American Econ. Review*, vol. 76, 1986, pp. 742-55.

GDP rises.) Based on the predictions of large-scale macroeconomic models, one billion dollars of new GDP created by putting unused resources to work is assumed to create 17,000 to 20,000 new jobs. As a result, the economy as a whole could add a total of 500,000 new employment opportunities during the years 1994 to 1996:

#### E. Growth and Employment within the Telecommunications and Information Sector

The rapid growth projected for telecommunications and information sector revenues will lead the sector to grow as a fraction of GDP. Figure 3 depicts the growth of inflation-adjusted revenues for this sector under the baseline and legislative scenarios.<sup>15</sup> In 1993, telecommunications and information revenues equaled more than 9 percent of GDP.<sup>16</sup> With the Administration's legislative proposals, the sector's GDP share could nearly double between 1993 and 2003.

In 1993, 3.6 million workers were employed in the telecommunications and information sector. Under the baseline scenario, assuming that recent trends in the growth of sector revenues per employee (average labor productivity) continue, the sector will employ more than 4.5 million workers in 2003. Acceleration of revenue growth (and acceleration of labor productivity growth) in the legislative scenario will lead the sector to employ up to 5.5 million workers in 2003.

#### F. Foreign Trade in the Telecommunications and Information Sector

Neither the baseline nor the legislative scenario fully captures the potential benefits to the telecommunications and information sector, or the U.S. economy as a whole, from the

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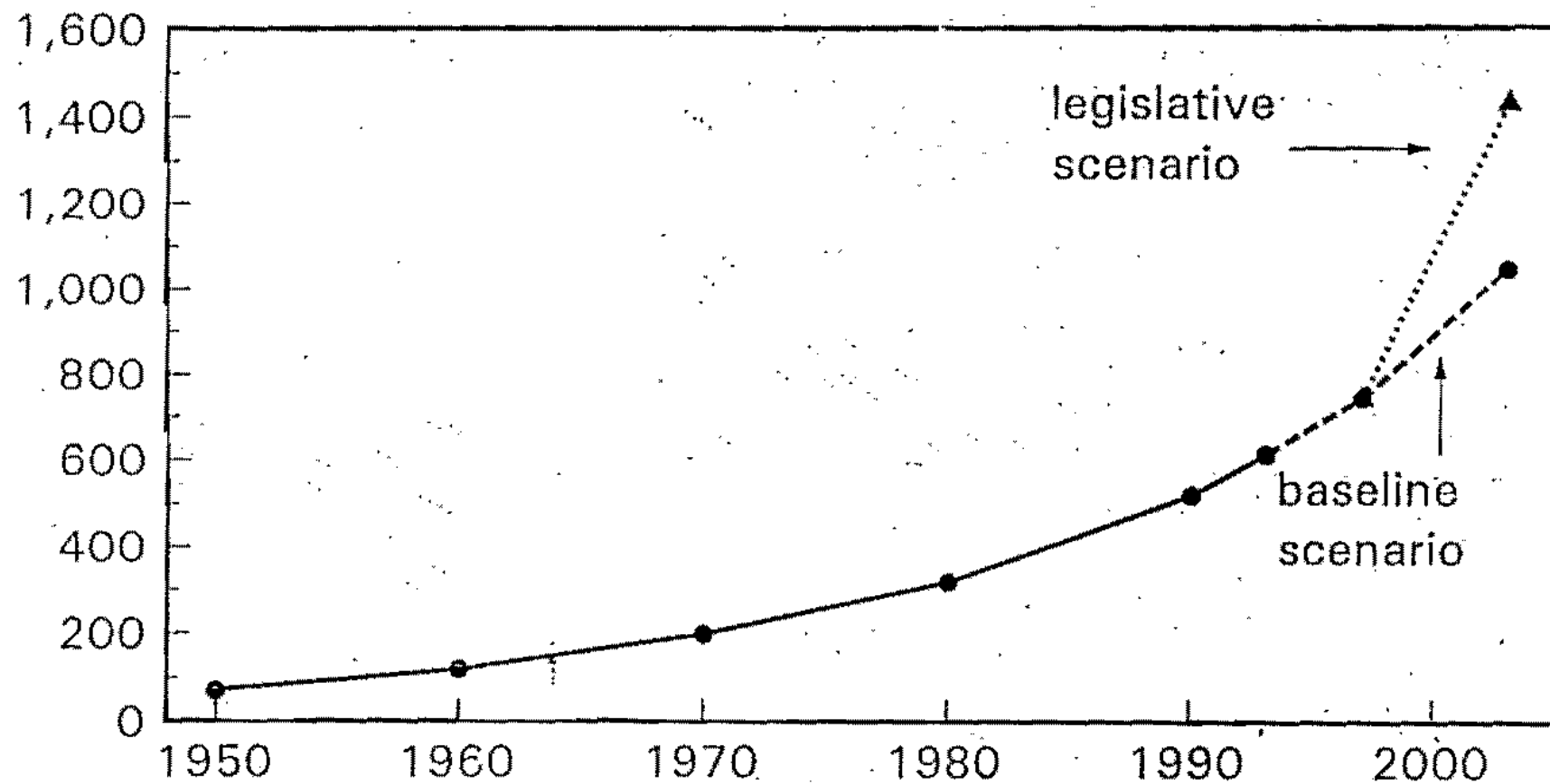
<sup>15</sup>Although much of the sector's revenue increase comes from the development and diffusion of new innovations, some is likely an artifact of the way service functions are classified. For example, during the 1950s, firm expenditures on preparing payrolls were probably not classified as part of the telecommunications and information sector. Yet to the extent the payroll function requires the use of computer hardware and software, and data processing services, it is more likely to be so classified today.

<sup>16</sup>Sector revenues as a fraction of GDP overstate the sector's share of GDP to the extent revenues exceed value added. For much of the sector, especially the services that are included, the difference is unlikely to be large. If commercial publishing and consumer electronics are added, sector revenues in 1993 would be closer to 10% of GDP than 9%.

Figure 3

# Telecommunications and Information Sector Revenues 1950 to 2003

Revenues (billions of 1994 dollars)



CEA Estimates



development of a Global Information Infrastructure (GII). That development will promote U.S. export growth, leading to increases in telecommunications and information sector revenue, domestic GDP, and domestic employment.

Over the next decade, many foreign governments will change their regulatory approaches and promote additional infrastructure investments. As other countries spend to improve their information infrastructure, privatize their existing telecommunications networks, and allow more competition, the world market for telecommunications and information is likely to experience tremendous future growth. U.S. firms, often already world leaders in these fields, can expect to achieve further success in the global market. As that success generates additional scale economies in production and encourages innovation, domestic producers will lower their costs. This dynamic promises to promote exports by enhancing the comparative advantage of the U.S. in the global marketplace.

**SUPPORTING RESEARCH AND DEVELOPMENT  
TO PROMOTE ECONOMIC GROWTH:  
THE FEDERAL GOVERNMENT'S ROLE \***

October 1995

A Report Prepared by  
The Council of Economic Advisers

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\* Federal research and development investments are obviously critical in the pursuit of many national objectives, such as defense, health, and the education of scientists and engineers. However, this paper focuses exclusively on economic returns.

## EXECUTIVE SUMMARY

- Increasing the productivity of the American workforce is the key to higher living standards and stronger economic growth in the future. Investments in research and development (R&D) are the key to increasing productivity, accounting for half or more of the growth in output per person, and to the creation of new products and processes.
- Investments in R&D have high rates of return. The social rates of return, which may be close to 50 percent, exceed the high private rates of returns, of 20 to 30 percent, by a considerable amount because of the "spillovers" -- benefits that accrue as other researchers make use of new findings, often in applications far beyond what the original researcher imagined. Because innovators realize only a fraction of the total return to an innovation, there will be an underinvestment in R&D.
- There has been a long record of successful government support for R&D, from its support of Samuel Morse's original telegraph line from Washington to Baltimore in 1842 to demonstrate the feasibility of his new technology, to the support of agricultural research, beginning with the 1862 Morrill Act establishing the land-grant colleges, to the development in more recent years of the Internet, the Global Positioning Satellite (GPS) system, and support of the basic research leading to the discovery of DNA. Examples of successful Federal R&D investments abound.
- Federal R&D expenditures stimulate additional private R&D expenditures. An additional dollar of Federal R&D adds more than a dollar of R&D to the economy, as the private sector expands its R&D effort. Accordingly, a cut in Federal R&D expenditures is likely to cause the private sector to cut back as well.
- The Congressional budget resolution would cut Federal R&D expenditures by about 30 percent by the year 2002. The Japanese government, by contrast, recently announced plans to double its R&D spending by the year 2000. While non-defense R&D expenditures in the United States, as a percentage of GDP, are already smaller than in Japan, as a result of the American decreases and the Japanese increases, the Japanese government will actually spend more, in total dollars, than the American government on non-defense R&D by 1997.
- Current debates not only focus on the level of support for R&D, but also on the composition. Increased living standards and faster productivity depends on increased support for civilian and dual-use research (that is, research that has both direct military and civilian applications), not just support of "star wars" and other military research. Opponents of government support for pre-commercial technological development erroneously characterize government efforts as "picking winners," interfering with what would otherwise be efficient market allocations, and try to draw a clear line between basic and generic research (which all agree government should support) and applied research. In reality, there is a continuum, with many applied research projects yielding significant spillovers, so that absent some government support, there may be marked underinvestment. Government can aid the development of such potentially high-payoff pre-commercial R&D with large spillovers, but must involve the private sector in such efforts. These government investments can yield high returns.

## INTRODUCTION

Increasing the productivity of the American workforce is the key to higher living standards and stronger economic growth in the future. Evidence indicates that investments in research and development (R&D) have large payoffs in terms of growth. R&D yields new products, improving the quality of life, and new processes, enabling American firms to reduce costs of production and become more competitive. Indeed, investments in R&D are estimated to account for half or more of the increase in output per person.<sup>1</sup> Maintaining or increasing this country's R&D effort is essential if we are to increase the rate of productivity growth and improve American living standards.<sup>2</sup>

The largest part of R&D in the United States is funded by private industry. Small entrepreneurs see an opportunity, raise funds any way they can, and take their chances on an innovative idea. Large companies spend billions on R&D labs to develop a stream of new products and processes. Private companies know the markets they serve and the workers who must produce the products. Risking their own funds gives them a strong incentive to avoid costly failures.

Since the founding of this country, the Federal government has had an important role in the promotion of science and technology. Indeed, the Constitution gave Congress the right to grant patents to "promote the progress of science. . . ." But in today's complex and competitive world economy, promoting the progress of science goes beyond simply the granting of patents. First, successful R&D in private companies depends upon the flow of new ideas and trained people stemming from basic research and pre-commercial R&D.<sup>3</sup> Federal support for these activities is vital.<sup>4</sup> Second, the Federal government sponsors much applied research to improve its own capabilities in such areas as national security, health, and transportation. The government can then help transfer technologies developed for its own use to the private sector.

This paper describes U.S. expenditures on R&D, how they have been changing over time, and how they compare with other countries. It then examines the rationale and role for government involvement in R&D and documents the high returns to R&D investments. Finally, it projects the results of the Congressional budget resolution on R&D expenditures and contrasts that projection with Japanese plans.

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<sup>1</sup> Griliches, Zvi. "The Search for R&D Spillovers." *Scandinavian Journal of Economics*. Vol. 94, supplement, pp. 29 - 47. 1992.

<sup>2</sup> Baily, M.N. and A. Chakrabarti, *Innovation and the Productivity Crisis*, Brookings Institution, Washington, DC 1988.

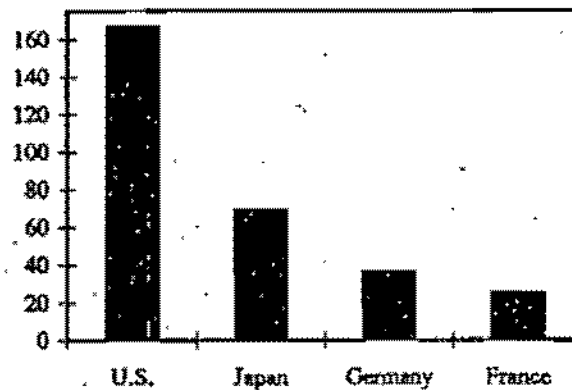
<sup>3</sup> Pre-commercial R&D may be loosely defined as R&D that is close to yielding a new product or process, but is still far enough away from commercialization to require a firm to take on substantial risk in pushing it towards the market, and may be such that the social returns to the investment will be much higher than the private returns.

<sup>4</sup> Industry also relies on the government to support the technical infrastructure -- for example, standards for weights and measures. Research in this area is essential for advancing commerce and trade.

## U.S. INVESTMENTS IN R&D

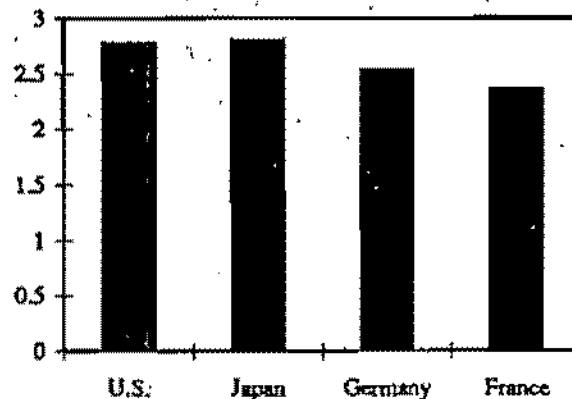
The United States leads the world in absolute spending on R&D (see Chart 1).<sup>5</sup> This finding is not surprising, given that the U.S. economy is by far the largest in the world.

Chart 1  
1992 Total Expenditures on R&D  
(billions of dollars)



An alternative comparison is R&D expenditures *as a percentage of GDP*, in order to account for differences in the size of economies. Using this comparison, the United States is just behind Japan and slightly ahead of (unified) Germany and France (see Chart 2).

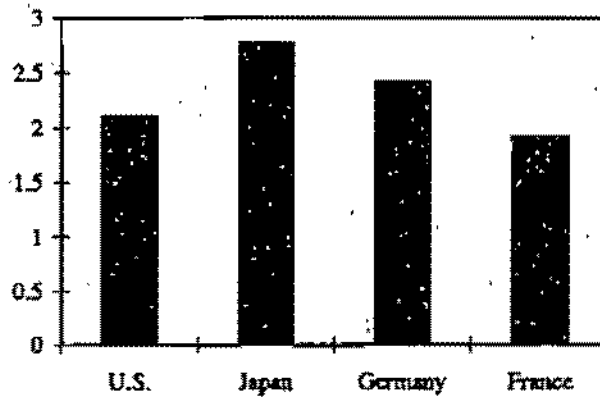
Chart 2  
1992 Total R&D Expenditures  
as a Percentage of GDP



<sup>5</sup> Data for Charts 1 through 5 and Table 1, unless otherwise noted, are from the National Science Foundation, National Patterns of R&D Resources: An SRS Special Report, NSF 95-304, 1995.

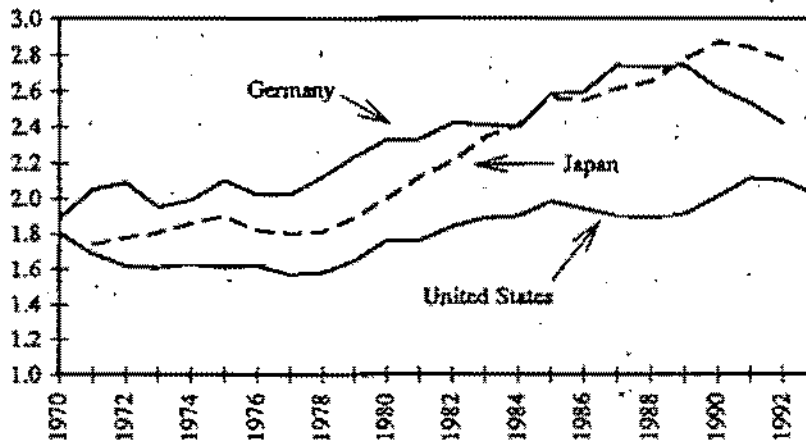
But this does not really tell the whole story. We must look not only at how much we spend, but also at what we spend it on. Aggregate R&D expenditures can be broken down into defense and non-defense R&D expenditures. The United States falls behind Germany, even further behind Japan, and remains just ahead of France in terms of non-defense R&D expenditures (see Chart 3).

**Chart 3**  
**1992 Non-Defense R&D Expenditures**  
**as a Percentage of GDP**



As seen in Chart 4, the United States consistently has lagged behind in this measure over the past two decades.

