

NBER WORKING PAPER SERIES

THE U.S. ECONOMY IN WWII AS A MODEL FOR COPING WITH CLIMATE
CHANGE

Hugh Rockoff

Working Paper 22590
<http://www.nber.org/papers/w22590>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
September 2016

This paper was prepared for “Coping with Scarcity: Energy Shortages, Food Crises, Drought, and Critical Materials in the Modern World (c. 1800 to the present),” a conference at Caltech, November 15-16, 2014, organized by John Brewer and Frank Trentmann. I thank the participants in the conference for many helpful suggestions and stimulating questions. I also thank my colleague Hilary Sigman for a discussion of the issues involved in trying to make use of the wartime model. Jessica Jiang provided excellent research assistance. I am responsible for the remaining errors. The views expressed herein are those of the author and do not necessarily reflect the views of the National Bureau of Economic Research.

NBER working papers are circulated for discussion and comment purposes. They have not been peer-reviewed or been subject to the review by the NBER Board of Directors that accompanies official NBER publications.

© 2016 by Hugh Rockoff. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

The U.S. Economy in WWII as a Model for Coping with Climate Change
Hugh Rockoff
NBER Working Paper No. 22590
September 2016
JEL No. N42

ABSTRACT

During World War II the United States rapidly transformed its economy to cope with a wide range of scarcities, such as shortfalls in the amounts of ocean shipping, aluminum, rubber, and other raw materials needed for the war effort. This paper explores the mobilization to see whether it provides lessons about how the economy could be transformed to meet scarcities produced by climate change or other environmental challenges. It concludes that the success of the United States in overcoming scarcities during World War II without a major deterioration in living standards provides a basis for optimism that environmental challenges can be met, but that the unique political consensus that prevailed during the war limits the practical usefulness of the wartime model.

Hugh Rockoff
Department of Economics
Rutgers University
75 Hamilton Street
New Brunswick, NJ 08901-1248
and NBER
rockoff@econ.rutgers.edu

1. War as an analog for environmental catastrophe

The question of how best to respond to the scarcities that are likely to be produced by global warming and pollution sends social scientists and policy makers in search of historical analogies. There are many examples of droughts, floods, deforestations, and so on, from which much can be learned. But wars can also help us understand how economies respond to extreme challenges. Wars will be especially useful analogs if climate change or pollution reach “tipping points” when conditions worsen dramatically in short periods of time. In this paper I explore the transformation of the American economy in World War II as a model for understanding how to cope with scarcities produced by climate change and pollution.¹

Often in everyday conversation terms such as scarcity or shortage are used simply to refer to a commodity that is available in amounts smaller than what was typically available in the past – amounts below “normal” – or smaller than what is considered adequate given ethical concerns. By these definitions the United States did not suffer from many shortages in World War II. With a few exceptions – most importantly rubber – commodities were available in amounts that exceeded prewar domestic production or imports.² Again, to use a different definition, there were many scarcities in the sense that prices were very high because of increases in demand and/or decreases in supply. There were also many shortages in the economist’s sense

¹ Wartime mobilizations are frequently invoked as models for dealing with other problems. It was a staple of the Roosevelt administration during the New Deal (Leuchtenberg 1966), and since then we have had the war on poverty and the war on cancer. Recently, Bill McKibben (2016) addressed climate change with the WWII analogy in an article in the *New Republic*.

² Supplies of silk (and luffa brushes!), were also cut by Japanese military expansion. Silk had been used for parachutes, but was replaced by nylon.

that demand exceeded supply at the market prices because prices were often fixed by the federal government to try to prevent inflation. In these cases the allocation of available supplies had to be accomplished by some form of non-price rationing: favoritism, queuing, or formal ration tickets. The adoption of non-price rationing in conjunction with price fixing is infrequent in peacetime, but might be used in the future to deal with emergencies produced by atmospheric warming, the exhaustion of fossil fuels, and related problems. The war years, in other words, although brief and aberrant in some ways, have much to teach us about how to deal with environmental challenges. Shortages, by whatever definition, were often addressed by attempts to increase supply, and that often meant huge infrastructure projects.

In some respects the European and Japanese experiences in World War II are better analogs for an economy weakened by environmental stresses than the American experience. Bombs dropped by enemy aircraft are, perhaps, a better analog for severe weather events produced by global warming than the distant challenges faced by the United States in World War II. But the American experience is also relevant. The United States faced many supply challenges and did so as a functioning democratic state in which non-war concerns although subordinate continued to influence policy. In other words, the process of decision making in the United States was much closer to the peacetime norm than it was in Europe or Japan during World War II.³ It is also true that

³ There is a large literature that describes the mobilization. Donald Nelson was the head of the War Production Board and his memoir (1946), although often criticized for its efforts to rationalize his decisions, remains the most important of the memoirs written by one of the participants. Janeway (1951) was the first attempt to explain the economics of the mobilization and draw out the implications for economic policy that received widespread attention. Koistinen (2004) is the best description of the political economy of the mobilization. Klein (2013) and Hyde (2013), the latter restricted to the automobile industry, are recent histories that do a good job of describing the scale and scope of the mobilization. Wilson (2016), in a book that will undoubtedly come to be regarded as a classic, provides a detailed overview of the war economy.

some environmental challenges could be met by investing a small proportion of national product year-after-year over a long period of time. Geoffrey Heal (2016), for example, recently estimated the cost of reducing greenhouse gas emissions 80% by 2050. A smaller war such as the Vietnam War or the Iraq War would be a better analog for this sort of policy than World War II.

In section 2 I describe the state of the economy on the eve of U.S. entry into the war. In section 3 I consider the attempts to augment supplies of crucial materials with massive infrastructure projects, such as the construction of a synthetic rubber industry. Global warming may require similarly large infrastructure projects such as construction of alternative power sources or desalinization plants. In section 4 I look at population movements. Considerable numbers of workers moved to production centers to produce munitions and to increase supplies of materials and transport. Global warming and other environmental challenges may require large population movements, for example from low lying coastal areas or from drought-ridden farming areas. Again, the war has much to teach us about how this can be accomplished quickly.

Despite successful efforts to increase supply, the growth of demand often outpaced supply, and the government, faced by the prospect of a wage-price spiral, turned to price controls and rationing. This issue is explored in section 5. Most of the responses to wartime scarcities required money, in most cases great heaps of money. Section 6 describes the monetary and fiscal policies that raised the needed funds. Progressives hoped that the mobilization would be seen as a hugely successful experiment with big government and that as a result the postwar period would experience a strong left turn in American politics. However, this was not to be. Section 7

explores some of the reasons why the war experience was not interpreted by the general public as Progressives had hoped. Section 8 summarizes the main themes.