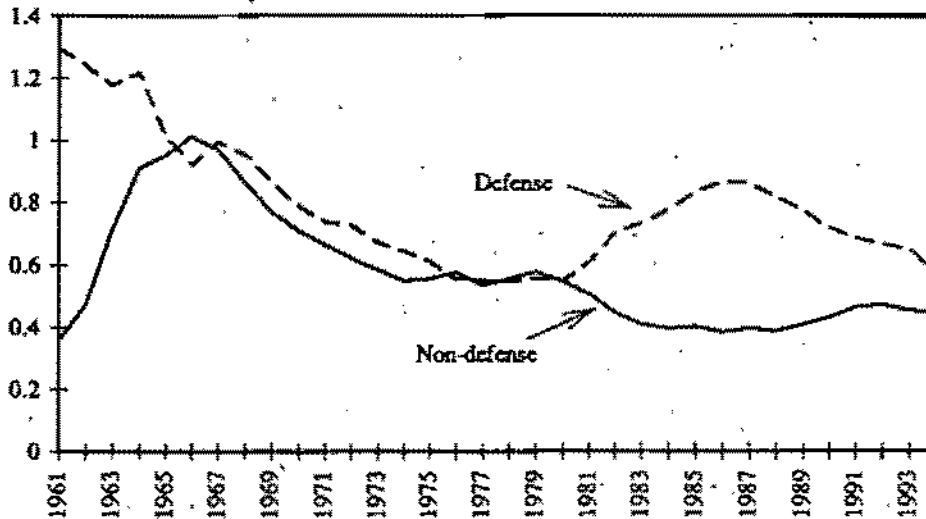
**Chart 4**  
**Non-Defense R&D Expenditures as a Percentage of GDP**



Although total expenditures on non-defense R&D have remained relatively constant as a share of GDP in the last 10 years (at a level well below those of Germany

and Japan), Federal expenditures on non-defense R&D in the United States actually have fallen as a percentage of GDP over the last three decades (see Chart 5).<sup>6</sup>

Chart 5  
Federal R&D Spending as a Percentage of GDP



In the United States in 1994, the Federal government provided approximately 36 percent of all R&D funds and industry provided about 59 percent, with the balance coming from universities and colleges and other non-profit organizations.<sup>7</sup> Industry primarily funds product-related applied research and development, as these areas are most likely to yield immediate payoffs. Government funds most basic research, since the results of this type of research are the most uncertain and applications may not be realized for quite some time, as well as more than one-third of all applied research. Table 1 details the breakdown of support for different types of research.

<sup>6</sup> Defense and non-defense expenditures: 1961 - 1979; Office of Management and Budget: Budget of the United States Government: Historical Tables, Fiscal Year 1996; 1979 - 1994: National Science Foundation, 1995; GDP figures from Council of Economic Advisers, Economic Report of the President, 1995.

<sup>7</sup> National Science Foundation, 1995.

**Table 1**  
**Sources of Funds for R&D in 1994<sup>5</sup>**

	All R&D		Basic Research	Applied Research	Development
	\$ billions	percent	percent		
Federal Government	62.2	36	58	35	29
Industry	102.1	59	26	58	70
Universities and Colleges	5.3	3	10	4	*
Non-Profits	3.0	2	5	2	*
<b>TOTAL</b>	<b>172.6</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

\* less than one percent

### THE ROLE OF GOVERNMENT INVESTMENTS IN R&D

Why does the government need to invest in R&D? The private sector on its own will not commit the level of resources to R&D that is best for society or even for the individual firms. A firm bases its investment expenditures, including those on R&D, on the expected return on an investment *to that firm*. Because firms realize only a portion of the total returns to an investment in R&D, they will not invest enough from a societal standpoint. R&D is a unique input in the production process.<sup>9</sup> Its results can spread quickly throughout the economy, with applications far beyond those imagined by the original researcher – the so-called “spillover” effect. Spillovers mean that an individual firm or innovator will realize only a fraction of the total returns to an innovation; that is, the innovation yields benefits to others *for which the original researcher is not fully compensated*.

Examples abound. Lasers and transistors are now a part of everyday life. The inventors of the laser probably had no idea that it would eventually be used for removing

<sup>5</sup> NSF, 1995.

<sup>9</sup> The chain from idea to usable product or process can be long. R&D is comprised, most generally, of basic research, applied research, and development. The divisions between these areas is not always clear, as they all interact in complex ways, with advances in one type of research influencing the direction of research in others. For conceptual purposes, though, The National Science Foundation (*Science and Engineering Indicators*, 1993) defines these terms as follows:

- **Basic Research:** The objective of basic research is to gain more complete knowledge or understanding of the subject under study, without specific applications in mind. In industry, basic research is defined as research that advances scientific knowledge but does not have specific immediate commercial objectives, although it may be in fields of present or potential commercial interests.
- **Applied Research:** Applied research is aimed at gaining knowledge or understanding to determine the means by which a specific, recognized need may be met. In industry, applied research includes investigations oriented to discovering new scientific knowledge that has specific commercial objectives with respect to products, processes, or services.
- **Development:** Development is the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.



cataracts or for playing music in a compact disc player. Likewise, the American physicists who invented the transistor at Bell labs in 1948 could not have imagined that their invention would be used today in radios, computers, spaceflight and guided missiles, and countless other electronic devices. In both cases, even if the inventors' imaginations did reach such heights, today they receive no additional monetary benefit for the large advantages that society reaps from their insights.

Sometimes the spillovers are far more subtle. The discovery of nylon showed that it was possible to create artificial fibers with remarkable properties -- and this knowledge affected the direction of research efforts applied by thousands of other researchers.

The consequences of the existence of important spillovers is that private firms will not invest enough in R&D from a national perspective. This point is not merely theoretical: many studies have demonstrated that investments in R&D yield high returns to investors and even higher returns to society. One recent review of econometric studies concluded that the average private rate of return to an innovation seems to be between 20 and 30 percent, while the social rate of return is closer to 50 percent.<sup>10,11</sup> An earlier, extensive, case-study approach found that the median private return to the innovations studied was 25 percent, while the median social rate of return was 56 percent.<sup>12</sup> While estimates of the rates of return are just that -- estimates -- a wealth of studies over the past two decades have confirmed these high private returns and even higher social returns. Table 2 highlights the results of some of these studies.<sup>13</sup>

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<sup>10</sup> Nadiri, Ishaq. "Innovations and Technological Spillovers." *NBER Working Paper Series*. Working Paper No. 4423. August, 1993.

<sup>11</sup> Rates of return can be estimated by computing the benefits (including discounted future benefits) and the costs of the innovation.

<sup>12</sup> Mansfield, Edwin, J. Rapoport, A. Romeo, S. Wagner, and G. Beardsley. "Social and Private Rates of Return from Industrial Innovations." *Quarterly Journal of Economics*. Vol. 77, pp. 221 - 240. 1977.

<sup>13</sup> Some of the studies cited in Table 2 look at industry-level data while others use a case-study approach. In some instances what is listed as a "social" rate of return is actually an indirect return to one industry resulting from the research of another industry. The point is clear: private rates of return to R&D are high, and the returns to society are even higher. The studies in the table are as follows (in addition to those already cited):

- Terleckyj, N. "Effects of R&D on the Productivity Growth of Industries: An Exploratory Study." National Planning Association. Washington, DC. 1974.
- Sveikauskas, L. "Technology Inputs and Multifactor Productivity Growth." *Review of Economics and Statistics*. Vol. 63, pp. 275 - 282. 1981.
- Goto, A. and K. Suzuki. "R&D Capital, Rate of Return on R&D Investment and Spillover of R&D in Japanese Manufacturing Industries." *Review of Economics and Statistics*. Vol. 71, pp. 555 - 564. 1989.
- Bernstein, Jeffrey and M. Ishaq Nadiri. "Interindustry Spillovers, Rates of Return, and Production in High-Tech Industries." *American Economic Review: Papers and Proceedings*. Vol. 78, pp. 429 - 434. 1988.
- Scherer, Frederick. "Using Linked Patent and R&D Data to Measure Interindustry Technology Flows." In *R&D, Patents, and Productivity*, Z. Griliches (ed.). University of Chicago Press, PP 417-464. 1984.
- Bernstein, Jeffrey and M. Ishaq Nadiri. "Product Demand, Cost of Production, Spillovers, and the Social Rate of Return to R&D." *NBER Working Paper Series*. Working Paper No. 3625. 1991.

**Table 2**  
**Private and Social Rates of Return to Private R&D<sup>14</sup>**

Author (year)	Estimated Rates of Return	
	Private	Social
Nadiri (1993)	20 - 30	50
Mansfield (1977)	25	56
Terleckyj (1974)	29	48 - 78
Sveikauskas (1981)	7 - 25	50
Goto-Suzuki (1989)	26	80
Bernstein-Nadiri (1988)	10 - 27	11 - 111
Scherer (1982, 1984)	29 - 43	64 - 147
Bernstein-Nadiri (1991)	15 - 28	20 - 110

In addition, some firms -- especially small ones that lack funds -- may not invest enough in R&D even from their own perspective. To make R&D investments, a firm may need to go to capital markets for funding, and to provide these funds, financiers must have sufficient information to be able to assess the risks of the investments. Firms may not want to provide this information for fear of losing future private gains if somebody else were to use that information. Moreover, R&D cannot be collateralized, in the way that an investment in a building or a machine can be. Thus, the firm must either pay higher interest rates for loans or use its own funds to pay for the research. In fact, evidence suggests that small firms' investments in R&D are limited by their internal cash-flow.<sup>15</sup>

The inadequacy of firms' incentives to invest in R&D creates an important role for the Federal government. The goal of technology policy, however, is not to substitute the government's judgment for that of private industry. Rather, the point is to correct a genuine and significant problem -- underinvestment in basic research and in pre-commercial R&D resulting from the divergence between private and social returns to those activities. A complementary goal is to design the technology investments that the government itself makes in public goods -- national security, public health, education, a clean environment, an efficient transportation system -- in ways that maximize the potential external benefits for the Nation's commercial technology base. In both cases, support for technological innovation enhances the Nation's economic and social welfare.

Expanding the R&D tax credit provides an additional incentive to the private sector to ameliorate the underinvestment problem discussed in this paper.<sup>16</sup> Indeed, the tax credit can be effective in increasing private sector R&D expenditures, and is an important component of a comprehensive technology policy.

<sup>14</sup> Table adapted from: Griliches (1992), and Nadiri (1993).

<sup>15</sup> Himmelberg, Charles and Bruce Petersen. "R&D and Internal Finance. A Panel Study of Small Firms in High-Tech Industries." *Review of Economics and Statistics*. Vol. 76, Issue 1. pp. 38 - 51. 1994.

<sup>16</sup> The R&D tax credit, officially known as the research and experimentation (R&E) tax credit, allows firms to deduct from their income taxes a portion of their R&D expenditures beyond a certain base level.

While the tax credit is important in promoting increased R&D expenditures, alone it is not sufficient. As a recent Congressional study noted, the tax credit does not alter the composition of R&D expenditures.<sup>17</sup> It is not designed to encourage research in areas subject to particularly severe underinvestment problems, which include basic and pre-commercial research.

**What can the government do?** The Federal government has a long history of involvement in science and technology. For example, in 1842 the government appropriated \$30,000 for Samuel Morse to build a telegraph line from Washington to Baltimore to demonstrate the feasibility of his new technology. In 1862 the Federal government passed the Morrill Act, which gave states land with which to establish land-grant colleges to teach agriculture and the mechanical arts.<sup>18</sup> Government also has a long history of involvement in direct funding of agricultural research dating back to the nineteenth century: many studies over the past 30 years have found rates of return to public investments in agricultural research of over 35 percent.<sup>19</sup>

The fact that government has a role in promoting science and technology clearly has long been recognized. The earliest and most widely used government incentive for encouraging innovation is the granting of patents, which essentially gives an innovator temporary monopoly rights on a new product or process. While important, patents alone are not a solution to the underinvestment problem. Even with strong patent protection, inventors capture only a small fraction of the benefits to society that accrue from their innovations, so that they will still underinvest. Underinvestment will be particularly severe for R&D with large spillovers and for research that yields results only far in the future or is extremely risky.

Investments in R&D are inherently risky, and some government-supported explorations, like those in the private sector, will be unsuccessful. Successful R&D investments -- from the jet engine to transistors to lasers -- can and have changed the whole economy. Government support was crucial in areas such as computers and integrated circuits, jet engines and airframes, and biotechnology and medical equipment. The result has been entire fields of productive wealth-enhancing, job-creating economic activity.

R&D provides the basis of America's competitive advantage in the many sectors in which the United States leads the world. Our strength, reflected in the large number of Nobel Prize winners in science -- most of whom have received government support -- is based on our research universities, the best in the world, all of which depend in large

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<sup>17</sup> Office of Technology Assessment, Congress of the United States. "The Effectiveness of Research and Experimentation Tax Credits." September 20, 1995.

<sup>18</sup> National Research Council. Colleges of Agriculture at the Land Grant Universities: A Profile. National Academy Press. Washington, DC. 1995.

<sup>19</sup> USDA Economic Research Service. "The Value and Role of Public Investment in Agricultural Research." Staff Paper Number 9510. May, 1995.

measure on government support. Students come from all over the world to learn from U.S. scientists and engineers.

**Funding basic research.** Most people recognize the need for government funding of basic, or fundamental, research. Indeed, as shown earlier in Table 1, the Federal government funds close to 60 percent of all basic research. Basic research is, by definition, not directed at solving an immediate problem or at inventing a particular product. While basic research has immediate returns in adding to our knowledge base and in educating scientists and engineers, economic returns from investments in basic research may be many years away, and may not have applications bearing any similarity to what the researcher originally thought. Since so much of the returns to basic research are not appropriated by the innovator (and indeed, in many cases, the output of basic research is not patentable), the gap between social and private returns is particularly large, and therefore the problem of underinvestment is particularly severe. Firms are typically reluctant to invest much in basic research.

Basic research ultimately can yield extraordinary returns to society. For example, two physicists in 1946 discovered nuclear magnetic resonance as the result of basic research. While they had no idea how this knowledge would eventually be used, others soon realized the potential applications of this knowledge. Today, most major hospitals have magnetic resonance imaging (MRI) machines for use in noninvasive scanning of patients' internal organs. The MRI is a direct outgrowth of earlier basic research.

Universities and colleges comprise the largest single group of performers of basic research, accounting for approximately 45 percent of all basic research in 1994.<sup>20</sup> This research is funded primarily by the Federal government. Universities and colleges create "knowledge for knowledge's sake," help develop an educated population, and train the scientific and engineering workforce. However, academic research itself also plays a crucial role in industrial innovation. One recent study of 76 manufacturing firms revealed that these firms could not have developed about 11 percent of their new products and 9 percent of their new processes without research done at universities and colleges. This study estimated the median social rate of return to research done at academic institutions to be 28 percent.<sup>21,22</sup>

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<sup>20</sup> Universities and colleges actually performed close to 55 percent of all basic research when one includes work done at Federally funded Research and Development Centers located at universities and colleges.

<sup>21</sup> While the "28 percent" figure is clearly a rough estimate, it shows that the returns to academic research are high. Moreover, this estimate is likely to be too low for two reasons. First, the study used academic research done only in the 15 years prior to the innovation -- much academic research may not be used in industrial innovations until more than 15 years after the initial discovery or publication, or may continue to be used for many years thereafter. Second, the study examined only seven industries. The academic research useful for innovations in these industries likely was useful in other industries, as well. Clearly, investing in academic research is an area with high payoffs.

<sup>22</sup> Mansfield, Edwin. "Academic Research and Industrial Innovation." *Research Policy*, Vol. 20, pp. 1 - 12, 1991.

Another study notes that it is difficult to assign a particular rate of return to basic research, since its results may be used in many diverse ways. Instead, it suggests that basic research should be viewed as an input into applied research in many areas. Basic and applied research interact in many ways, increasing the productivity of both.<sup>23</sup> In fact, one study of manufacturing firms found a correlation between increased spending on basic research and increased firm productivity, which may reflect increased effectiveness of a firm's applied R&D when the firm also conducts basic research.<sup>24</sup>

**Pre-Commercial R&D: The Changing Government Role.** The government's role does not end with funding basic research. One can view R&D as a continuum, with basic research at one end, facing a huge underinvestment problem requiring substantial government involvement, and product commercialization at the other end, where most returns go directly to the firm. Pre-commercial R&D is somewhere in between these two extremes. Some types of pre-commercial research may be extremely risky or have an especially large gap between private and social returns. Government support of such pre-commercial R&D involves identifying, with the aid of scientists, engineers, entrepreneurs, economists, and business people, technologies that could yield large societal benefits but may not necessarily yield much private return to the innovator. It is this belief that drives the Administration's technology policies.

In fact, the United States implicitly began following a similar technology policy after the Second World War. The Second World War brought great technological advancements from government research, all in the name of the war effort. Many of those technological accomplishments had applications in civilian life, as well. President Franklin Roosevelt recognized the potential of the R&D machine that had been built up during the war, and requested that Vannevar Bush, director of the wartime Office of Scientific Research and Development, devise plans on how to use the wartime experience in peacetime. In response to President Roosevelt's request, Bush authored Science: The Endless Frontier in 1945, which became the guiding document for much of U.S. postwar science policy.

The United States channeled public investment into basic research at universities and government laboratories, then supported the initial application of the results in products and production processes procured by public agencies. New technologies first developed for (and procured by) the Department of Defense, the Department of Energy, or the National Aeronautics and Space Administration, or supported by the National Science Foundation or the National Institutes of Health, would then diffuse, or "spin off," into commercial use. In this manner, the Federal government supported the development and diffusion of jet aircraft and engines, semiconductor microelectronics, computers and computer-controlled machine tools, pharmaceuticals and biotechnology, advanced energy

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<sup>23</sup> David, Paul, et al. "Analysing the Economic Payoffs From Basic Research." Economic Innovations and New Technology. Vol. 2, pp. 73-90. 1992.

<sup>24</sup> Mansfield, Edwin. "Basic Research and Productivity Increase in Manufacturing." American Economic Review. Vol. 70, No. 5. pp. 863-873. December, 1980.

and environmental technologies, advanced materials, and a host of other commercially successful technologies.

This system worked well as long as military requirements represented the leading-edge applications of new industrial technologies. In many areas of basic research supported outside the defense establishment, including biomedical research and the development of pharmaceuticals, biotechnology, and medical diagnostic devices, the system continues to work well.

The circumstances that allowed the United States to rely primarily on a defense-led model have changed. With the end of the Cold War, demand for new defense systems is now less than it was. Commercial product spin-offs from military research have also diminished from their heyday of the 1950s and 1960s, and American companies face intense international competition from increasingly capable foreign firms. On the other hand, these changes also create exciting new opportunities: innovative defense technologies are now more likely to emerge first in commercial products and production techniques, and American companies are taking advantage of expanded opportunities in foreign markets. Accordingly, the Administration's technology initiatives are shifting the composition of Federal R&D from military to civilian concerns, and the composition of military R&D toward the development of so-called dual-use technologies -- those with applications to both military and commercial products.

**Designing a successful program of technology support.** The Administration's efforts to promote innovative technology contain design features meant to limit the possibility of government failure in the implementation of technology policy: in most cases, firms participating in the Administration's programs must cover at least 50 percent of the costs of the project; projects are initiated by private firms, which compete for limited funding; outside experts in the relevant scientific, technological, and economic fields evaluate competing proposals; and firms can compete for funds in a wide array of technological fields, to ensure that support for pre-commercial R&D support does not get "captured" by any particular technology or set of firms.

Even the best-designed technology program will have failures. Indeed, if it does not, then it certainly is too cautious. In the final analysis, the returns to government-funded R&D depend upon the returns to the successful projects outweighing the losses from the unsuccessful ones. By incorporating the above design features, the Administration's technology program provides the best chance for achieving high returns that benefit American living standards.

**Returns to government R&D investments:** It is impossible to provide a reliable quantitative estimate of the returns to publicly-supported R&D based upon historical data, primarily because such a large percentage of Federal R&D support has been defense-related, although as noted earlier the returns to other public investments have been

enormous.<sup>25</sup> Traditional ways of calculating private returns to R&D do not apply in situations where the government funds the R&D and then purchases the resulting output.

The real impact of government-supported R&D is not the returns to the individuals involved in the research, but the returns to society. Measuring such returns is not a simple task, since the results of public R&D weave their way through the economy in countless directions. Researchers have noted that because of such spillovers, one must examine Federal research on a case-by-case basis.<sup>26</sup> Some government programs have been spectacular successes, yielding enormous social returns.<sup>27</sup> The aircraft industry is a prime example. The development of the U.S. aerospace industry was largely government-funded. As late as 1986, close to 80 percent of all R&D in this industry was Federally-supported.<sup>28</sup> Today this industry is a large employer and one of the largest exporters in the nation.<sup>29</sup>

Other examples include:

- **The atomic clock and the Global Positioning Satellite (GPS) system.** Super-precise atomic clocks were invented to help answer fundamental questions about the nature of the universe. However, a practical application for the atomic clock also emerged. The GPS is a system of 24 satellites that depends on computer chips, miniaturized radio receivers, and atomic clocks. GPS, initially developed by the U.S. Air Force for military navigation, allows users to determine their precise location and altitude anywhere on earth. Now GPS is also used for many civilian applications, including coastal navigation, emergency rescue, and the tracking of commercial vehicles. Over 160 manufacturers are developing GPS-based systems for an emerging multi-billion dollar industry.
- **The Hubble Space Telescope and cancer detection.** The Hubble Space Telescope was designed to gather more detailed information about the universe than is possible from ground-based telescopes. It may have another use, as well. The image-

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<sup>25</sup> In 1987, for example, about 70 percent of all Federal research was defense-oriented. Products resulting from defense R&D generally are purchased by the government and are not subject to a market test. See Hall, Bronwyn. "The Private and Social Returns to Research and Development: What Have We Learned." June, 1995 for a discussion of the difficulty of measuring the return to public R&D. One study of manufacturing firms found that increased government funding for applied research is correlated with increased productivity (Mansfield, Edwin. "Basic Research and Productivity Increase in Manufacturing." American Economic Review. Vol. 70, No 5. December, 1980. PP 863-873). The unique feature of this study is that because it was not actually focused on government funding, the results were based on firms not necessarily involved in defense contracting.

<sup>26</sup> Bartelsman, Eric. "Federally Sponsored R&D and Productivity Growth." Finance and Economics Discussion Series, No 121. Federal Reserve Board, Washington, DC. April, 1990.

<sup>27</sup> Some programs that do not meet their specified goal may officially be classified as failures. However, even some "failed" projects can yield enormous positive spillovers.

<sup>28</sup> Mowery, David and Nathan Rosenberg. Technology and the Pursuit of Economic Growth. Cambridge University Press. 1989.

<sup>29</sup> In 1994 the industry employed about 480,000 people. From 1990 to 1994, exports averaged over \$30 billion per year.

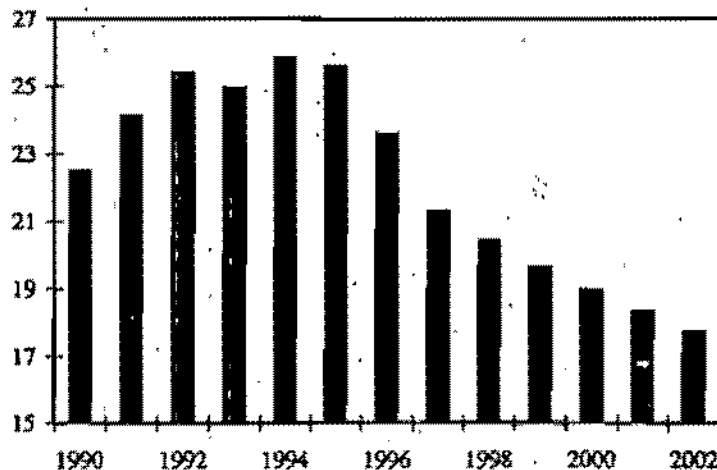
processing software NASA developed to reconstruct and filter images can be applied to a digitized mammogram, and likely will be useful in identifying suspicious areas indicative of breast cancer.

- **The Internet and the Information Superhighway.** The Internet was originally a government-sponsored computer network designed to connect researchers. Today, it is an important component of what is commonly referred to as "the information superhighway." Nobody knows exactly how the Internet will develop, but it is increasingly active, with more and more business involvement.

### CONGRESSIONAL PROPOSALS CUT FEDERAL R&D EXPENDITURES

Today, we face the possibility of unprecedented cuts in Federal R&D expenditures. The American Association for the Advancement of Science estimates a real cut of about 30 percent in Federal support of non-defense R&D by the year 2002 if the Congressional budget resolution were to become a reality. Chart 6 details the estimated results of the Congressional plan.

Chart 6  
Projected Congressional Non-Defense R&D Allocations 1990 - 2002  
(billions of 1987 dollars)<sup>30</sup>

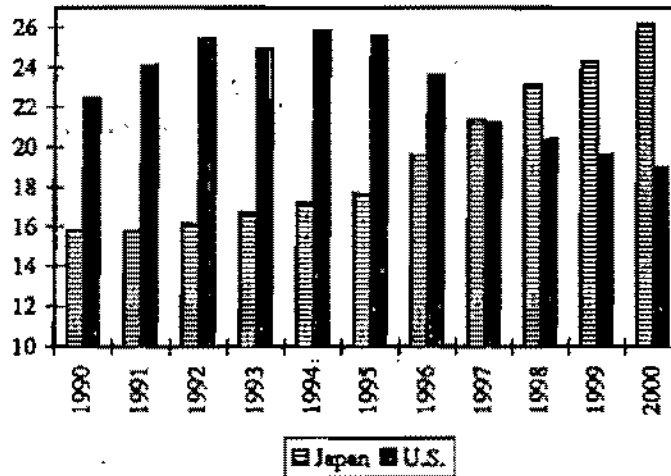


By contrast, the Japanese government recently announced plans to *double* its R&D spending by the year 2000. Chart 7 highlights the effect of the Congressional plan and the Japanese plan: by 1997 Japan will overtake the United States in government support of non-defense R&D -- in total dollars, not just as a share of GDP.

<sup>30</sup> 1990 - 1995 are actual expenditures; 1996 - 2002 are estimated results of Congressional proposals; deflators 1994 - 2000 are estimates from OMB, Analytical Perspectives: Budget of the United States Government, FY 1996. Assumed 3.5 percent inflation from 2000 - 2002.



**Chart 7**  
**Estimated Japanese Governmental Expenditures on**  
**Non-Defense R&D Compared with Projected Congressional Allocations**  
 (in billions of 1987 dollars)



See updated chart attached.

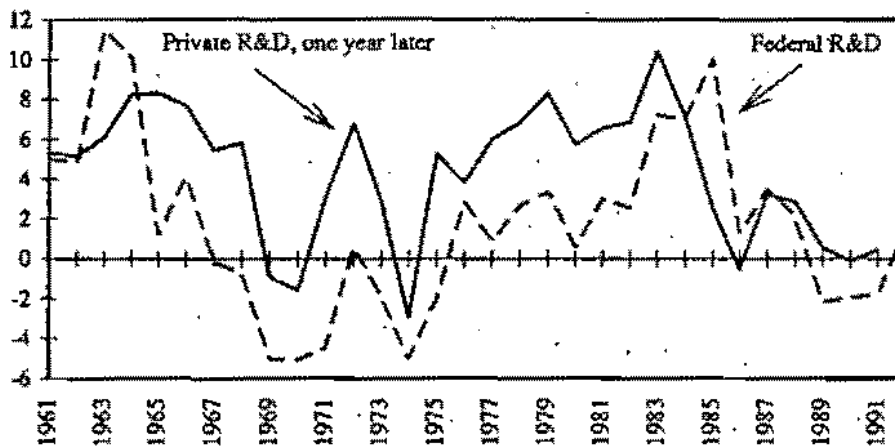
**Cutting Federal R&D will reduce private R&D expenditures.** Many studies demonstrate that Federal spending on R&D stimulates additional private spending on R&D.<sup>31</sup> This complementarity holds up in basic, as well as applied, research.<sup>32</sup> In other words, an additional dollar of Federal R&D expenditures adds more than a dollar of R&D investment to the economy.

Unfortunately, complementarity also suggests that if the Federal government cuts R&D expenditures, the private sector will cut R&D expenditures, as well. Chart 8 shows a clear correlation between changes in Federal R&D expenditures and changes in private R&D expenditures one year later.

<sup>31</sup> Levy, David and Nestor Terleckyj. "Effects of Government R&D on Private R&D Investment and Productivity: A Macroeconomic Analysis." *The Bell Journal of Economics*. Vol. 14, No. 2. pp. 551 - 561. Autumn, 1983.

<sup>32</sup> Robson, Martin. "Federal Funding and the Level of Private Expenditure on Basic Research." *Southern Economic Journal*. Vol. 60, No 1. pp. 63 - 71. July, 1993.

**Chart 8**  
**Percent Changes in Federal R&D Expenditures and**  
**Private R&D Expenditures One Year Later<sup>33</sup>**



This correlation means that if Federal R&D support is cut, the nation is likely to lose future rewards not only from the Federally-supported R&D that will not be undertaken, but also from the industrial R&D that will not be undertaken as the private sector scales back in response to Federal cuts.

### CONCLUSION

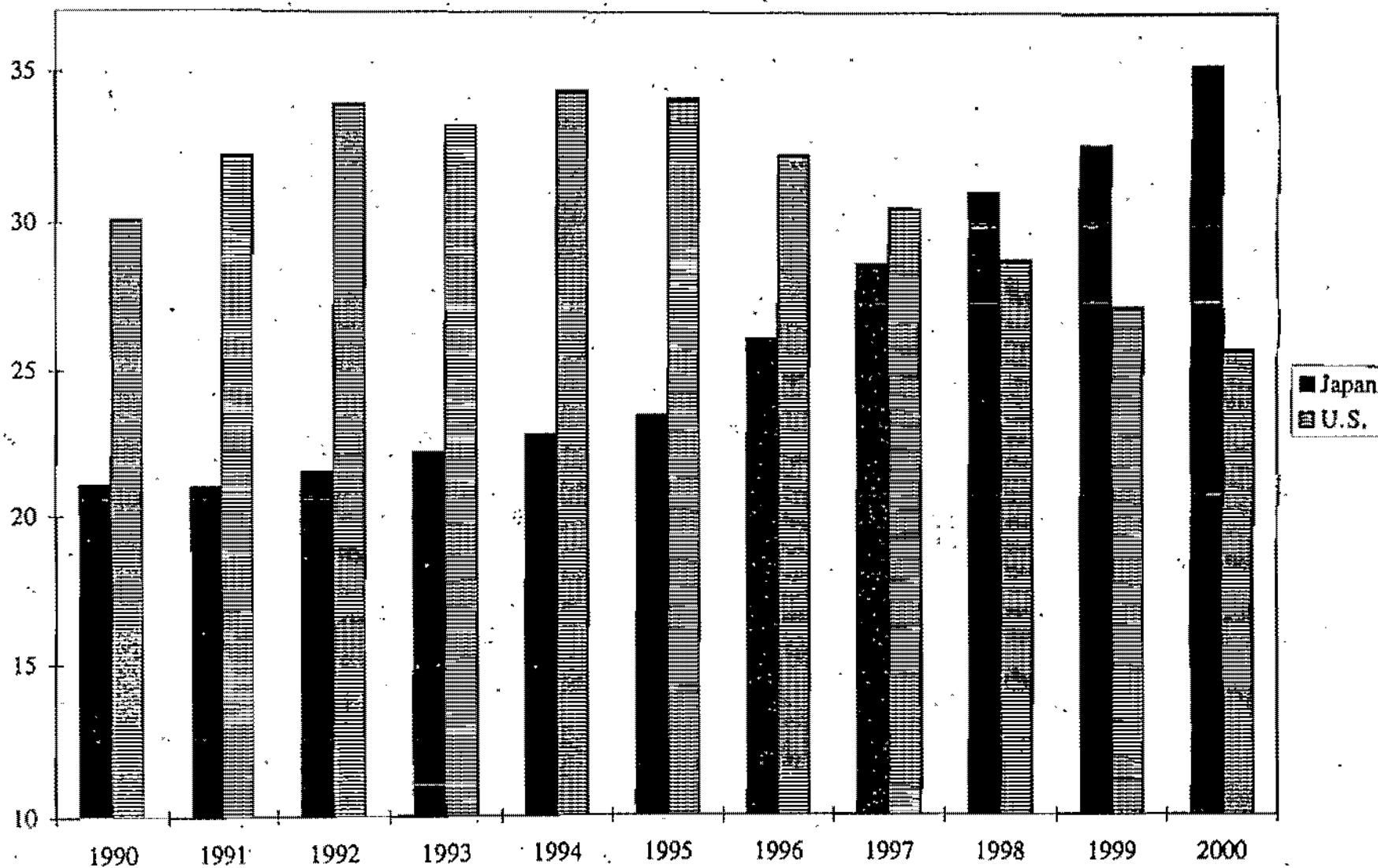
Continued advances in R&D and technology are crucial to ensuring and increasing economic growth. Many studies have shown that while returns to a firm from investing in R&D are high, returns to society are even higher as new ideas are applied to areas far beyond what the innovator initially imagined. However, such spillovers imply that private firms will not invest in enough R&D from a national perspective. The Federal government can step in to fill the gap between the private level of R&D investment and the level and types of R&D investment that are best for the nation. Moreover, the nation benefits not just from the results of Federally-sponsored projects, but also because Federal R&D expenditures seem to stimulate additional private R&D expenditures.