2. The U.S. Economy in December 1941

It is often assumed that mobilization was facilitated by a high level of unemployment of both workers and capital that was still present at the onset of the mobilization. There is some truth in this claim, but it is easily exaggerated. The U.S. economy was expanding rapidly in 1940 and 1941, partly as a result of increases in U.S. and foreign military expenditures. During 1941 the rate of unemployment, as shown in Table 1, averaged 6.0 percent, a rate more typical of postwar recessions than the dark days of the Great Depression.⁴ Pearl Harbor and the intensification of the mobilization that followed then pushed unemployment rates to very low levels and hours worked to very high levels (Vernon 1994). The drafting of large numbers of young men, a group that normally has a high rate of unemployment, makes direct comparisons of the wartime and peacetime unemployment rates problematic, but there can be no doubt that the qualitative conclusion, that unemployment had reached very low levels, is surely right. The effect of these trends on the amount of labor available is shown in Figure 1 which plots total hours worked per week from January 1940 to August 1946. Hours worked per week increased steadily during 1940 and 1941 a trend that continued after Pearl Harbor. Hours worked peaked in the summer of 1943.

One category of workers was readily available for the military or work in munitions factories: federal emergency workers. To address unemployment during the

⁴ The three highest rates in the 1950s were 6.8 percent in 1954, 7.1 percent in 1958, and 5.9 percent in 1959.

depression the federal government established several programs to create jobs for unemployed workers including the Civilian Conservation Corps and the Works Projects Administration. Although these agencies undertook projects that could be defended on grounds of productivity, such as planting trees in national parks, the main purpose was mainly to create jobs. The extent of this effort can be seen in Table 1. The second column shows the unemployment rate at key dates. In this column emergency workers are counted as employed, although at the time official statistics counted them as unemployed to emphasize the severity of unemployment. Unemployment on average for the year 1939 was 11.3 percent of the civilian labor force, and as shown in column 2, emergency workers constituted another 5.9 percent of the labor force. Both groups included many workers willing and able to move into the armed forces or war production. By 1944 unemployment was down to 1.2 percent, and the emergency work programs had been eliminated.

That the economy had recovered a good deal of the ground lost during the depression by time Pearl Harbor was attacked probably was a plus for further rapid conversion. In peacetime it may be easier to open a closed factory than to convert one which is going full blast. Financial incentives may be sufficient to convince owners of the closed factory to open it and for managers and workers to show up for work. The same financial incentives may not convince the owners of the factory going full blast to produce a new product. The new product may appear to be more profitable, but why *take a risk* if things are going well? It may be thoughts about the opening of closed factories as opposed to changing production in a factory that is already profitable in peacetime that lead observers to think that unemployment facilitates conversion.

But during World War II risk was taken off the table with the use of cost-plus contracts, rapid depreciation of war related investments, and other measures. The incentive effects of these contracts were reinforced by limitation orders⁵ and patriotism. With risk off the table, another consideration comes to the fore. If a factory is going full blast, workers and managers are already in place, all that needs doing is tearing out old production lines and putting in new ones. The closed factory can also be brought online, but there may be delays in assembling workers and managers. Executives in the auto industry made use of this argument when, before Pearl Harbor, it was being pressured to begin some limited production of weapons. Partial conversion, they claimed was inefficient. Let us have full civilian production runs, and then when we have to, we will be able to convert rapidly to war production. The argument was self-serving, but not without logic.

3. New Infrastructure

An impressive array of new infrastructure was built in the United States during World War II. Production of raw materials, of course, had to be multiplied substantially to meet the needs of the armed forces, and this required expanding existing facilities and constructing new ones. The peak for ingot steel was in March 1944 when 93.8 million long tons were produced, an annual rate about 1.8 times the amount produced in 1939. Aluminum production increased by a factor of 6.9, and magnesium production by a factor of 72 (Dewhurst 1947, 778).

⁵ Beginning in the summer of 1941 government orders first limited and then prohibited production of automobiles, trucks, refrigerators, and many other consumer durables.

Robert J. Gordon in a famous paper estimated that about \$29 billion, including both private and public money, was spent on manufacturing structures and equipment during the war (Gordon 1969, 228). This would be about \$442 billion in today's money using the CPI as the inflator, about \$781 billion using the unskilled wage, and about \$3.04 trillion using nominal GDP.⁶ Many of the projects completed during the war would be the subject of intense public attention and consuming political and legal controversy if undertaken today. A list of these projects includes the Big Inch and Little Big Inch pipelines, the Alaska Highway, new factories to produce aluminum and magnesium, the synthetic rubber industry, an expanded fleet of ocean transport, and the Manhattan Project which built the atomic bomb.

The rapid completion of these projects – which was accomplished without substantially endangering current living standards – suggests that large infrastructure projects designed to cope with climate change or other environmental challenges could be completed quickly provided adequate funding was available and the usual array of legal obstacles could be overcome. In each of these cases – the Manhattan Project is the exception – the project made use of known technologies. Projects designed to cope with the effects of climate change that require the development of new technologies cannot rely on the wartime analogs as evidence that they could be accomplished relatively easily.⁷ There are many papers and monographs that are devoted to these projects. Here I will provide brief summaries of four that together convey a sense of the scope, speed, and diversity of the projects undertaken.

⁶ I used the inflators available at www.measuringworth.com (accessed April 21, 2016) and assumed that the expenditures were all made in 1942.

⁷ Field (2008) showed that despite many claims to the contrary total factor productivity did not ratchet upwards over the war period.

(1) The synthetic rubber industry is perhaps the clearest example of the creation of a new industry to resolve a wartime scarcity. In this case the term scarcity can be given a conventional definition of a severe reduction in the amount of a commodity available. Before World War II most of America's rubber came from plantations in the Far East. Those supplies were cut off by the outbreak of the war with Japan. There had been attempts before the war to create a stockpile of rubber, but those efforts were limited. Adequate funding to lay in a stock of raw materials that were then in abundant supply, but would not be if the United States became involved in a war that most Americans did not want to join, was not forthcoming either from the automobile tire industry (the main user of rubber) or the government. Figure 2 shows the amount of rubber consumed by type during the war: natural rubber, reclaimed, and synthetic. The Figure shows the dramatic fall in the consumption of natural rubber. By 1945 consumption of natural rubber was only about 14 percent of what it had been in 1941.

As can also be seen in Figure 2, the contribution of reclaimed rubber to total production remained roughly constant during the war. The exception is 1943 when consumption was about 16 percent higher than it had been in 1941. After Pearl Harbor automobile tires were rationed to limit hoarding and gasoline was rationed to limit driving and conserve the existing stock of tires. Part of the increase in consumption of reclaim was due to the efforts of the general public who responded enthusiastically to a highly publicized salvage campaign. The reclaim industry, however, had been well established before the war and continued to supply most of the reclaimed rubber from traditional sources. The efforts of patriotic Americans to find rubber by rummaging for old tires, rubber mats, and so on, made a modest contribution, despite the inspiring

news stories about the nationwide search for used rubber. Much of the salvaged rubber could not be turned into tires, the most pressing need. Although helpful, the contribution of the salvage campaign was mostly to morale. The fears of children in particular could be assuaged by making them feel that they were helping to win the war.