The competitive position of the United States – and indeed future increases in standards of living – depends on technological advances. These in turn depend on our entire scientific and technological infrastructure, which includes our educational institutions – producing the scientists and engineers that will provide the creative advances of the future – our research universities, and our nation's laboratories, both within the private and public sectors. Ideas flow from basic research, through pre-competitive development, to concrete applications, producing new products and developing new, better, and lower-cost production processes. Government has a vital role

<sup>33</sup> Hill, Christopher. "Private Funds are Unlikely to Replace Cuts in Public Funds for R&D in the U.S." Mimeo, June 19, 1995. Data from NSF. "National Patterns of R&D Resources: 1992." NSF 92-330. October, 1992.

in sustaining this infrastructure — from supporting scientists and engineers, to promoting basic research, to assisting in the development of new, high-risk technologies with significant spillovers. We have evolved an effective system that has led America to its current pre-eminent role. Changes in our world necessitate that this system, and the role of government, continue to evolve. Now is the time to renew our commitment to these advances and to continuing the adaptation of our system to the changing world. These are high-return investments that will provide the basis of the America of the twenty-first century.

Estimated Japanese Governmental Expenditures on  
Non-Defense R&D Compared with Projected Congressional Allocations  
(in billions of 1996 dollars)



Updated March, 1996 to reflect changes since the Congressional Budget Resolution in expected FY1996 expenditures.

**U.S. TRADE POLICY WITH JAPAN:  
ASSESSING THE RECORD**

**A Report Prepared by**

**The Council of Economic Advisers  
U.S. Treasury Department**

**November 9, 1995**

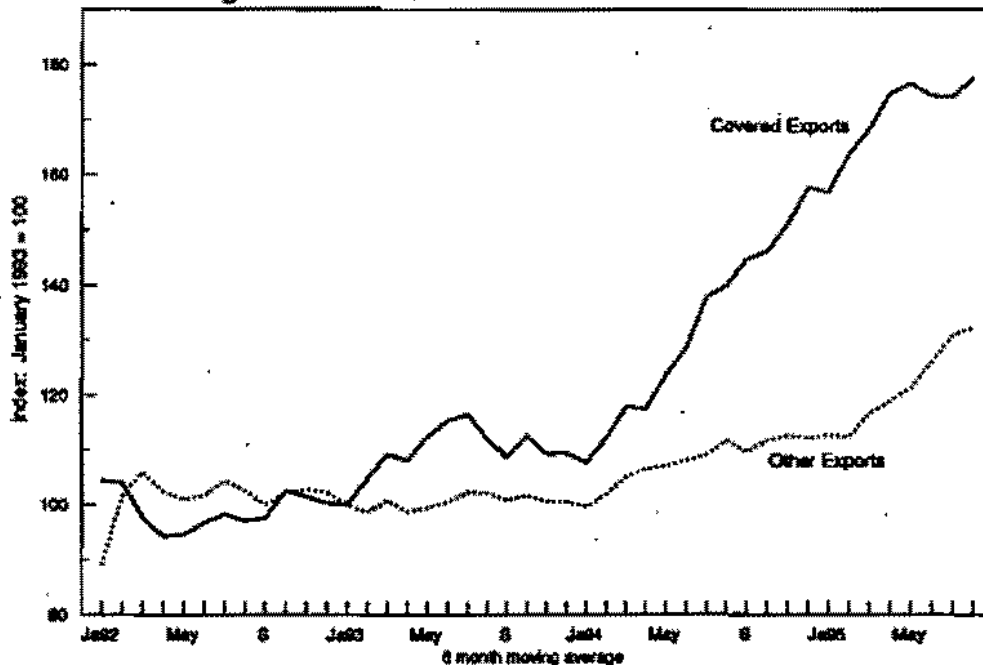
Three years ago, President Clinton said, "We must compete not retreat." Since that time, he has charted a new trade policy with Japan that is delivering results. This policy has three goals:

- To give American businesses, farmers, and workers a chance to compete fairly in the second largest market in the world by targeting expanded market access in those sectors where U.S. competitiveness is strongest.
- To increase the growth of Japanese imports and promote adjustment of the massive current account imbalance in Japan in order to strengthen global economic growth.
- To restore American leadership in the global economy.

Significant progress has been made on each of these goals. While initial results are encouraging, we are watching closely to make sure our trade agreements are implemented and work.

## U.S. exports to Japan in targeted sectors are growing rapidly.

**U.S. Exports to Japan in Sectors Covered by Trade Agreements Are Growing at an Even Faster Pace Than Those in Other Sectors**



- The Clinton Administration has negotiated 20 trade agreements with Japan; 12 of these are Framework Agreements. These trade agreements are results-oriented, i.e., they include objective criteria for measuring progress. Too often in the past, our bilateral trade agreements have failed to deliver real benefits for American companies, workers, and farmers.
- In the goods sectors covered by our Uruguay Round, Framework, and other bilateral trade agreements, U.S. exports to Japan have grown nearly 80 percent since this Administration took office.
- Growth in exports to Japan in these sectors is nearly 2.5 times greater than growth in other U.S. exports to Japan — which has also been strong. Indeed, growth in all U.S. exports to Japan has been over twice as great as growth in U.S. exports to the European Union. Total U.S. exports to Japan reached \$60 billion for the 12 months ending in August 1995.
- In the goods sectors covered by our trade agreements, U.S. exports to Japan have grown at an accelerating pace; these exports grew by one-seventh in 1993, one-quarter in 1994, and by nearly one-third in the first 8 months of 1995 (on a year-over-year basis).

- In the goods sectors covered by our Framework Agreement alone, U.S. exports to Japan have risen over 50 percent since the Agreement was signed – more than twice as fast as other U.S. exports to Japan.
  
- Our strong export performance in general and to Japan specifically is attributable to a variety of factors. On the macroeconomic side, the President's overall economic plan, with its emphasis on deficit reduction and investment, has led to strong sustained growth with low inflation in the United States. This has encouraged strong growth in U.S. investment, labor productivity, and employment, and helped to increase U.S. business confidence and strengthen the fundamental competitiveness of U.S. industries and workers. Such overall economic factors have helped accelerate U.S. export growth to the world, rising from 4 percent in 1993, to 10 percent in 1994, and 16 percent so far this year. Our strong export performance to Japan, especially in targeted sectors, also reflects the numerous market opening agreements concluded during this Administration under the Framework and the Uruguay Round.
  
- The trade agreements are "win-win", yielding lower prices and higher quality for Japanese purchasers and consumers and increasing market access for U.S. businesses.



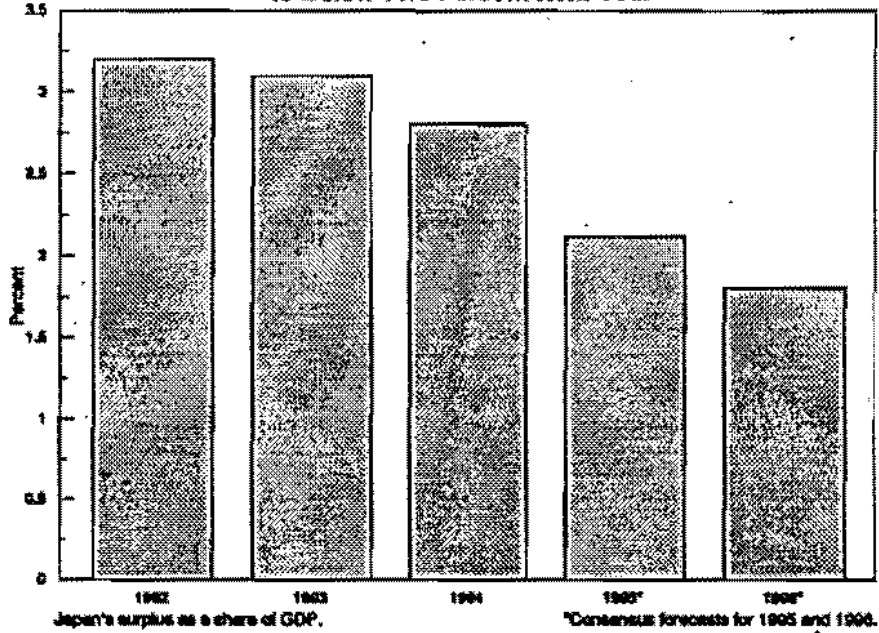
**U.S. businesses are achieving successes in sectors covered by  
Clinton Administration trade agreements.**

- After years of stalled negotiations, the Clinton Administration concluded an agreement in March 1994 with Japan to open the cellular telephone market in the Tokyo-Nagoya area, the largest population center in Japan. Since the agreement was signed and the Japanese Government instituted deregulation measures, subscribers to the North American designed system have grown from 22,000 to 500,000. Motorola, which tried unsuccessfully for years to break into this market, provides the bulk of the equipment to build and maintain this system, with sales values in the hundreds of millions of dollars per year. Greater competition in the region has also benefited Japanese consumers -- not only is there now greater consumer choice but also prices for cellular phone services have dropped.
- Since the Clinton Administration concluded a Framework Agreement with Japan covering public sector procurement of medical technology (such as MRI machines and CT scanners) on November 1, 1994, total U.S. exports of medical instruments to Japan have grown over 50 percent, reaching \$1 billion for the 12 months ending August 1995. This is over twice the rate of growth of U.S. medical instruments exports to the European Union.
- The Clinton Administration targeted copper as a priority sector in the Uruguay Round negotiations. Since the Uruguay Round Agreement was signed on April 15, 1994, U.S. exports of copper to Japan have grown over 150 percent, reaching \$0.4 billion for the 12 months ending August 1995. This is more than 6 times as fast as the growth of other U.S. exports to Japan.
- The Clinton Administration targeted chemicals in the Uruguay Round negotiations. Since the Uruguay Round Agreement was signed, U.S. exports of chemicals to Japan have grown over 80 percent, reaching \$2.9 billion for the 12 months ending August 1995. This is over three times as fast as the growth of other U.S. exports to Japan and over 6 times as fast as the growth of U.S. chemical exports to the European Union.
- The Clinton Administration targeted apples as one of its first bilateral trade initiatives with Japan and an agreement was concluded on September 13, 1993. Where U.S. apple exports to Japan were once banned, apple exports are now expected to reach \$15 million in 1995. This is more than half the total average annual sales of U.S. apples to the European Union.

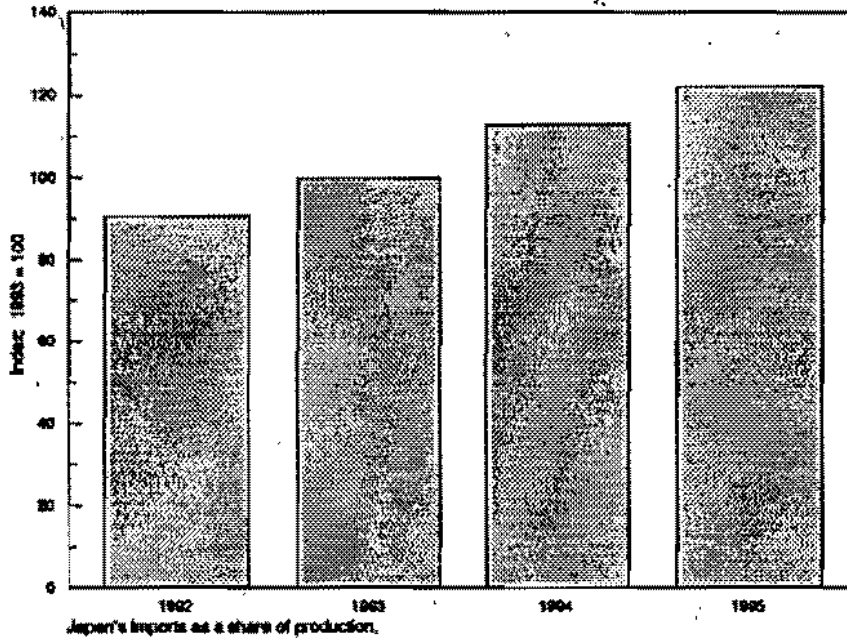
- **The Clinton Administration targeted rice in the Uruguay Round negotiations. Imported rice had been banned in Japan for over two decades. With the successful conclusion of the Uruguay Round, Japan has finally opened its market to imported rice.**
- **A major failure of the rice crop in Japan in 1993 led to the first taste of American rice for many Japanese consumers.**
- **U.S. exports of rice to Japan rose to \$243 million in 1994. This is more than twice the total annual U.S. rice exports to Europe.**
- **American medium-grain rice has been highly rated on quality by the Japanese Food Agency and American rice has been well-received by Japanese consumers.**

## Japan's market is also opening up more broadly.

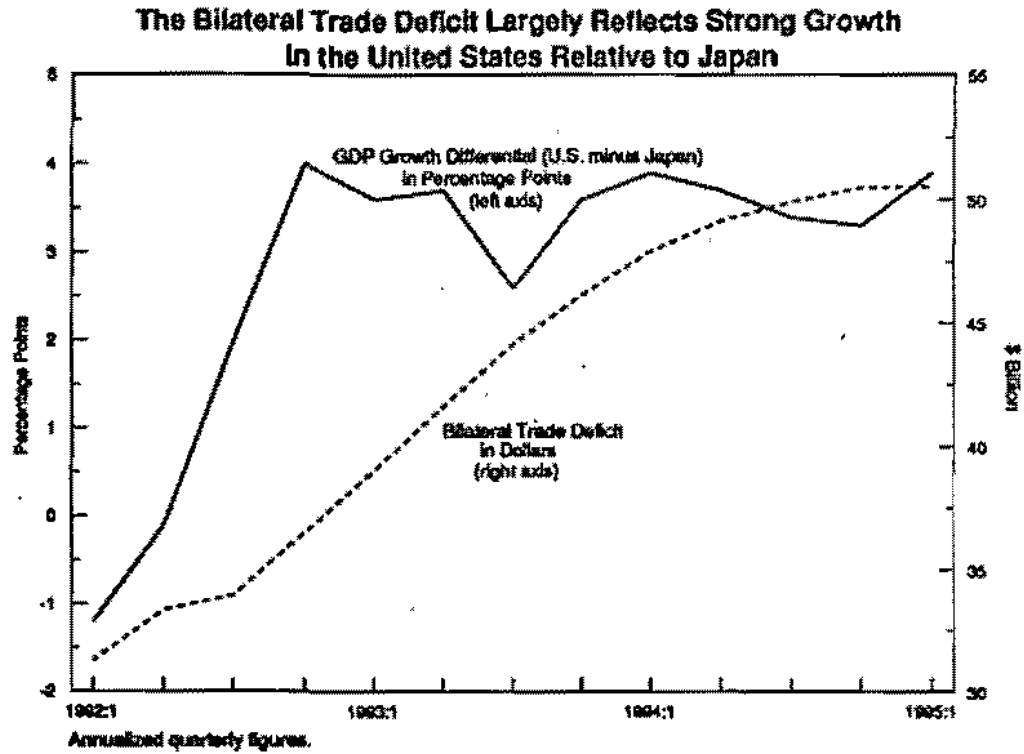
### Japan's Current Account Surplus Is on Track to Fall to Below Two Percent Next Year



### Japan's Imports as a Share of Production Are Up



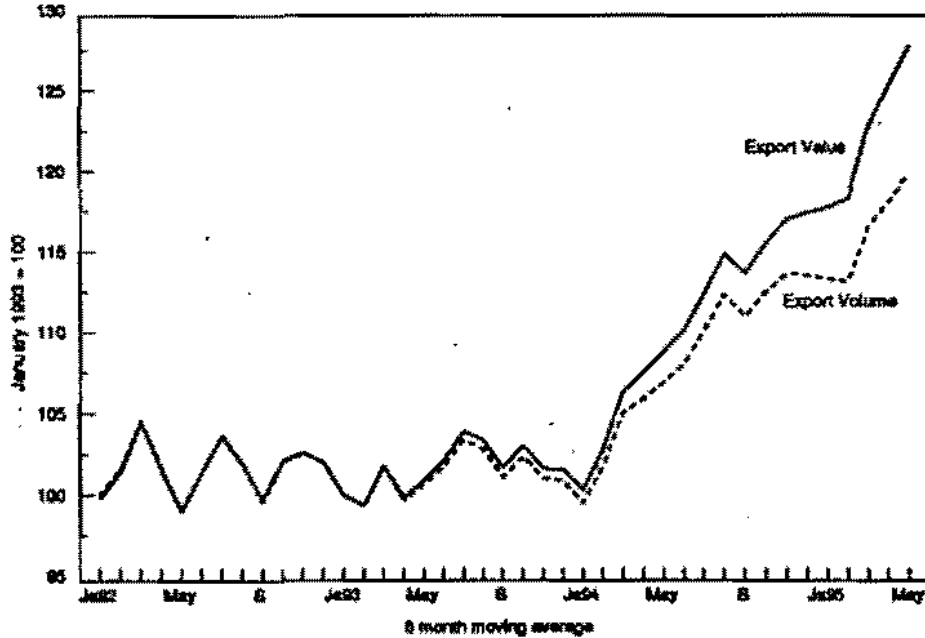
The goal of our trade policy is to expand trade. Although the U.S.-Japan bilateral trade deficit remains high, it is misleading to focus on it as a scorecard.