Another salvage campaign, incidentally, that was less important in economic terms than it was in political and social term was the fat salvage campaign. Americans were encouraged to save cooking fat and turn it in to the local butcher. Fat was needed, Americans were told, to make explosives. The truth, however, was rather different. The amount of fat needed for munitions was only a small fraction of U.S. production. Explosive makers could be sure that they would get their share. The fat salvage campaign was funded by the soap makers. They were concerned that if soap was rationed, some consumers would get used to using less, and that as a result postwar market for soap would be spoiled.

The real answer to the rubber shortage was synthetic rubber.⁸ Automobile tires of high quality had been made successfully from neoprene, a synthetic developed in the United States, as early as 1934. But the molecule finally chosen to be the workhorse of the synthetic rubber program was Buna-S which had been developed by I.G. Farben and Standard Oil. I.G. Farben had invented the molecule; Standard Oil's contribution was scaling up the laboratory process for mass production. Attempts had been made to convince the tire companies to invest in synthetic rubber before the war, but these efforts had been frustrated by the low price of natural rubber. To contemporaries the synthetic rubber program seemed to be slow in getting off the ground. One problem was

⁸ Bisio and Herbert (1985) provides an excellent overview of the program. Howard (1947), a Standard Oil chemist and executive provides an informed participant's view and a defense of Standard Oil's role.

to decide on the type of synthetic rubber that would form the basis of the program. A committee appointed by President Roosevelt and headed by Bernard Baruch, the head of the War Industries Board in World War I, solved that problem by picking Buna S. A further delay was caused by Standard Oil's attempt to receive long-run recognition of its patent rights. But once these issues were settled facilities were created and came online rapidly. The Baruch Committee reported in September 1942. By May of 1943, Standard Oil had its Butadiene plant (a key feedstock for synthetic rubber) up and running. By 1944, as shown in Figure 2, the shortfall in consumption of natural rubber had been offset by production and consumption of synthetic rubber. The synthetic rubber program, however, was only one of many infrastructure projects.

(2) The Big Inch and Little Big Inch pipelines were completed in 1943 and 1944. Before the war much of the oil going from Texas oil fields to East coast refineries had been carried by ocean tankers. German submarines, however, successfully attacked the oil tankers, creating the need for safer supply lines. Pipelines were the obvious answer. Pipes had been used for many years to transport oil. But sustainable pressures were low and the oil moved slowly. In the 1930s techniques were developed to create large diameter pipes that could transport oil under high pressure. The government provided the funding for the pipelines through subsidiaries of the Reconstruction Finance Corporation. Contracts for the Big Inch, the first of the lines, were awarded in July 1942, the first pipes were laid in August, and oil was flowing by February of 1943.

Over the years the oil pipe line industry had been faced with many legal challenges from the government for monopoly pricing. On December 23, 1941 the Justice Department launched a suit against a number of oil and affiliated pipe line

companies, with a potential penalty of \$1.5 billion (about \$162 billion in 2015 dollars to maintain a constant share of GDP). But this suit was quickly settled by a consent decree that imposed few penalties because the companies argued that they couldn't respond to wartime demands for new construction with this penalty hanging over them. Further investigations of the industry by the Justice Department and Interstate Commerce Commission were postponed for the duration of the war (Dillard 1944), a good illustration of the elimination of legal constraints on infrastructure investment produced by the war. After the war the pipe lines were converted to natural gas and sold to private firms.

(3) Aluminum was needed in large amounts for aircraft, and so the United States undertook a major expansion program. New plants were financed by the government through the Reconstruction Finance Corporation. Before the war the Aluminum Company of America had a monopoly and had been charged with violating the antitrust laws. After the war several West Coast plants were sold to Henry Kaiser, creating Kaiser Aluminum and competition for the Aluminum Company. Production of aluminum as shown in Figure 3 more than quadrupled between January of 1941 and the peak in 1943.

One sometimes finds references in general histories of the war to the fact that the government needed to ration steel, copper, and aluminum. The story is complex. There was considerable concern during the early phase of the war that the armed forces were letting too many contracts. Producers, it was feared, would be working on too many half-finished projects and the economy as a whole might deteriorate because too many resources were devoted to the production of munitions and not enough to the

production of goods for the civilian sector. A number of plans were tried to deal with this problem. One, borrowed from World War I, was the priority system. The idea was that each contract would be given a rating by the War Production Board – A, B, C, and so on – and producers would be required to finish higher rated contracts first. It sounded good, but in practice it foundered on “priorities inflation.” Major producers were given the authority to pass on their high priorities to subcontractors and they tended to use the highest justifiable priority. The productive system was flooded with high priorities. The War Production Board responded by introducing higher priorities, but these new and higher priorities soon flooded the system as well. The priorities system clearly was not working.

Eventually, the War Production Board settled on the “controlled materials program” (CMP). Under this system the Board would give the agencies awarding contracts for munitions allotments of steel, copper, and aluminum (the three “controlled materials).” Contracts could only be awarded if there were enough of these materials available for its completion. The CMP has been heralded as a great success. One enthusiastic historian, of the war effort, Elliot Janeway (1951) claimed that the CMP “flooded the fighting fronts with firepower.” His claim has been repeated often by historians of the war effort. For one thing, the name of the plan may have appealed to historians anxious to find successful examples of government planning. But consider Figure 3 which plots monthly production of steel, copper, and aluminum, and shows the dates on which the CMP was announced and the CMP became mandatory. Although there were modest increases in steel and copper production, they were dwarfed by the increase in aluminum production which was needed in vast amounts for aircraft. But as

shown in Figure 3 by the time the CMP went into effect the problem created by a shortage of aluminum had been solved. Production of airframes was soon cut because the supply of planes coming on line was more than adequate. The limiting factor was pilots rather than planes. And with the cut in airframe production came the cut in aluminum production. There is also some evidence that the Army Air Force ignored the CMP for a time even after it became mandatory – telling the War Production Board one thing and the aircraft manufacturers something else. The end of this policy of “double book keeping,” as it has been referred to, was more or less coincident with the peak in aluminum production.

(4) The most stunning example of what could be accomplished by the government in a short period of time when financial and legal constraints were removed was the atomic bomb. American progress toward a bomb can be dated from the delivery to President Roosevelt in October 1939 of the famous Einstein–Szilárd letter warning that Germany might build an atomic bomb and urging that the United States build one. Although the general idea of how an atomic bomb would work was understood by physicists, the methods by which one could be constructed were not. The solution was to set several teams to work exploring alternative means of collecting fissionable material and alternative ways of constructing a bomb from those materials. General Leslie Groves, who had supervised construction of the Pentagon, assumed command of the Manhattan Project in September 1942 and acquisition of land at Oak Ridge Tennessee, one of the key sites for the production of the raw material for the bomb began at that time. J. Robert Oppenheimer became the supervisor of the scientific work in July 1943.

There were local objections to the acquisition of land at Oak Ridge and the displacement of local residents. There was even a brief congressional investigation. But the urgency of war meant that local resistance would not be allowed interfere. Work on the site at Los Alamos in New Mexico, where the scientists worked and where the bomb would be assembled, began in December 1942. Only about two and one half years elapsed from the breaking of ground at Los Alamos and the explosion of the first bomb in July 1945, evidence of what can be accomplished when an external threat creates a national consensus.