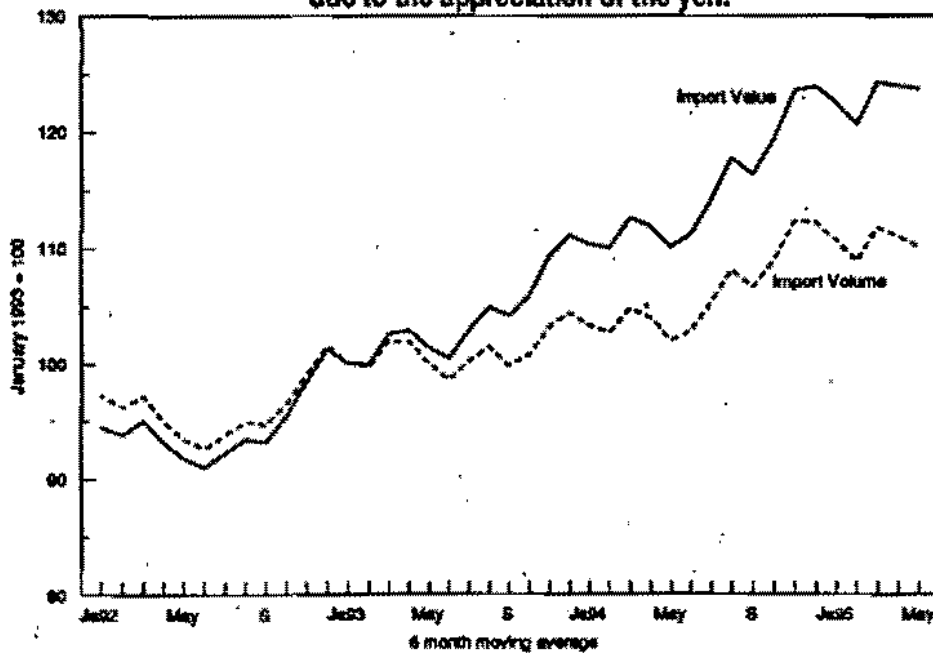
- o Periods of high employment growth such as in the past three years are often accompanied by deterioration in the trade balance due to strong demand for imports.

- Moreover, U.S. exports to Japan have grown twice as fast as imports in volume terms. However, we are paying more for imports from Japan due to the appreciation of the yen relative to the dollar.

Although we are selling a lot more to Japan...



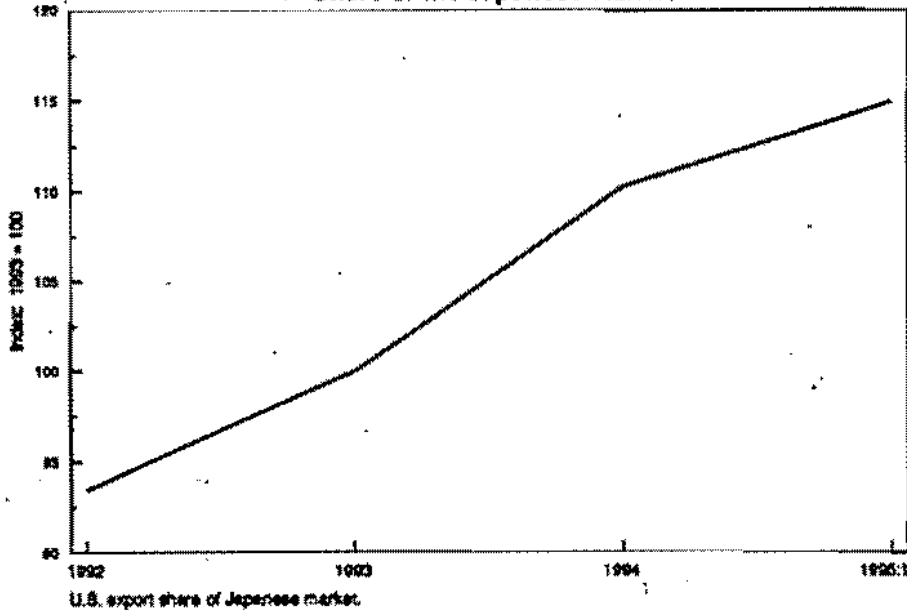
...we are also paying higher prices for Japanese goods due to the appreciation of the yen.



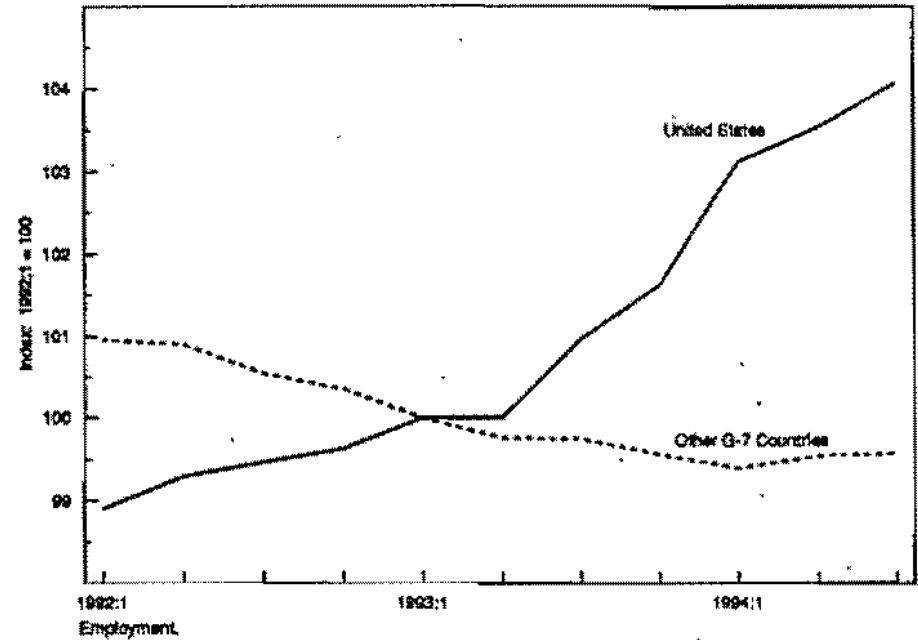
## U.S. competitiveness and economic strength have surged ahead in the last two years.

- o For the second year in a row, a survey of international corporate managers rated the United States Number 1 on competitiveness this year, up from Number 5 in 1992.

### U.S. Manufacturing Firms Are Increasing their Share of the Japanese Market



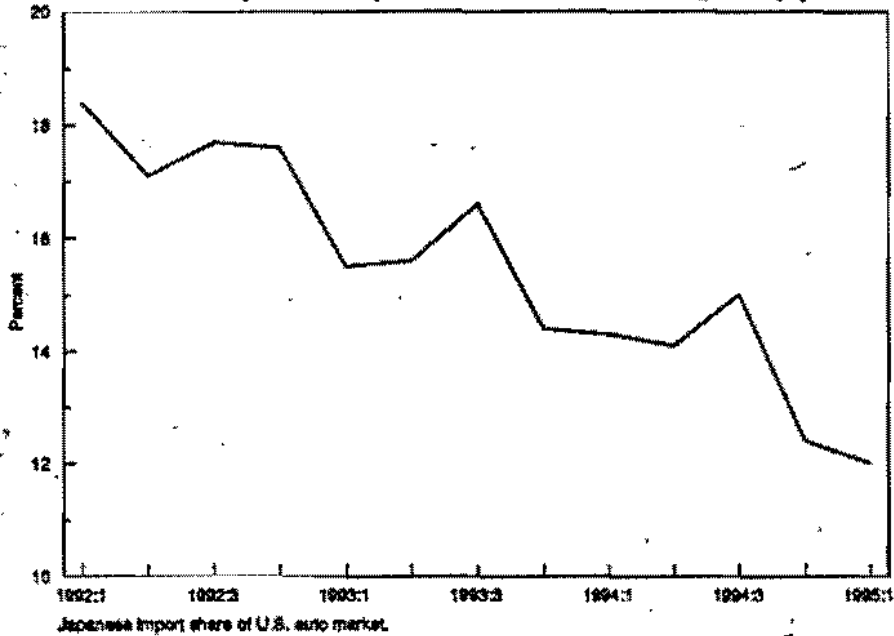
### The United States Leads In Job Creation



- o The U.S. economy has created 7.5 million jobs since the Clinton Administration began.

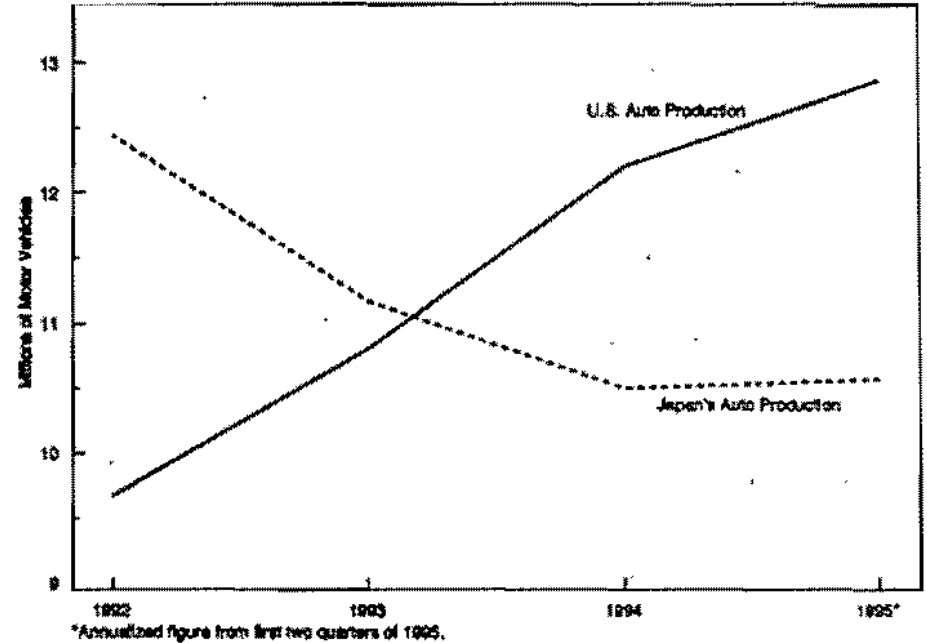
The resurgence in U.S. competitiveness has led to gains in key sectors.

**U.S. Imports of Japanese Autos Are Declining Sharply**



- The Japanese import share of the U.S. auto market has fallen from 18 to 12 percent.

**U.S. Automakers Have Bounced Back Strongly**



- The United States overtook Japan as the world's Number 1 auto producer in 1994 for the first time since the 1970s. U.S. production totalled 12.4 million vehicles, 17 percent more than the Japanese total.

**EDUCATING AMERICA:  
AN INVESTMENT FOR OUR FUTURE**

**A Report by the  
Council of Economic Advisers and the  
U.S. Department of Labor**

**September, 1995**



EDUCATING AMERICA: AN INVESTMENT FOR OUR FUTURE  
EXECUTIVE SUMMARY

\* The educational level -- that is, the number of years of completed formal education -- of the U.S. workforce has risen, both over the long-term and over the past twenty years. Test scores have been increasing in the United States, especially for minorities. At the same time, U.S. students compare unfavorably to those in many other nations on tests of math and science achievement.

\* More educated workers earn more, and the gap between earnings of high school and college graduates has more than doubled over the past 15 years. In 1994, the median full-time worker with at least a bachelor's degree earned 74 percent more per week than the median full-time worker with only a high school degree; this figure was only 36 percent in 1979.

\* Since education raises the earnings and productivity of workers, it contributes to overall economic growth. Evidence from cross-country comparisons generally supports the conclusion that education contributes to growth.

\* The weight of evidence indicates that Head Start and other compensatory preschool education programs improve subsequent school achievement. Evidence is not yet available to provide a full evaluation of "school to work" programs, but the initial evidence is favorable.

\* Education and training pay off for workers who have already entered the labor market. Worker training is generally an essential ingredient of high-performance workplaces.

\* Programs that make education cheaper or more available appear to increase the amount of educational attainment.

## EDUCATING AMERICA: AN INVESTMENT FOR OUR FUTURE

Investments in education yield greater dividends today than ever before. The following is a survey of the overwhelming evidence regarding the benefits of education to American workers and to our nation's economy, and the importance of assuring affordable access to higher education.

### **I. THE EDUCATIONAL LEVEL OF THE U.S. WORKFORCE HAS RISEN IN RECENT YEARS.**

American workers now have more years of formal education than ever before. Recent years have seen the continuation of three heartening trends.

First, more students are finishing high school. In 1973, 14.1 percent of 16- to 24-year-olds were high-school dropouts; by 1993, the rate had fallen to 11.0 percent. Part of this improvement is due to increases in the graduation rates of African American students, whose dropout rates have fallen much more sharply than have dropout rates for white students. [See Chart A]

Second, more high-school graduates are attending college. Since 1980, the percentage of high-school graduates who enrolled in college following graduation has increased from 30.5 percent to 41.6 percent. [See Chart B] As new workers have replaced older, less educated workers, the share of the labor force with a college degree has also increased, from 16 percent in 1973 to 29 percent in 1993. [See Chart C]

Third, total graduate-school enrollment has grown almost as rapidly as undergraduate enrollment, in percentage terms, over the past two decades; growth in graduate enrollment for full-time students has been much faster than in undergraduate enrollment.

The result of these three trends has been a more educated labor force: average years of education per worker climbed from 11.8 in 1973 to 13.0 in 1990.<sup>1</sup> [See Chart D]

Test scores have also risen, although they remain unimpressive by international standards. Over the past decade, test scores in mathematics, science, and verbal skills have generally risen for children of almost all ages and racial and ethnic groups. These test-score gains have been largest among African American students. Despite the gains, there remains room for further improvement: U.S. students continue to trail students from most other industrialized nations on international achievement tests in math and science. [See Chart E and F]

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<sup>1</sup> U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics, 1994*; and U.S. Department of Labor, Bureau of Labor Statistics, *Labor Composition and U.S. Productivity Growth, 1948-90*, December 1993.

## II. FORMAL EDUCATION CREATES SUBSTANTIAL ECONOMIC BENEFITS, BOTH FOR THE INDIVIDUAL AND FOR SOCIETY.

More educated workers earn more, and the gap has doubled over the past 15 years. In 1994, for example, the median full-time worker with at least a bachelor's degree earned 74 percent more per week than the median full-time worker with only a high school degree; this gap was only 36 percent in 1979. The rewards to education and training are one of the most well-established findings in economics.<sup>2</sup> Positive returns to education and the recent increase in returns have been documented for a wide range of foreign nations, as well as for the United States.<sup>3</sup> [See Chart G]

Establishments with higher levels of education have higher productivity.<sup>4</sup> A nationally-representative survey found that an establishment whose workforce has an average education 10 percent (that is, slightly more than one year of schooling) above that of similar establishments has productivity about 8.6 percent above similar establishments.

Labor demand in high-skill occupations is increasing. Taken together, the two trends noted above -- the greater numbers of college graduates, and the increasing earnings gap between college and high-school graduates -- suggest that demand for higher-skilled workers must have increased in recent decades. And indeed, occupational evidence supports this view. From 1984 to 1994, whereas employment growth in occupations whose workers have low levels of education averaged only 7 percent, employment growth in high-skill occupations averaged an impressive 32 percent. The increases in employment in high-skill occupations presumably would have been even larger if there had not been an increase in the wages of skilled workers relative to unskilled. [See Chart H]

There is some debate about the cause of the correlation between education and earnings. One problem is that people with high ability are disproportionately likely to receive above-average education, but would also have been disproportionately likely to receive high wages even if they had not received so much education. In addition, education can pay off for an individual because education is a credential that signals high ability, even if little is learned at school.

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<sup>2</sup> Willis, Robert, "Wage Determinants: A Survey And Reinterpretation of Human Capital Earnings Functions," in Orley Ashenfelter and Richard Layard, eds., *Handbook of Labor Economics*, Volume 1, Elsevier Publishers, 1986.

<sup>3</sup> Psacharopoulos, George, "Returns to Education: A Further International Update and Implications," *Journal of Human Resources*, Volume 20, Fall, 1985; and Freeman, Richard B., and Lawrence Katz, "Rising Wage Inequality: The United States vs. Other Countries," in Freeman, Richard B., ed., *Working Under Different Rules* (New York: Russell Sage Foundation), 1994.

<sup>4</sup> Lynch, Lisa, "The Other Shoe: Characteristics of Human Capital Investments and their Pay-offs to Employers," working paper, National Center on the Educational Quality of the Workforce, University of Pennsylvania, 1995.