The best estimate of the cost of the Manhattan Project, at least in an accounting sense, is about \$2 billion in wartime dollars (O'Neill 1998, 60). In some ways, this appears to be a relatively small sum, a lot of "bang for the buck" as one commentator noted. If we inflate with the consumer price index we get a sum of about \$26 billion in today's (2015) dollars. But this is not, to my mind, the best way of inflating the cost of the Manhattan Project because many of the expenditures were made for highly trained personnel, and specialized equipment and materials, whose cost has probably risen more rapidly than the consumer price index. Inflating by GDP per capita gives a figure of \$68 billion. Or, to take a third approach, expenditures of \$2 billion amounted to about 0.8 percent of GDP in 1945, or about \$157 billion in 2015 dollars.⁹ The same project, however, is likely to cost still more today. A large scale project today that inflicted costs on local interests would face much more effective legal and political resistance with correspondingly higher costs. It was also possible in World War II to get many of America's leading scientists and engineers to put their academic careers on hold while

⁹ The inflation factors were taken from the website www.measuringworth.com accessed November 5, 2014.

they worked on the Manhattan Project. Today assembling a team of similar eminence would be far harder and far more costly, even if it was for the worthy goal of addressing climate change. Some engineers and executives working on the project, moreover, may have been dollar-a-year men (their salaries were paid by the corporations that employed them in peacetime) and so the costs of their services may not be adequately accounted in the conventional figure. All in all, the largest figure cited above, \$139 billion, in other words may well be an underestimate of what it would cost today to do something similar. Nevertheless, the history of the Manhattan Project suggests that much can be accomplished in a short period of time, even when the technology cannot simply be taken off the shelf, when the project is sufficiently urgent.

These examples do not by any means exhaust the list of projects undertaken to meet the unique demands of the war economy. Cargo ships including the famous Liberty ships, machines for decoding the German enigma machines, a highway to Alaska, factories for producing magnesium, and many others could be named. The range was extraordinary.

4. Redistribution of the population

Global warming is likely to produce the need for the redistribution of the population, for example from low-lying coastal areas to safer ground, or from agricultural regions that are no longer productive because of persistent drought to regions where global warming has increased agricultural productivity, or at least left productivity unchanged. The war experience suggests that given the right incentives this can be accomplished quickly and, given the challenges, relatively smoothly. Figure 4 shows

interstate migration of the civilian labor force between April 1, 1940 and November 1, 1943. The region that was changed the most was the Pacific Coast which gained 1.8 million people from other regions. There were, moreover, substantial population movements among the states within these regions, and movements within states. The city that appears to have been affected the most by the war was Los Angeles. One estimate is that 780,000 people moved into the Los Angeles area between April 1940 and April 1944 (Verge 1994, 303). The redistribution of the labor force was accomplished mainly through financial incentives: There were high-paying jobs to be had in war production centers. William Bendix starred as Chester Riley, a riveter at a California aircraft factory, on a hit radio and TV series in the 1940s. The show's title "The Life of Riley," meaning an ordinary guy living the good life, became a much used catchphrase in the 1940s.

The federal government attempted to smooth the redistribution by creating agencies and programs to ease the difficulties produced by mass population movements. A perusal of a list of government wartime agencies reveals the efforts: the Defense Housing Coordinator, the Office of Defense Health and Welfare Services, the Office of Community War Services, and the Committee for Congested Production Areas. Undoubtedly, programs were created in many other agencies to deal with the problems created by mass population movements. One of the motives for price and rent controls, for example, was to prevent profiteering aimed at workers moving into congested production centers. The war experience suggests that financial incentives can produce a rapid redistribution of the population, but also suggests some ways that the government can ameliorate the problems created by mass population movements.

Some studies of how and how well these agencies coped with population movements are available and more would be valuable.

The American experience with population redistribution may not be generally relevant. Americans have been moving west since the first years of European settlement. Many Americans probably viewed the war as a favorable occasion to make a move that they had long contemplated; a favorable occasion in other words to act on Horace Greeley's famous admonition to "Go West Young Man, and Grow up with the Country." Some perspective on the long-run trends can be obtained from Figures 5 and 6. Figure 5 shows by census years the percentage of non-white Americans residing in states or territories that were different from the state or territory in which they were born. The largest increase occurred in the war decade 1940-1950. But that increase was also, as can be seen in Figure 5, part of a longer-term trend. The exception in this Figure is the slight decrease between 1930 and 1940, reflecting the lack of incentives to move. White migration is shown in Figure 6. Here again there is a large increase in the war decade, but again it appears to have been part of a trend that continued into the 1960s and 1970s.

5. Rationing and Price Control

In the introduction, I used the phrase "without seriously damaging contemporary living standards" to convey my sense of how Americans fared during the war, a formula that I think would be shared by most historians of the war. It is deliberately vague because the standard of living during the war is a contested issue. Some statistics if taken at face value actually show that Americans were better off during the war than

they were in the relatively prosperous years that followed. But Robert Higgs (1992) is surely right that the statistics are misleading because there were fundamental differences between the war economy and the peacetime economies that followed. Production of many consumer durables, for example, was cut off during the war. Prices of products that were available, moreover, are hard to measure because of quality deterioration, black markets, and so on. One example that illustrates these difficulties is a problem that was perhaps the major problem facing price controllers during the war, but one which is hardly remembered today: forced uptrading. Manufacturers faced with booming demand and price controls would discontinue production of low-quality-low-priced lines because these were typically the low-profit-margin items produced in bulk. But discontinuing these lines were a burden on low-income consumers who were forced to “trade up” to higher priced lines. The people compiling the price indexes were aware of this problem, but it was not easy to deal with. There have been many attempts to correct the standard price indexes for these problems. The best known is Friedman and Schwartz (1982, 107). Others include (Barro 1978, 502, Rockoff 1978, and Mills and Rockoff 1987). The number of attempts and the range of estimates obtained suggest the difficulty of the problem.

On the other side of the ledger, there were jobs to be had, something that had not been true for a decade. But they were often dangerous jobs, and getting them often meant moving to a congested war production zone with primitive services. New consumer durables were not available, but one could save and plan on buying those goods after the war. The expectation that prices would fall after the war, as the

economy fell back into depression, may have made wartime savings seem more valuable at the time than they turned out to be.

But the basics were there. American civilians were well fed during World War II. Consumption of sugar and coffee were reduced somewhat below prewar levels because ocean transport had to be diverted to the war effort. Civilian consumption of meat, on the other hand, which did not require ocean transport, was higher during the war than it had been before (Rockoff 1984, 130). The main reason for rationing food was that demand (pushed up by stimulative monetary and fiscal policies) substantially exceeded supply at the prices set by the Office of Price Administration. Price control, it was felt, was necessary to prevent a dangerous “wage-price spiral.”