Nevertheless, much of the evidence indicates that the economic rewards to education accrue because schooling actually makes students more productive as employees, and not primarily because schooling screens out low-ability students.

One recent study showed that a year of college education increases earnings by 5 percent to 10 percent, even controlling for family backgrounds or test scores in high school. This result holds not only for four-year institutions, but also for community colleges.<sup>5</sup>

Another study examined identical twins, who obviously share similar family characteristics and identical genes, and found that each year of additional schooling raises later earnings of the more-educated twin by about 13 percent.<sup>6</sup>

A third study found that each additional year of schooling due to compulsory-schooling laws raises earnings by 8 percent (although statistical problems limit the precision of this estimate).<sup>7</sup>

### III. EDUCATION CONTRIBUTES TO ECONOMIC GROWTH.

New evidence emphasizes that education is an important determinant of the speed at which the economy as a whole grows. A large body of literature has shown that countries with the highest initial levels of education in 1960 or 1965 typically grew the fastest in subsequent decades.<sup>8</sup> One recent study, in trying to pinpoint just how education makes its contribution, has shown that countries with better-educated labor forces are better able to take advantage of technologies developed in other countries;<sup>9</sup> this factor is likely to have contributed to the growth successes of Japan and the East Asian newly industrialized countries. Sketchier evidence suggests that even within countries, states and regions with

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<sup>5</sup> Kane, Thomas J. and Cecilia Rouse, "Labor Market Returns to Two and Four-Year College: Is A Credit a Credit and Do Degrees Matter?", *American Economic Review*, Vol. 85, No. 3, pp. 600-14 (1995).

<sup>6</sup> Ashenfelter, Orley, and Alan B. Krueger, "Estimates of the Economic Returns to Schooling From a New Sample of Twins," *American Economic Review*, December 1994. Other studies of twins have found smaller, but still positive, effects.

<sup>7</sup> Angrist, Joshua and Alan Krueger, "Does Compulsory School Attendance Affect Schooling and Earnings?," *Quarterly Journal of Economics*, Vol. 61, No. 4, November 1991.

<sup>8</sup> See, for example, Barro, Robert J., "Economic Growth in a Cross Section of Countries," *Quarterly Journal of Economics*, Volume 106, May 1991; and Mankiw, N. Gregory, David Romer, and David Weil, "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics*, Volume 107, May 1992.

<sup>9</sup> Benhabib, Jess, and Mark M. Spiegel, "The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country Data," *Journal of Monetary Economics*, Vol. 34, 1994.

better-educated labor forces grow more rapidly.<sup>10</sup> A well-educated workforce can also raise the productivity of R&D (for example, because new innovations are implemented more quickly), encouraging the technological improvements that are the crucial ingredient in long-term growth.

The cross-country evidence for an education growth effect can best be thought of as augmenting the other evidence on the returns to education. The central difficulty with these cross-country analyses is that countries that "got education right" also got many other things right. That is, countries with high levels of education tended to be those with high investment rates, low inflation rates, a strong export orientation, and stable political systems—all of which are believed to contribute to growth. As a result, disentangling these factors to determine which of them has contributed most is no easy matter. Still, most growth economists believe that in combination with other factors, education plays an important role.

Educational improvements have contributed significantly to postwar economic growth in the United States. If we accept the proposition that more educated workers are paid more because their education makes them more productive, then we can estimate education's growth effects directly by measuring increases in the educational attainment of the workforce. Using this method, the Bureau of Labor Statistics estimates that between 1963 and 1992, improvements in education added 0.3 percentage points per year to the growth rate of GDP—meaning that education accounted for about 20 percent of per-capita income growth over that period. This estimate depends crucially on the assumption that the earnings effects of education equal its effects on the economy's productivity. To the extent that returns to education are associated with credential screening and signalling, then 0.3 percentage points is an overestimate; but if education has positive spillovers, then the actual contribution of education may be even greater. Training and on-the-job learning also contribute to economic growth, although we have no estimates of the magnitude of these effects.

Educational improvements for lower-skilled workers can help ensure that they benefit fully from economic growth. Factors that contribute to growth, such as technological advancement and increased trade, sometimes benefit higher-skilled workers disproportionately. The computer advances of recent years, for example, have probably contributed to economic growth while simultaneously shifting labor demand toward the high-skilled workers who can best use the new technologies. To keep lower-skilled workers from being left behind by growth, it may therefore be necessary to increase their levels of education and training.

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<sup>10</sup> Holtz-Eakin, Douglas, "Solow and the States: Capital Accumulation, Productivity, and Economic Growth," *National Tax Journal*, Vol. 46, No. 4, 1993.

#### IV. LEARNING THROUGHOUT THE LIFE CYCLE HAS HIGH PAYOFFS.

Head Start and other compensatory pre-school programs have substantial economic payoffs. Pre-school programs, such as Head Start, can give a persistent boost to academic achievement. Compared with other students with similar characteristics, graduates of Head Start-style programs are less likely to be held back in school, less likely to be classified as special-education students, and more likely to graduate from high school. As a result, the program appears to yield net benefits not only for participants but also for the taxpayer.<sup>11</sup> Critics of Head Start-style programs have noted that although the programs substantially increase the IQ test scores of participant children relative to non-participants, this test-score advantage disappears by the end of grade school. But studies that have looked beyond this narrow measure of intelligence show that despite the erosion of IQ test-score effects, these programs do raise future academic achievement.

School-to-work programs can improve student outcomes. Recently, substantial governmental efforts have been devoted to strengthening the link between high schools, community colleges, and the workplace. Although these efforts are in many cases too recent to have produced results that can be evaluated rigorously, preliminary results are encouraging. For example, California's Partnership Academies, which combine high-school education with career-focused training and work experience, have apparently been quite successful in reducing dropout rates among program participants.<sup>12</sup> More definite results are available for established programs targeted at high-school dropouts, such as the highly successful Center for Employment Training in San Jose.

Education and training for experienced workers have economic benefits as well. One recent study concluded that each year of education provided through a Pennsylvania program for older displaced workers increased earnings by some 7 percent.<sup>13</sup> And a recent study of the Job Training Partnership Act, a Federal program providing training for economically disadvantaged clients, found that participation increased the earnings of adult

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<sup>11</sup> Barnett, W. Steven, "Benefits of Compensatory Preschool Education," *Journal of Human Resources*, Vol. 27, No. 2, Spring 1992.

<sup>12</sup> Hayward, Becky, and G. Tallmadge, *Evaluation of Dropout Prevention and Reentry Projects in Vocational Education*, draft final report, Research Triangle Institute, November 1993; and Stern, David, et al., "Benefits and Costs of Dropout Prevention in a Program Combining Academic and Vocational Education: Third-Year Results from Replications of the California Peninsula Academies," *Educational Evaluation and Policy Analysis*, Vol. 11, No. 4, 1989.

<sup>13</sup> Jacobson, Louis, Robert LaLonde, and Daniel G. Sullivan, "The Returns to Classroom Training for Dislocated Workers," unpublished manuscript, September 1994.

males by 10 percent and the earnings of adult female participants by 15 percent. These earnings gains were one and a half times greater than the costs invested to produce them.<sup>14</sup> [See Chart I]

**Firm-provided vocational training has positive economic impacts for participants and employers.** For workers, a year of either on-the-job or formal training raises wages by about as much as a year of college education.<sup>15</sup> There is also evidence that firm-provided training leads to productivity gains. A survey of small manufacturing firms in Michigan that received training grants from the state government found that the additional training provided by manufacturing firms significantly raised productivity.<sup>16</sup> Another study of formal training programs in manufacturing firms found that firms that introduced training programs in 1983 had productivity growth that was 19 percent faster, on average, than at other firms.<sup>17</sup>

Some evidence suggests that training is most effective when combined with other innovative workplace practices. In practice, companies that train their workers well tend also to have adopted other innovative practices—for example, pay systems that reward productivity, as well as management structures that give frontline employees the ability to suggest and implement improvements in the product and workplace.<sup>18</sup> Several studies suggest that taken together, these policies are particularly effective.

Evidence of the effectiveness of these human-resource practices comes from a variety of industries. In manufacturing, a multiyear study of steel finishing lines showed that plants using highly innovative human-resource management systems (i.e., that had incentive-based pay and employee involvement as well as training) had the highest productivity: these plants were in operation 98 percent of scheduled time, compared with only 88 percent of the time at companies with traditional work practices.<sup>19</sup> Another study concluded that high-involvement steel minimills not only excel in quality and productivity but also enjoy lower employee

<sup>14</sup> Bloom, Howard S., et al., *The National JTPA Study: Overview of Impacts, Benefits, and Costs of Title II-A*, Abt Associates, February 1994.

<sup>15</sup> Lynch, Lisa, "Private Sector Training and the Earnings of Young Workers," *American Economic Review*, Vol. 82, No. 1., 1992.

<sup>16</sup> Holzer, Harry et al., "Are Training Subsidies for Firms Effective? The Michigan Experience," *Industrial and Labor Relations Review*, November 1993.

<sup>17</sup> Bartel, Anne, "Productivity Gains from the Implementation of Employee Training Programs," *Industrial Relations*, forthcoming.

<sup>18</sup> U.S. Department of Labor, *High Performance Work Practices and Firm Performance*, 1993; and Levine, David I., *Reinventing the Workplace: How Business and Employees Can Both Win* (Brookings, 1993).

<sup>19</sup> Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi, "The Effects of Human Resource Management Practices on Productivity," unpublished manuscript, March 1994.

turnover.<sup>20</sup> Moreover, these results are not unique to the steel industry. A comparison of productivity in several industries in the U.S., Germany and Japan found that adopting best-practice production processes generally required extensive worker training.<sup>21</sup> A worldwide study of the automobile industry found that a coordinated change to an involvement-oriented human resource system can simultaneously improve product quality and productivity.<sup>22</sup> Studies of the electrical components industry and of companies with flexible manufacturing systems have found similar results.<sup>23</sup>

Although most of the detailed studies are in manufacturing, these policies also appear to yield benefits in service industries. One study of 850 publicly held service companies discovered that these work practices correlated with a significant reduction in employee turnover and with 16 percent higher sales per employee (controlling for capital per worker and research and development spending), higher annual cash flow, and increased market value of the company.<sup>24</sup>

## V. FAMILY INCOME AND TUITION COSTS AFFECT EDUCATIONAL OPPORTUNITIES.

Borrowing constraints mean that college costs may have a particularly large effect on educational attainment. If capital markets functioned perfectly, any student for whom the expected returns to education were greater than the interest rate would be able to borrow enough to cover tuition and living costs. Thus low- and high-income students with similar abilities would be expected to enroll in college at similar rates. But in practice, future earnings are far less effective as collateral than are physical assets such as houses. As a result, before federal guarantees, students could not generally borrow enough to cover the costs of education. Thus college costs matter more than they should: even when costs are low enough to make education a good investment for a low-income student, they may be too high for him or her to stay in school. A variety of evidence suggests that by easing the borrowing constraint, government can substantially increase educational enrollments.

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<sup>20</sup> Arthur, Jeffrey B., "Effects of Human Resource Systems on Manufacturing Performance and Turnover," *Academy of Management Journal*, Vol. 37, No. 3, 1994.

<sup>21</sup> Baily, Martin Neil, and Hans Gersbach, "Efficiency in Manufacturing and the Need for Global Competition," *Brookings Papers on Economic Activity: Microeconomics*, forthcoming.

<sup>22</sup> MacDuffie, John Paul, "Human Resource Bundles and Manufacturing Performance," University of Pennsylvania, Wharton School of Management, June 1993.

<sup>23</sup> Cutcher-Gershenfeld, Joel, "The Impact on Economic Performance of a Transformation in Workplace Relations," *Industrial and Labor Relations Review*, Vol. 44, January 1991; and Jaikumar, Ramchandran, "Postindustrial Manufacturing," *Harvard Business Review*, Vol. 64, November-December 1986.

<sup>24</sup> Huselid, Mark A., "The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance," *Academy of Management Journal*, forthcoming.



Lower college tuition leads substantially more students to enroll in college. The net cost of college education appears to have a substantial impact on the likelihood of college enrollment for low-income students. For example, one recent study has found that students from states with low public-university tuition levels are more likely to attend post-secondary education than students from other states, even after controlling for a wide variety of other factors that could cause this difference.<sup>25</sup> The effect is stronger for low-income students than for high-income students, consistent with the hypothesis that borrowing constraints do indeed constrain educational attainment.

Government aid can also play an important role in driving down the cost of college, and thus inducing more students from low-income families to attend. For a variety of reasons, students from low-income families may be particularly averse to taking on the high level of indebtedness associated with borrowing for college. Consistent with this, there is a substantial amount of evidence that for low-income students, the availability of grant aid strongly increases the likelihood of participation in further education.<sup>26</sup>

The low levels of educational attainment of low-income students (caused both by borrowing constraints and by other risk factors) are costly in terms of lost future productivity. For poor children, rates of school completion and advancement to post-secondary education are much lower than for other children. For example, children who experience poverty between the ages of 6 and 15 years are two to three times more likely to drop out of high school than are students who never experience poverty. A recent study commissioned by the Children's Defense Fund, which added up the costs of low educational achievement for the 14.6 million poor children in 1992, estimated that each year that these children spend in poverty costs the economy somewhere between \$36 billion and \$177 billion in reduced future productivity and employment. (Again, these estimates assume that the productivity benefits of a year of education are as large for poor students as they are for the average student.)

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<sup>25</sup> Kane, Thomas, "College Entry By Blacks Since 1970: The Role of College Costs, Family Background, and Returns to Education," *Journal of Political Economy*, October 1994. See also Manski, Charles, and David Wise, *College Choice in America*, Harvard University Press, 1983.

<sup>26</sup> McPherson, Michael, and Morton Shapiro, *Keeping College Affordable: Government and Educational Opportunity*, Brookings Institution, 1991, p. 214; Hauptman, Arthur M., and Maureen McLaughlin, "Is the Goal of Access to Post-Secondary Education Being Met?," Washington, D.C., American Council on Education, 1988; Jensen, Eric L., "Financial Aid and Educational Outcomes: A Review," *College and University*, Spring 1983; Leslie, Larry, and Paul Brinkman, *The Economic Value of Higher Education*, McMillan, 1988; Manski and Wise, *op. cit.*

## VI. CONCLUSION

A quality education is a key determinant of an individual's future economic well-being and is a critical ingredient for this nation's future economic health and strength. The evidence on this score is overwhelming.

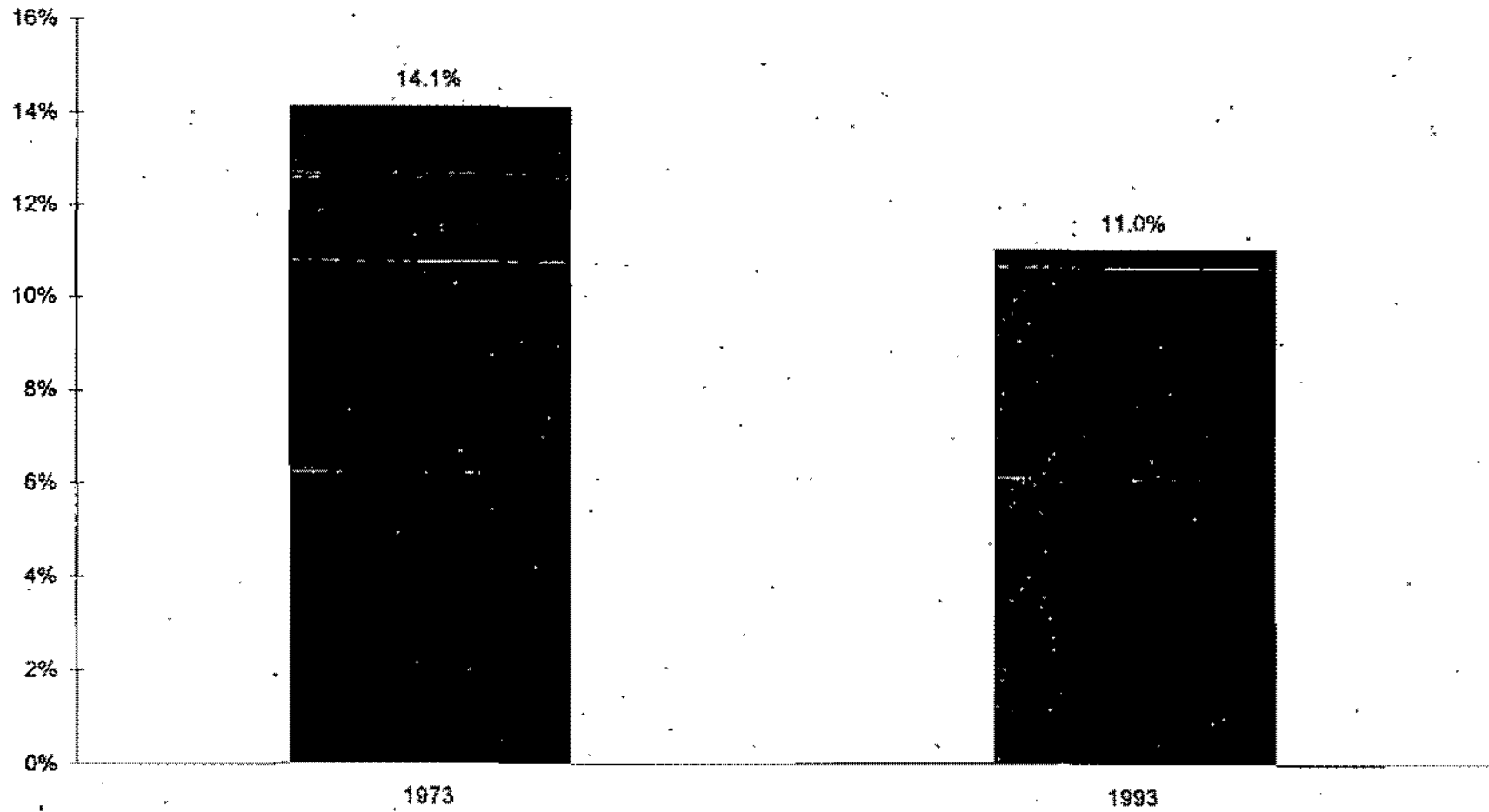
- \* The economic returns to education for America's working men and women have risen dramatically. In 1979, the median full-time worker with at least a bachelor's degree earned 36 percent more per week than a worker with only a high school degree. By 1994, that difference had grown to 74 percent.
- \* Since education raises the earnings and productivity of workers, it contributes to overall economic growth.
- \* The evidence shows that compensatory preschool education programs such as Head Start improve subsequent school achievement. The evidence is not yet available to provide a full evaluation of "school to work" programs, but the initial evidence is favorable.
- \* Education and training pay off for workers who have already entered the labor market. Worker training is generally an essential ingredient in the adoption of high performance workplaces.
- \* Programs that make education cheaper or more available appear to increase the amount of education.