One can think of the wartime equilibrium as a bargain agreed to by three parties: labor, management, and government. The unions – then an important factor in labor markets – agreed to a “no strike” pledge that became the de facto basis for the establishment of the War Labor Board. Employers agreed to “no lockout” pledge. And the government agreed to enforce the bargain by fixing prices and wages. Fixing prices without formal ration coupons would have produced forms of non-price rationing that would have been inherently unfair. Queuing would have been common, and then available supplies would have gone to the person who was lucky enough to be in the right line at the right time. Price controls without formal rationing, moreover, would have made it easy to divert supplies to the black market. Rationing increased the fairness of the distribution system, and diminished the incentive of people to violate price controls. Everyone would get something. Even so, some pressure to evade the system would remain. Some consumers would get ration tickets for smaller amounts than they wanted

to buy at the Office of Price Administration price and some consumers would get more. One suggestion frequently made by economists is that the authorities permit the organization of a gray market in which consumers could sell excess ration tickets. This makes a lot of sense, but was not tried, as far as I am aware in World War II. Perhaps it was felt that allowing the sale of excess ration tickets would undermine the moral of the story behind rationing: sacrifices must be endured for the good of the country.

Although price control and rationing was fairly successful during the period of national unity produced by the war, problems began to develop as the war progressed that might be expected to be pervasive in a system that was in place for a long time, especially in a fluid democracy such as the United States. One was evasion through quality deterioration and black markets. Some examples of quality deterioration were straightforward: the candy bar shrank and the recipe was altered to use less desirable ingredients. Landlords deferred maintenance on rent controlled properties. A subtler form of evasion was known as “forced uptrading.” Manufacturers of products as different as clothing and steel discontinued low-priced, low-quality, low-profit-margin lines. Purchasers were then forced to “trade-up” to high-price-high-profit margin lines. Manufacturers could claim that they were selling these high priced lines at the official price, but now they could sell far more of these high priced items. Low income families, however, complained that they were “forced up” to lines of merchandise that they did not want to buy and did not have to buy before the war. The Office of Price Administration found dealing with this clever evasion a major headache.

Open black markets were less common, but still a problem. Some supplies of meat, for example, moved in clandestine channels from producers through black market

slaughter houses to wholesalers and restaurants where it was sold at prices far above the official prices set by the Office of Price Administration. Black market meat was also sold in meat easies (after the speak easies of prohibition) where one could buy meat without a ration ticket. The black market in meat deepened as the war progressed and undermined support for controls.

6. Financing the War

The rapid transformation of the American economy was made possible by money, lots of it. Elsewhere I have referred to the wartime economy as the “gold rush of 1942” (Rockoff 2012, 191-93). In 1849 Americans discovered gold in the rivers of California and the rush was on. People quit their jobs in the East and raced to California to pan for gold. The key to the gold rush was the commitment of the federal government to mint gold coins containing a fixed amount of gold out of any amount of gold offered, more exactly to buy any amount of gold offered and to pay \$1.00 for every 25.8 grains of pure gold. Something similar was true in 1942; the federal government was willing to pay high prices for bullets, planes, tanks, and factories to produce synthetic rubber and aluminum. Again the rush was on. Indeed, in some respects the deal offered munition producers in World War II was better than the deal offered the gold miners. The gold miners might rack up costs that exceeded the value of the gold they produced, and end up losing money. But in World War II, munition producers were offered cost-plus contracts. Higgs (1993) describes the switch to cost-plus contracts, and the long-run consequences for military procurement. This is not an interpretation invented many

years after the war. During the war many observers recognized what was happening and referred to it as a “second gold rush.”

Figure 7 shows an index of real after tax nonfinancial corporate profits. 1929 was a very good year for corporate profits. But that level was equaled in 1940 and exceeded in every following year through 1944. The high level of corporate profits during the war shouldn't be taken to mean, however, that there were no restraints on profits. Federal agencies, as shown by Wilson (2016, chapter 4), made valiant efforts to prevent or claw back excessive profits, and there was an effective excess profits tax. To some extent corporations may have welcomed these efforts from patriotic motives and to forestall charges of profiteering. Still, these were very good years. There was essentially no risk in taking federal contracts because they were cost-plus. Much of the long-term capital was financed and owned by government, but operated by private firms. Government ownership spared the operators the risk of investing in long-term capital that might prove uneconomical to run after the war, while giving them the inside track if these plants were returned to private ownership, say through an auction, after the war.

It might have been different. Progressives, including many prominent New Dealers, believed that the way to maximize production and minimize the damage to civilian living standards was through detailed planning by federal agencies. Indeed, many such agencies were created: the National War Labor Board, the Office of Price Administration, the Defense Plant Corporation, the War Production Board, the War Shipping Administration, the Petroleum Administrator for War, the War Food Administration, the Committee for Congested Production Areas, and so on. But while these agencies and their activities – such as the controlled materials plan discussed

above -- may have helped smooth the rough edges of the mobilization most of them launched their programs too late to affect the basic outline of activity that had been laid down during the gold rush.

The Progressive idea that received the most attention early on was the “Reuther Plan,” put forward by Walter Reuther, a rising star in the United Auto Workers Union, in late 1940. Reuther’s plan would have had the entire auto industry convert to the production of military aircraft. The auto companies would pool their efforts: one would produce engines, another would make other parts, and a third would assemble the planes. The military would have the lead in deciding who produced what, but industrial councils that included workers would play a prominent role in organizing production. If adopted it would have been a long step toward socialism and might have had, certainly its proponents hoped it would be, a step that would leave its mark on the postwar economy. But the Reuther plan was proposed before Pearl Harbor. It was discussed for a time, but nothing on this scale could be done until Pearl Harbor, and after Pearl Harbor it was largely forgotten (Brinkley 1995, 205-9).

There are always entrepreneurs willing to produce and sell to a rich customer. But the skills needed to excel in winning government contracts were not identical with the skills needed to win contracts from private firms. In World War II the entrepreneur who excelled above all others in winning the races for government contracts was the legendary Henry Kaiser who built ships, and factories to supply steel, magnesium, and aluminum for the war effort. Kaiser had forged strong ties with the Roosevelt administration before the war, but the war provided the range of challenges, and the funds, to turn him into a household name (Adams 1997).

To an unprecedented degree the war was financed by raising taxes. Higher personal income taxes, higher corporate taxes, and an excess profits tax financed almost fifty percent of the war expenditures. But the government also relied heavily on borrowing. To some extent financing the war by issuing debt made economic sense. After all, this was rightly regarded as a temporary emergency. Debt could be repaid after the war was over. In the modern parlance taxes could be smoothed over time through wartime borrowing rather than being allowed to spike during the war as would have happened if they had been raised to the extent necessary to finance all of the war. This logic, however, does not work so well when it comes to meeting scarcities arising from environmental damage because this sort of damage is likely to be of long duration or permanent. I also believe that the reliance on borrowing was motivated in part by a desire to hide the cost of the war and to minimize inevitable unpopularity of a government that imposed higher taxes. There were also concerns by conservatives in Congress that extremely high tax rates – some administration proposals of this sort were rebuffed – might persist after the war.

The contrast with depression era finances was stark. Criticism of the Roosevelt administration's deficit spending during the 1930s was intense and persistent. Roosevelt believed that a deficit might be necessary in an emergency, but that deficits should be kept as small as possible, and that every effort should be made to return to a balanced budget as quickly as possible, a belief on which he acted on several occasions by cutting spending or raising taxes. Once the war began, concern about the deficit evaporated, and the United States ran deficits that would have been inconceivable a few years earlier. This is shown in Table 1. In 1939 a highly

controversial deficit was 2.8 percent of GDP; by 1949 the deficit was 22.5 percent of GDP. The change in federal and state and local spending is shown in Figure 8. It shows clearly that although New Deal spending seemed revolutionary to contemporaries, it was dwarfed by spending during World War II.

Keynes recognized that war was the one occasion on which American politics would allow “Keynesian policies” of deficit finance to be used. This was the point that he made in his famous “open letter” to Roosevelt in 1933. There Keynes pointed to the prosperity produced by deficit spending in World War I and urged Roosevelt to adopt the same policy to meet the Great Depression. Another indication of the recognition that the war fundamentally altered the public’s attitude toward the role of government in the economy can be found in Simon Kuznets work on the measurement of national product. Kuznets (1945, 3-31), America’s pioneer estimator of GDP, wrestled with the how to measure national product in wartime. He concluded that while peacetime GDP estimates should be based on the assumption that there was one final purpose for economic activity, satisfying the demands of the public, estimates of GDP in a major war had to be based on two final purposes, satisfying the demands of the public and producing war goods.

Although considerable reliance was placed on taxation and borrowing during the war, the government also turned to the printing press. The reason seemed to be a fear of high interest rates on government debt. High rates would have increased the long-run costs of government debt, would have been seen as a sign that the U.S. economy was weakening under the strains of war, and would have imposed costs on civilian borrowers as high rates spread through financial markets. Federal Reserve purchases

of federal debt (today we call it quantitative easing and think of it as something new) directly added to bank reserves. Increased expansion of lending by the banks then produced further purchases of government debt by banks and their customers. The net result was that nominal rates were held down during the war, the stock of money rose rapidly, and the price level rose, more than doubling. The use of borrowing and especially money creation tended to hide the full cost of the war from the average American. Inflation would be blamed on war profiteers rather than on the government's financial policies.

7. The Rejection of Wartime Socialism

Progressives might well have hoped that the success of the mobilization would produce a consensus that big government, in the sense of government ownership of the means of production and detailed planning of prices and production, "worked." The rhetorical question, in other words, was "if socialism works in war, why not in peace?" True, I have argued above that the success of the mobilization owed more to the "gold rush" produced by a flood of no-risk-high-profit contracts than it did to central planning. But Progressives might well have hoped that, whatever might be argued against it, the public would see the war as proof of the enormous capacity of the state to do good things, and would support increased regulation of private enterprise and increased public ownership of the means of production after the war.

The reality, however, proved very different. Republicans recovered the House in 1946. Truman defeated Dewey in 1948, but was defeated by Eisenhower in 1952. In general the 1950s are remembered for their conservatism, not for progressive policies

rooted in a continuation of wartime socialism. Several interrelated factors can be suggested to explain the failure of the wartime socialism to make the case for peacetime socialism. Together, these factors also suggest some reasons why the wartime model may have limited contemporary applicability.

(1) The undoing of the Progressive interpretation of the war experience, in the sense of successful detailed control of the economy by the federal government, began well before the war. As Alan Brinkley demonstrates in *The End of Reform* (1995) the public began to lose confidence in New Deal Progressivism, in this sense, during the 1930s. The National Industrial Recovery Act had won few friends for detailed planning. The recession of 1937-1938, moreover, undermined claims that the New Deal was on the right track economically, and the court packing episode undermined the claim that the New Deal was on the side of democracy.

(2) The main problem for the wartime model, however, was the unraveling of wartime controls that occurred after the war ended. The transition to the peacetime economy went badly. One of the main problems was a wave of strikes that hit the economy after VJ day, including strikes by autoworkers, steel workers, miners, railroad workers, petroleum industry workers, and even Hollywood actors.

Labor unions had made a no-strike pledge (matched by a no-lockout pledge by employers) that was the de facto basis for the War Labor Board. There were, to be sure, many so-called wildcat strikes during the war, many of which prompted seizures of firms by the government; and John L. Lewis's mine workers were particularly defiant. But on the whole unions kept to their pledge. But that pledge was understood to mean for the duration of the war (Dunlop 1947). Once the war was over, the no-strike pledge could

no longer be counted on to deter strikes. Wage controls, the unions argued, had been strictly enforced, while producers found numerous ways around price controls. Above we mentioned forced uptrading, the elimination of lower-priced lines of merchandise. This form of evasion was particularly irksome to the labor unions, because it was their members who bought the lower priced lines. The effect of forced uptrading wasn't counted properly, they argued, in the price indexes that were then used to determine allowable wage increases. Workers, in short, felt entitled to wage increases to make up for these losses, and to gain a fair share of the income being earned by corporations.

Strikes created painful dilemmas for the agencies regulating prices and wages. By granting price and wage increases in an industry experiencing a strike, the government could help end a strike and restore production. The agencies, moreover, were under great pressure to do just that. The public was anxious to see strikes end and goods, especially consumer durables that the public had been denied during the war, made available again. But by making exceptions to its general rule of no increases in prices and no substantial increases in wages the government undermined the entire structure of controls and the premise of equality of sacrifice on which it rested. Although many people inside and outside the government hoped that controls could be continued, controls quickly disintegrated and were abandoned.

Labor unions were less important in agriculture, but decontrol of food prices and the end of food rationing also ended on a sour note. Ranchers could see that price controls were on the way out, so they had an incentive to keep their animals off the market until the price of meat was decontrolled. The result was meat shortages that

angered the public. Proposals to nationalize the nation's ranches, although not without support, clearly went a step too far (Rockoff 1984, 99, 106-07).

(3) Wartime prosperity strengthened the Keynesian argument that the problem of the depression had been "merely" a problem of aggregate demand. This meant -- particularly as formulated by Keynes's American followers such as Alvin Hansen, Abba Lerner, and Paul Samuelson -- that the main thing was to maintain full employment through fiscal policy. Keynes had argued in the *General Theory* that once the problem of aggregate demand had been solved through fiscal policy, the allocation of resources among alternative activities could safely be left to the market. In the *General Theory* Keynes (1936, 312) put it this way.

"... I see no reason to suppose that the existing system seriously misemploys the factors of production which are in use. There are, of course, errors of foresight; but these would not be avoided by centralising decisions. When 9,000,000 men are employed out of 10,000,000 willing and able to work, there is no evidence that the labour of these 9,000,000 men is misdirected. The complaint against the present system is not that these 9,000,000 men ought to be employed on different tasks, but that tasks should be available for the remaining 1,000,000 men. It is in determining the volume, not the direction, of actual employment that the existing system has broken down."