In the words of Benjamin Franklin: "An investment in knowledge pays the best interest."

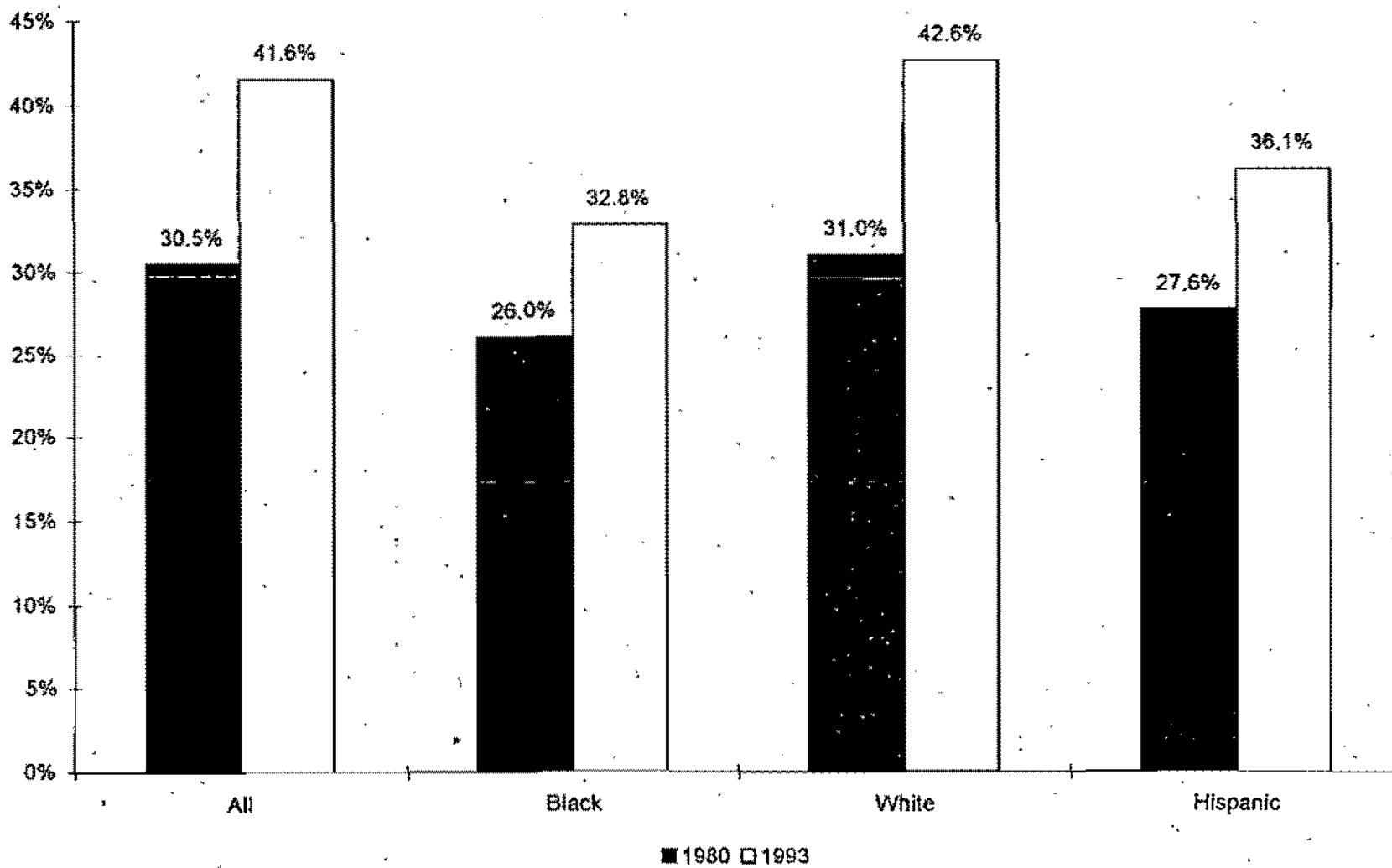
Given the strong evidence pointing to the positive impact that education has on the lives of American workers and our economy, our nation must renew its commitment to these investments. Abandoning our commitment to education -- especially at a time when the future standard of living for American workers and the strength of the American economy depends on an educated workforce -- is shortsighted and could have long-term damaging consequences to this nation's economic health and strength.

### CHART A

High-school dropout rates for persons aged 16 to 24 years

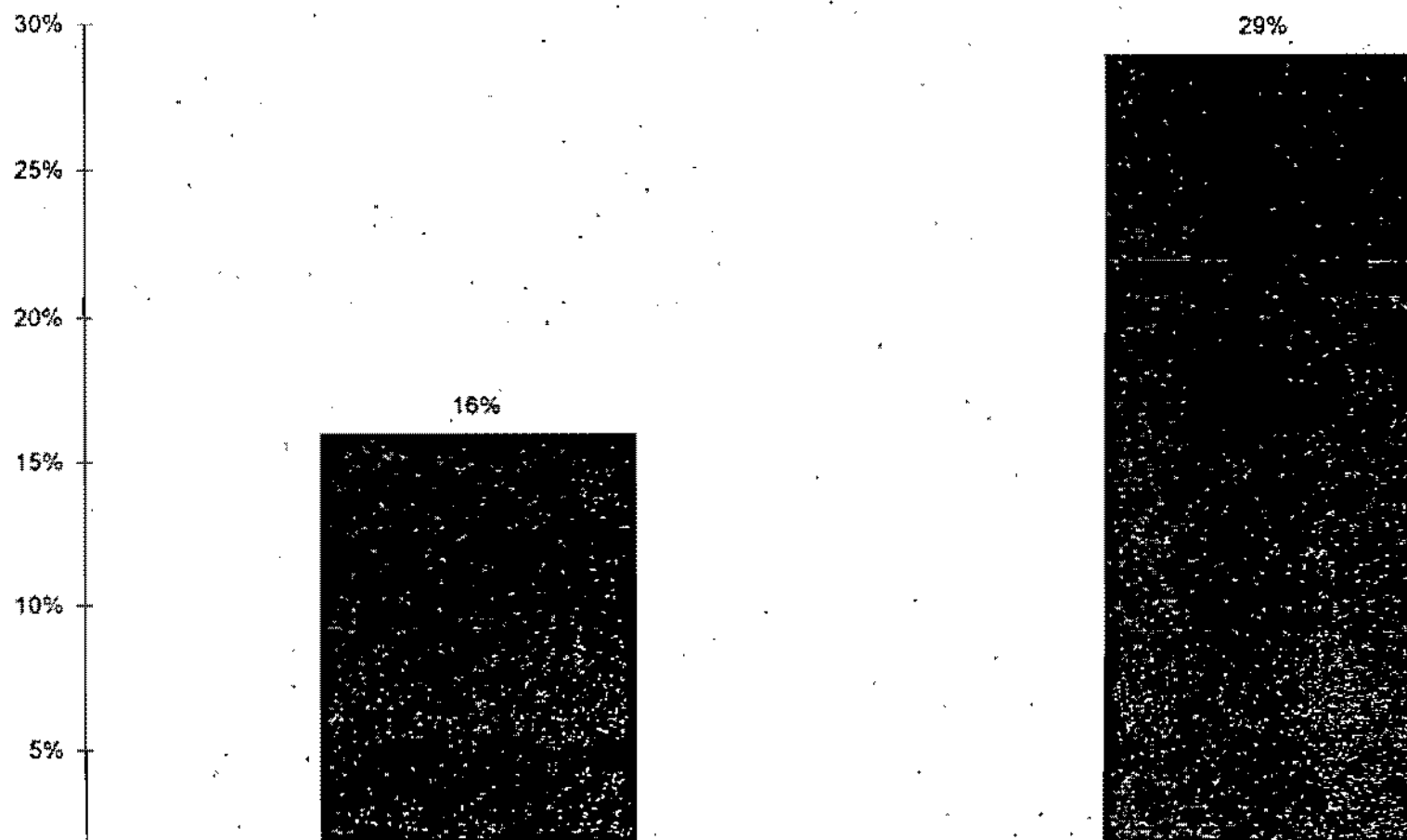


**CHART B**  
College enrollment of 18- to 24-year-old high-school graduates

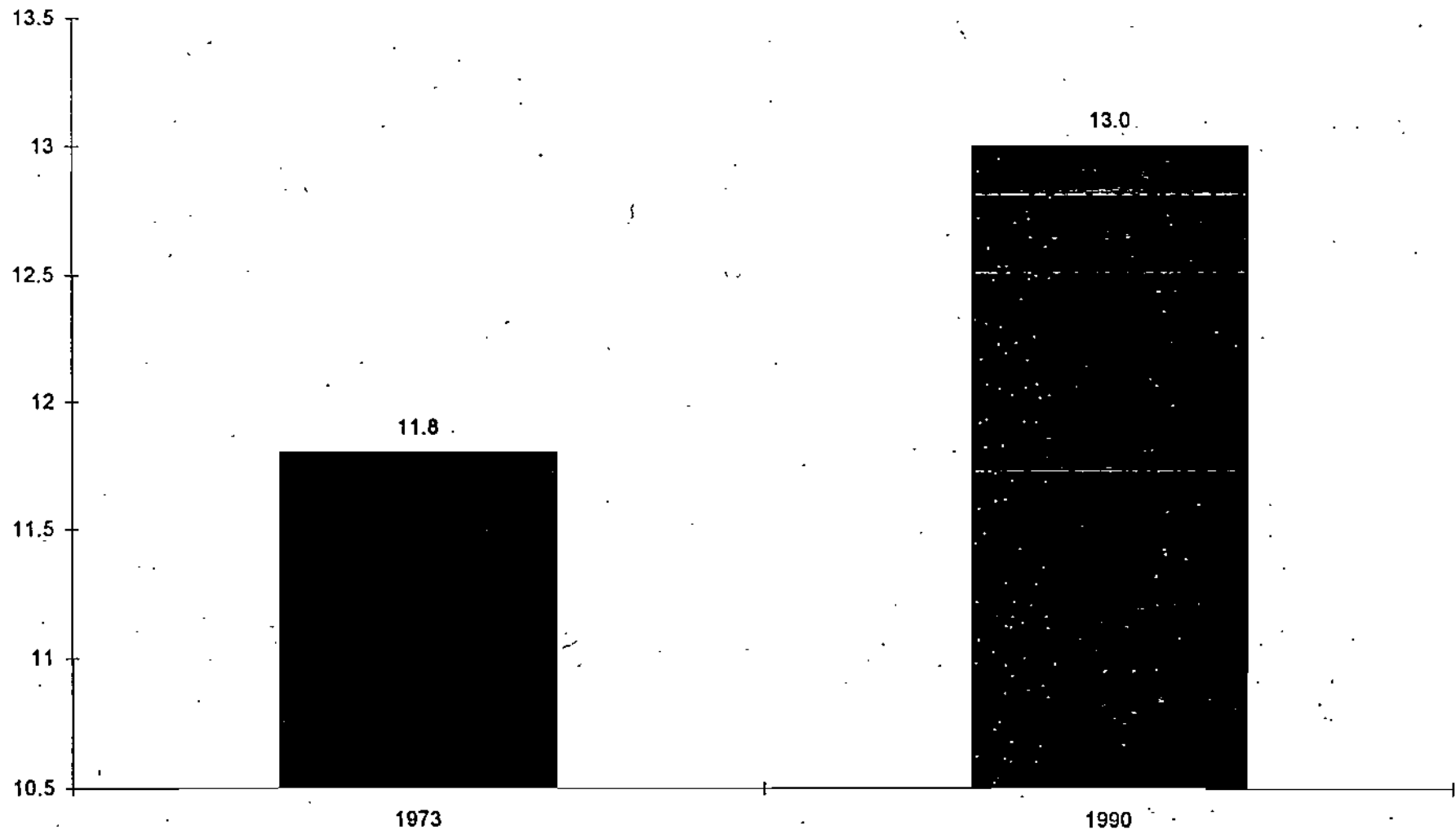


### CHART C

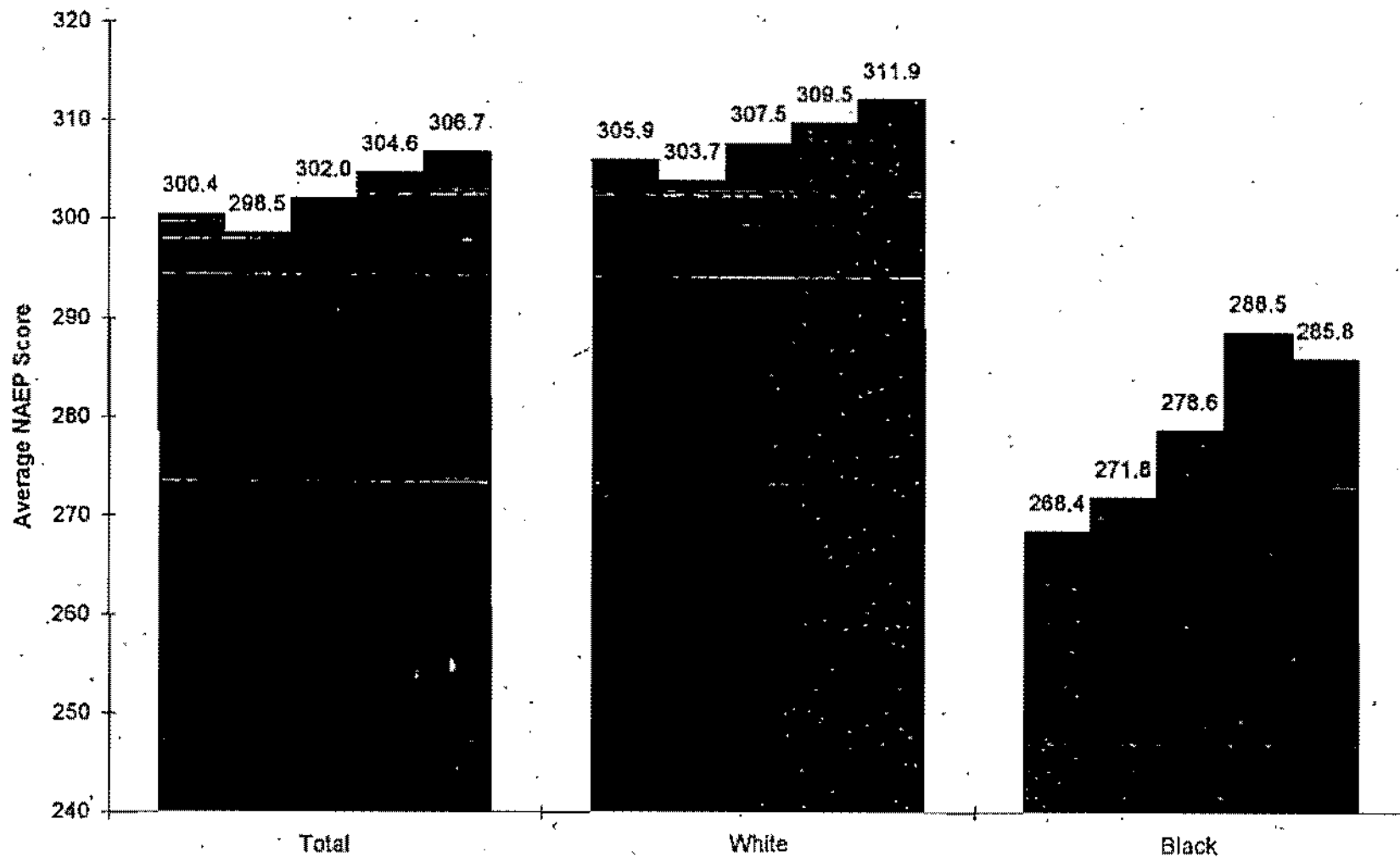
Fraction of labor force with a college degree