Keynes's view was rapidly adopted by an overwhelming majority of American economists, and was, for the most part, the lesson that the public at large drew from the war; Detailed planning by government agencies was not needed to counter slowdowns in private spending; increased government spending or tax cuts were.¹⁰

¹⁰ I have used the gold rush analogy to explain the mobilization rather than referring to Keynesian economics, because the gold rush is a more specific analogy that connects with a good deal of what was happening. But a gold rush can be viewed as one way of implementing a Keynesian stimulus. Indeed, since a good bit of spending was financed by money creation, the gold rush could also be viewed as a way of implementing a monetary expansion.

This view was shared even by John Kenneth Galbraith, deputy head of the Office of Price Administration during part of the war, who became the leading economist advocating Progressive policies after the war. In *A Theory of Price Control* (1952) Galbraith argued that if restrictive monetary and fiscal policies had been imposed after the war they would have permitted the gradual release of controls without inflation. Galbraith (1952, 57) added that there was little likelihood of controls becoming permanent, or at least that permanent controls did not “commend themselves to anyone who ever undertook to administer them.”

(4) American manufactures used radio and the print media to push for a free market economy. Progressives may have wanted these companies to point out the crucial role played by government finance and direction in wartime production achievements, but, of course, that is not the story to be found in newspapers, magazines, or on the radio (Fones-Wolf1999, Griffith 1983, Wilson 2016 chapter 3). In an advertisement in the *Washington Post* in April 1945 General Motors touted its production achievements in 1944 – “total deliveries amounted to \$4,300,000,000 ... 90.2% were war products ... -- and declared that “Victory is Our Business.” In an advertisement in May 1945 General Motors looked forward to the postwar era. The advertisement declared that “what is good for our country and our countrymen is good for General Motors.”¹¹ And it laid out certain “articles of faith” that should guide Americans after Japan was defeated, a list that included, not surprisingly, “Faith in the rightness and benefits of individual freedom and individual enterprise.” Regulation of

¹¹ In 1953 Charles Wilson of General Motors said something similar during hearings on his nomination for Secretary of Defense, but his remarks were long remembered as starting with “what is good for General Motors ...” proof of corporate arrogance.

business by government was not included (*Washington Post*, April 28, 1945, p. 9; May 13, 1945, p. M5).

(5) Finally, part of the story is what historians Arthur Schlesinger Sr. and Jr. (1999) identified as the recurring cycle in American life that alternated between “public purpose” and “private interest.” Americans are willing to sacrifice themselves, according to the Schlesingers, for the common good – but only for a while. After they have followed leaders who call for personal sacrifice for the public good there comes a time when they grow tired of sacrifice and want to pursue their own interests: Liberalism gives way to conservatism. Wars, inevitably, bring a call for sacrifices for the greater good. We can, on this argument, expect wars to be followed by conservative eras of private interest. The era of the Civil War and Reconstruction came to an end and was followed by a conservative period in American politics, sometimes referred to as the Gilded Age. The Progressive era included World War I and was followed by a conservative turn in national politics, remembered for President Harding’s “what we need now is normalcy, not nostrums.” It is no surprise then, indeed it could have been predicted, that the same phenomenon would follow World War II.

The lesson that many Americans took from the depression, war, and postwar periods taken together was that the success of government planning in wartime was *sui generis*. It depended on a willingness to cooperate that was possible only with the patriotism generated by a major war. Perhaps people recognized the simple psychological fact, or better assumed fact, that people are endowed with a willingness to sacrifice, even to the point of giving their lives, for the common good when the enemy

is a human enemy who is attacking one's territory. It is not at all clear that the same willingness to sacrifice can be invoked to fight an enemy that can't be personified.

8. What does the war teach us about coping with scarcity?

The American mobilization in World War II provides some reasons for optimism about the ability of the United States to cope with the challenges posed by climate change and other environmental challenges, but equally reasons for pessimism. The optimistic part of the story is that the economy was drastically reorganized in a short period of time. Production of consumer durables was curtailed and production of munitions was ramped up. Civilian construction was curtailed and large-scale infrastructure projects such as the construction of a synthetic rubber industry, the Big Inch and Little Big Inch pipelines, and the Manhattan project were completed. Large numbers of workers moved to war production centers. All of this was accomplished without seriously damaging contemporary living standards although coping with life during the war was not always easy.

The basic method behind this transformation was “gold rush economics.” The federal government was willing to pay high prices for bullets, planes, aircraft carriers, synthetic rubber plants, and so on, and so people stopped what they were doing and rushed to produce them. Just as people rushed to California in 1849 because the U.S. mint was paying a high price for the gold found in California’s rivers, people rushed to California in 1942 because the US. Army was paying a high price for the war planes made in California’s aircraft factories. Another important factor was the short-circuiting of the power of special interests to block projects that were considered to be in the

national interest. The mobilization suggests, therefore, that large scale projects involving the building of alternative energy sources or moving populations from low lying coastal areas could also be accomplished rapidly once sufficient financial incentives were provided and probably could be accomplished without seriously endangering current living standards.

The pessimistic part of the story, however, is that the rapid transformation of the economy depended on an overwhelming national consensus that the United States faced an immediate and existential threat. Concerns about excessive government spending that had been a political staple during the 1930s disappeared after Pearl Harbor. There were now, as Simon Kuznets argued, two end purposes to economic activity. In the United States only major wars have generated the political consensus needed for federal spending on the scale undertaken in World War II. And even during the war, fear of adverse political reactions to high taxes led to heavy reliance on borrowing. And the fear that high interest rates would generate adverse political reactions in part accounts for the Federal Reserve's decision to adopt a rigid bond-support program that produced a substantial increase in the stock of money.

The war was won in four years. Price control, and to a lesser extent rationing, enjoyed considerable public support during that period, but were wasting assets. Once the war was won, and patriotic appeals to cooperate lost their force, severe cracks appeared in the system of government controls. The wave of strikes after VJ day was particularly disruptive because they pitted workers and employers together against the government's wage and price controllers. Price controls and rationing, while they might be pressed into service during an environmental emergency, do not appear to be

appropriate for dealing with the problem of scarcities produced by global warming and environmental contamination over the long term.

The United States, it should be remembered, was an unusual case. It was rich: Middle class Americans could still live comfortably even with consumer durables temporarily unavailable, many other commodities subject to rationing, and various services impaired or unavailable because of the transfer of workers to industrial production and the military. The United States had, moreover, an unusually flexible economy. The auto industry, for example, was in the habit of tearing out old production lines and replacing them with new ones to produce new models. American chemical companies were in the habit of building new plants in locations far removed from their home offices. And Interregional labor mobility, in particular moving west, was a long-running tradition. The ability of the United States to make rapid adjustments in World War II, although a hopeful sign for rich industrial economies may have less to say about the adjustment process in poorer, less flexible economies.

Hopefully, environmental problems will not reach tipping points that require a massive reorganization of the economy in a short-period of time, but rather can be solved with less disruptive measures taken over a long period of time. Nevertheless, the experience of World War II can suggest some of the possibilities and difficulties to be encountered along the way.