**CHART D**  
Average years of education per worker

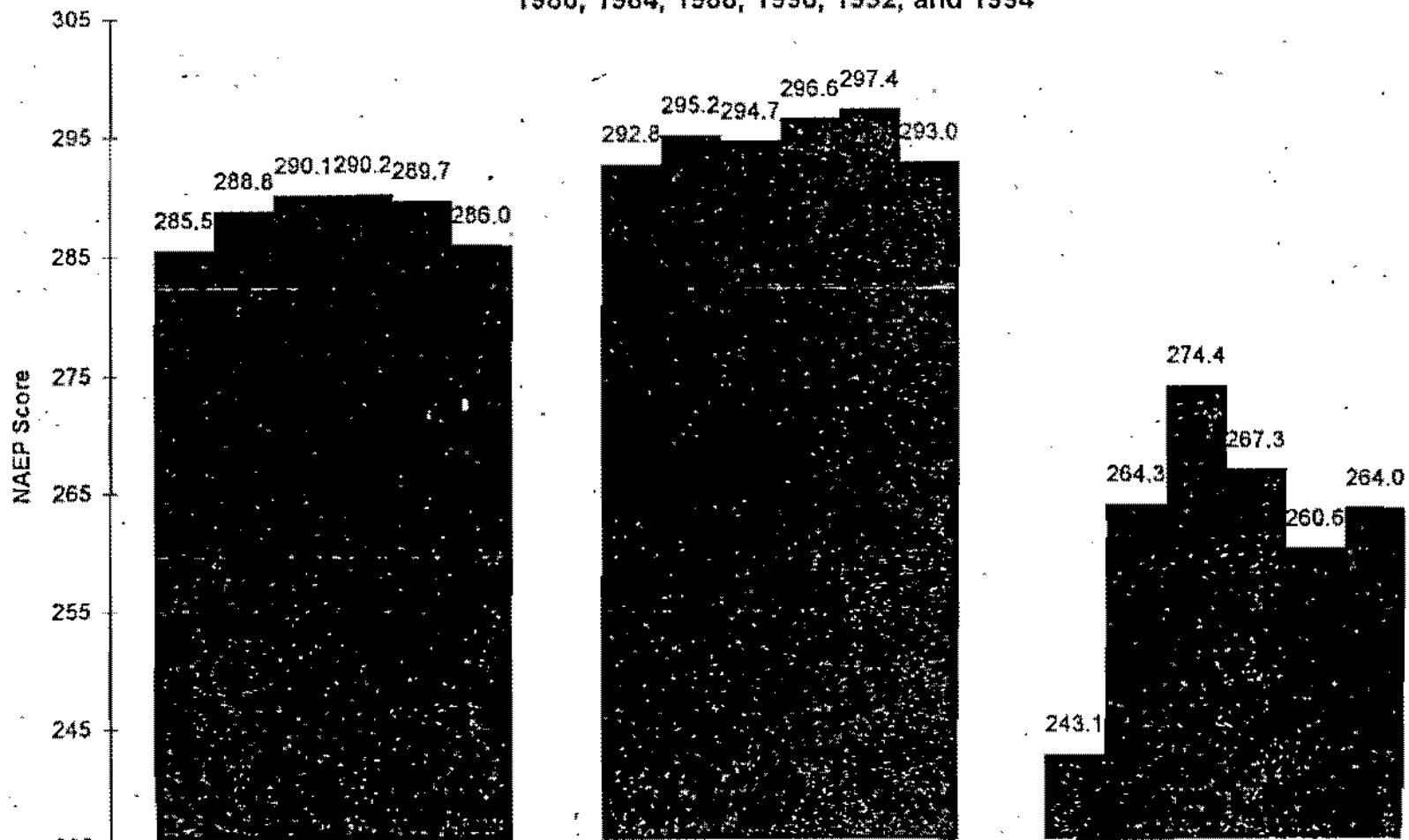


**CHART E**  
**NAEP Mathematics Scores of 17-year olds**  
**1978, 1982, 1986, 1990, and 1992**



### CHART F

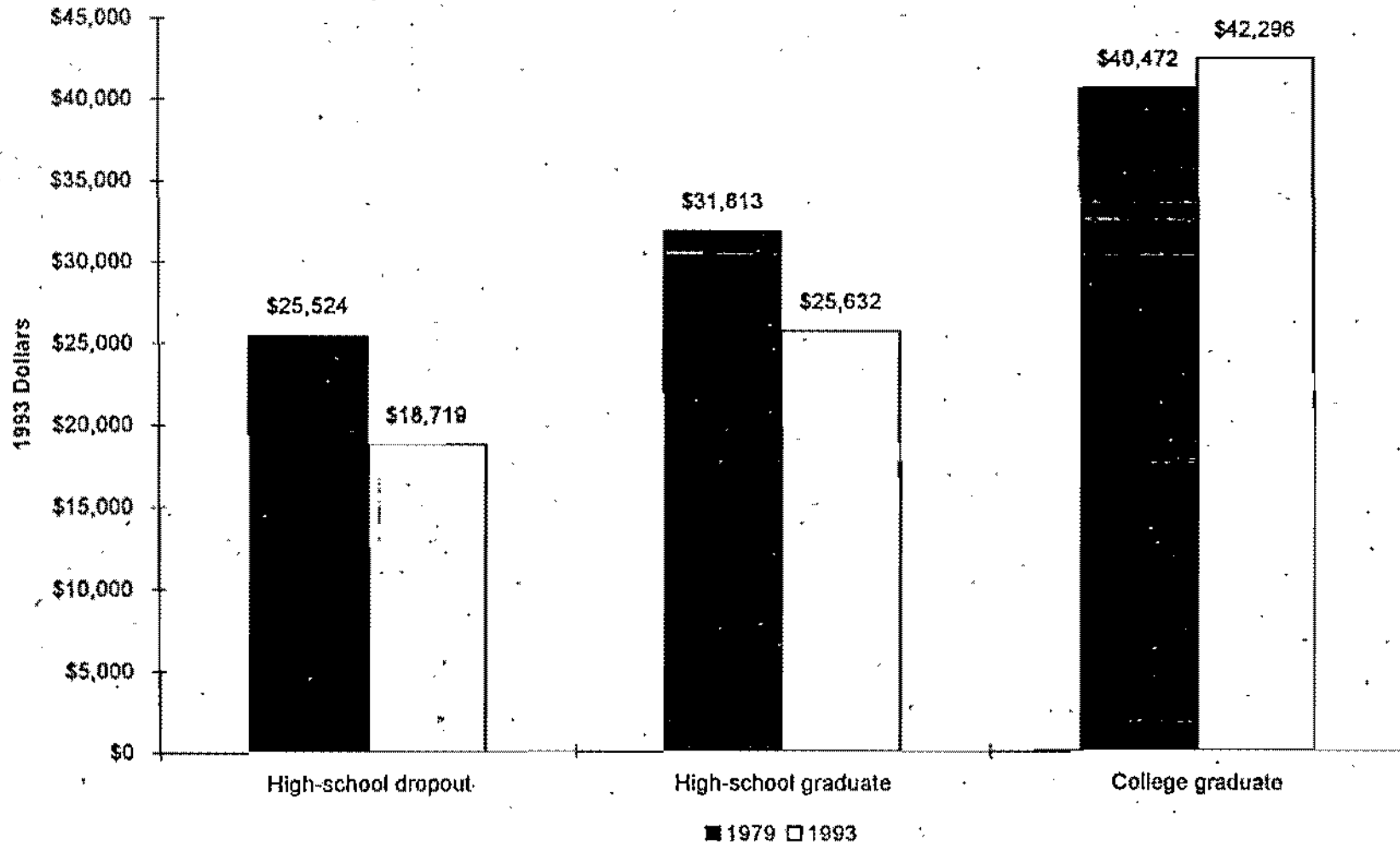
NAEP Reading Scores of 17-year olds\*  
1980, 1984, 1988, 1990, 1992, and 1994



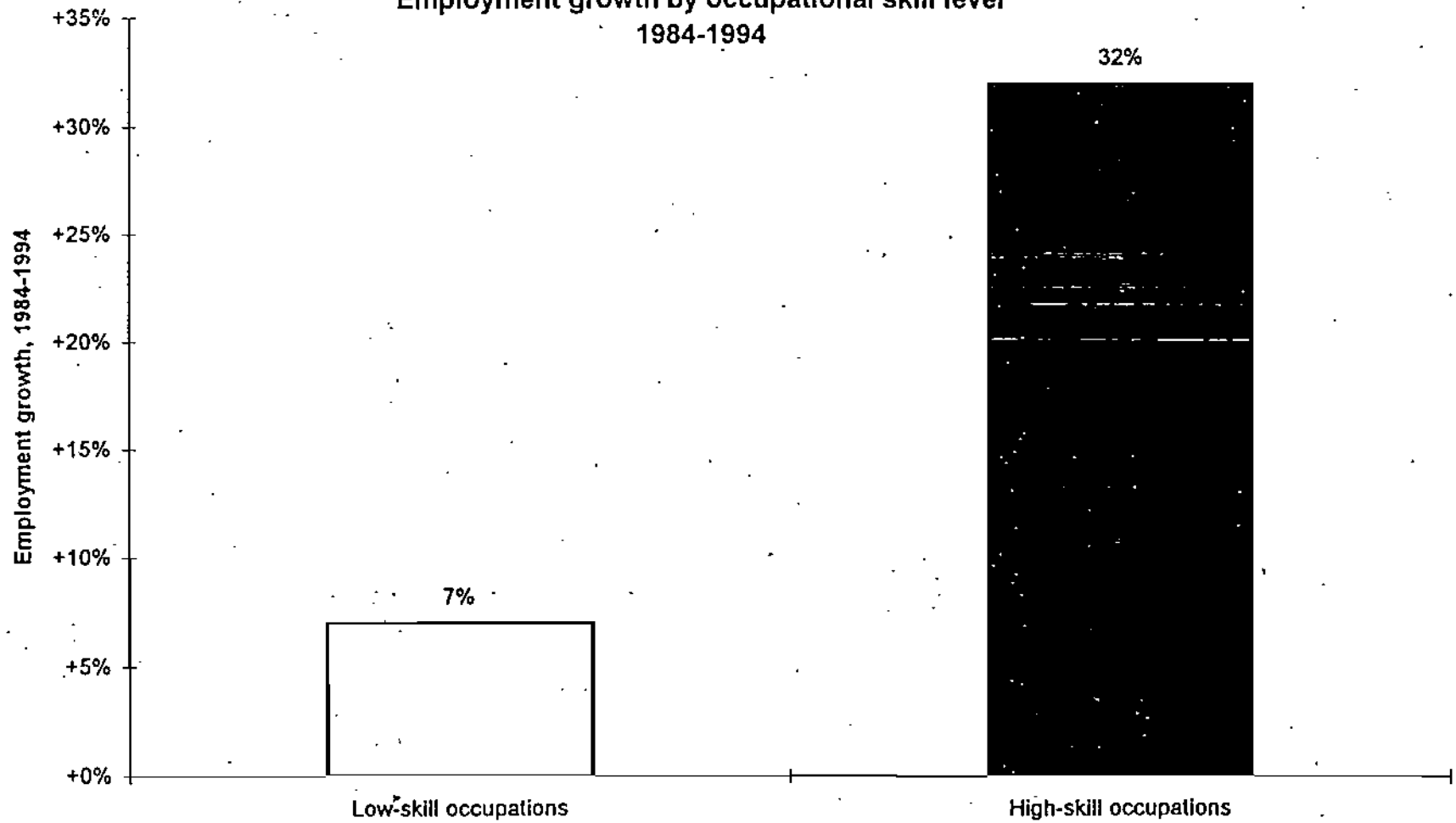


### CHART G

Mean annual earnings for male full-time year-round workers,  
Aged 25 to 34 in 1979 and 1993

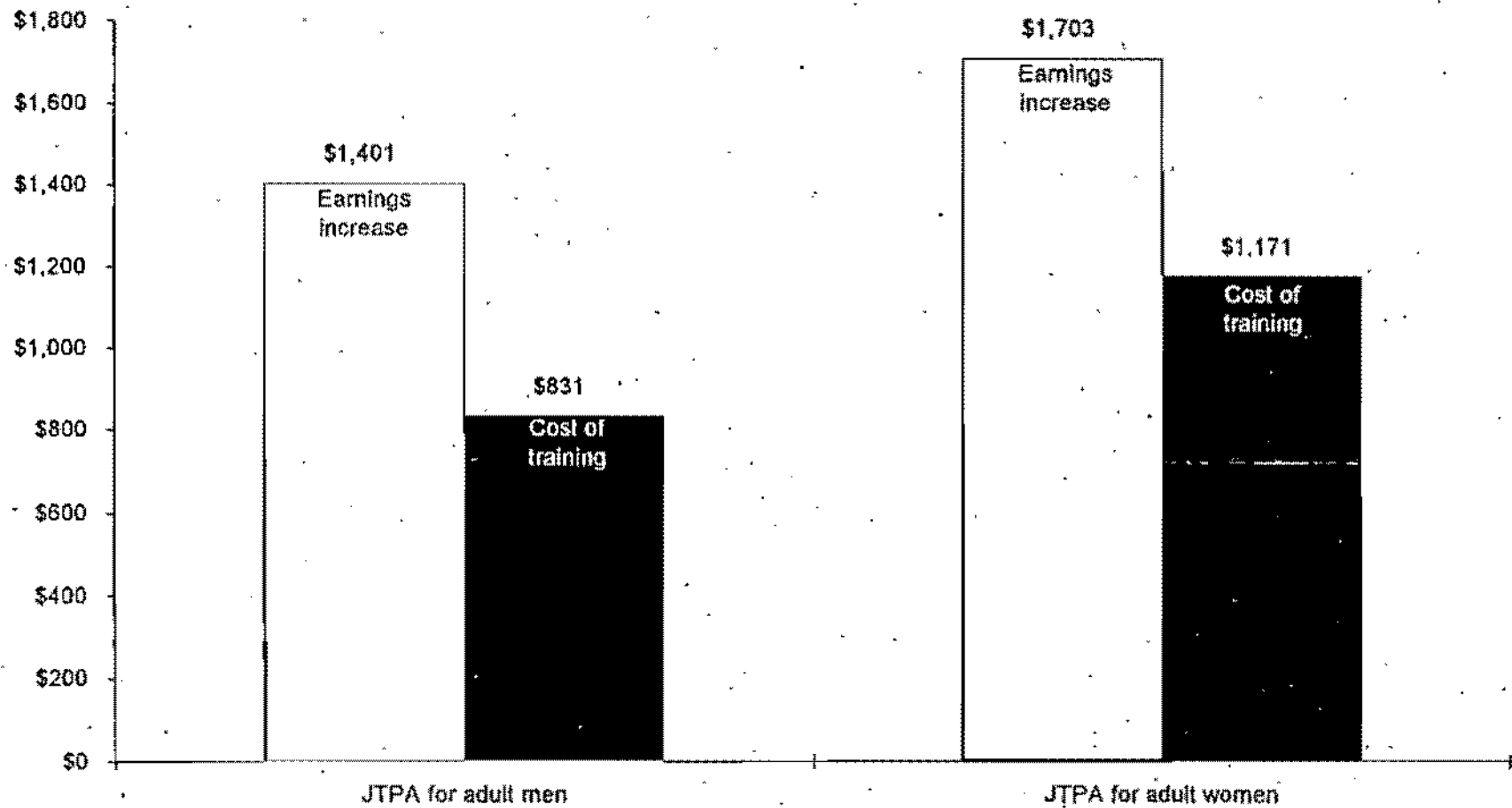


**CHART H**  
**Employment growth by occupational skill level**  
**1984-1994**



NOTE: High-skill occupations are defined as those in the top third of all employment by average educational attainment. Low-skill occupations are defined as those in the bottom third of all employment by average educational attainment.

**CHART I**  
**Increases in earnings outweigh costs of JTPA training**



NOTE: Earnings increase represents total additional earnings due to training over 30 months following training.