References

- Adams, Stephen B. 1997. *Mr. Kaiser Goes to Washington: The Rise of a Government Entrepreneur*. University of North Carolina Press.
- Anderson, Kevin, and Alice Bows. 2011. Beyond 'dangerous' climate change: Emission scenarios for a new world. *Philosophical Transactions: Mathematical, Physical and Engineering Sciences* 369 (1934, Four degrees and beyond: the potential for a global temperature increase of four degrees and its implications) (13 January): 20-44.
- Barro, Robert J. 1978. "Unanticipated Money, Output, and the Price Level in the United States," *Journal of Political Economy*. 86 (Aug.): 549-80.
- Bisio, Attilio and Vernon D. Herbert. 1985. *Synthetic Rubber: A Project That Had to Succeed*. Westport, Conn.: Greenwood Press
- Brinkley, Alan. 1995. *The End of Reform: New Deal Liberalism in Recession and War* New York, Alfred A. Knopf.
- Carter, Susan B., Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch, and Gavin Wright. 2006. *Historical statistics of the United States: earliest times to the present*. Millennial Edition. New York: Cambridge University Press.
- Dewhurst, James Frederic, and Twentieth Century Fund. 1947. *America's needs and resources, a twentieth century fund survey which includes estimates for 1950 and 1960*. New York: The Twentieth Century Fund.
- Dillard, Dudley. 1944. "Big Inch Pipe Lines and the Monopoly Competition in the Petroleum Industry." *The Journal of Land & Public Utility Economics* 20, no. 2: 109-22.
- Dunlop, John T. 1947. "A Review of Wage-Price Policy." *The Review of Economics and Statistics* 29, no. 3: 154-60.
- Field, Alexander J. 2008. "The Impact of the Second World War on US Productivity Growth". *The Economic History Review* 61 (3). [Economic History Society, Wiley]: 672-94.
- Fones-Wolf, Elizabeth. "Creating a Favorable Business Climate: Corporations and Radio Broadcasting, 1934 to 1954." *The Business History Review* 73.2 (1999): 221-55.

- Friedman, Milton, and Anna Jacobson Schwartz. 1982. *Monetary Trends in the United States and the United Kingdom*. University of Chicago Press.
- Galbraith, John Kenneth. 1952. *A Theory of Price Control*. Cambridge: Harvard University Press.
- Gordon, Robert J. 1969. "\$45 Billion of U.S. Private Investment Has Been Misaid". *The American Economic Review* 59 (3). American Economic Association: 221–38.
- Griffith, Robert. "The Selling of America: The Advertising Council and American Politics, 1942-1960." *The Business History Review* 57.3 (1983): 388-412.
- Heal, Geoffrey. 2016. "What would it take to Reduce US Greenhouse Gas Emissions 80% by 2050?" NBER Working Paper No. 22525, August.
- Higgs, Robert. 1992. "Wartime Prosperity? A Reassessment of the U.S. Economy in the 1940s". *The Journal of Economic History* 52 (1). Cambridge University Press: 41–60.
- _____. 1993. "Private Profit, Public Risk: Institutional Antecedents of the Modern Military Procurement System in the Rearmament Program of 1940-1941." In *The sinews of war: Essays on the economic history of World War II*, eds. Geoffrey Mills and Hugh Rockoff, pp. 166-98
- Howard, Frank A. 1947. *Buna Rubber: The Birth of an Industry*. New York: D. Van Nostrand.
- Hyde, Charles. K. 2013. *Arsenal of Democracy: The American Automobile Industry in World War II*. Detroit: Wayne State University Press.
- Janeway, Elliot. 1951. *The Struggle for Survival: A Chronicle of Economic Mobilization in World War II*. New Haven, Yale University Press.
- Klein, Maury. 2013. *A Call to Arms: Mobilizing America For World War II*. New York: Bloomsbury Press.
- Koistinen, Paul A.C. 2004. *Arsenal of World War II: The Political Economy of American Warfare, 1940-1945*. University of Kansas Press.
- Kuznets, Simon. 1945. *National Product in Wartime*. New York: National Bureau of Economic Research.
- Leuchtenberg, William E. "The New Deal and the Analogue of War." In *Change and Continuity in Twentieth-Century America*, ed. John Braeman, Robert H. Bremner, and Everett Walters. New York, Harper & Row, 1966, 81-143.

- McKibben, Bill. "We Need to Literally Declare War on Climate Change: We're under attack from climate change – and our only hope is to mobilize like we did in WWII." *New Republic*, August 15, 2016.
- Mills, Geoffrey, and Hugh Rockoff. 1987. "Compliance with Price Controls in the United States and the United Kingdom During World War II." *The Journal of Economic History*, 47 (March): 197-213.
- Nelson, Donald M. 1946. *Arsenal of Democracy: The Story of American War Production*. Harcourt Brace.
- O'Neil, Kevin. 1998. "Building the Bomb." In *Atomic Audit: The Costs and Consequences of US Nuclear Weapons*, ed. Stephen I. Schwartz, 33-104. Washington, D.C.: Brookings Institution Press.
- Rockoff, Hugh. 2012. *America's Economic Way of War: War and the U.S. Economy from the Spanish-American War to the Persian Gulf War*. Cambridge: Cambridge University Press.
- _____. 2007. "Keep on Scrapping: The Salvage Drives of World War II." NBER Working Paper No. 13418. Available at www.nber.org.
- _____. 1984. *Drastic Measures: A History of Wage and Price Controls in the United States*. Cambridge: Cambridge University Press.
- _____. 1978. "Indirect Price Increases and Real Wages during World War II." *Explorations in Economic History*, (October): 407-20.
- Schlesinger, Arthur M., Jr. 1999. *The Cycles of American History*. Boston: Mariner Books.
- Verge, Arthur C. 1994. "The Impact of the Second World War on Los Angeles". *Pacific Historical Review* 63 (3). University of California Press: 289–314.
- Vernon, J. R. 1994. "World War II Fiscal Policies and the End of the Great Depression". *The Journal of Economic History* 54 (4). Cambridge University Press: 850–68.
- Wilson, Mark R. *Destructive Creation: American Business and the Winning of World War II*. Philadelphia: University of Pennsylvania Press, 2016.

Year	Unemployment (percent of the labor force)	Federal Emergency Workers (Percent of the Civilian Labor Force)	Nominal GDP (billions of dollars)	Federal budget deficit (billions of dollars)	Federal budget deficit (percent of GDP)
1929	2.9	0.0	103.7	0.7	0.7
1933	20.9	4.3	56.4	-2.6	-4.6
1939	11.3	5.9	92.0	-3.9	-4.2
1940	9.5	5.1	101.3	-2.9	-2.9
1941	6.0	4.0	126.7	-4.9	-3.9
1942	3.1	1.6	161.8	-20.5	-12.7
1943	1.8	0.2	198.4	-54.6	-27.5
1944	1.2	0.0	219.7	-47.6	-21.6
1945	1.9	0.0	223.0	-47.6	-21.3
1946	4.0	0.0	244.4	-15.9	-7.2

Table 1. Unemployment and related variables in the Great Depression and World War II.

Source: Carter, et al (2006, series Ba470, Ba475, Ba477, Ca10, Ea586, Ea681).

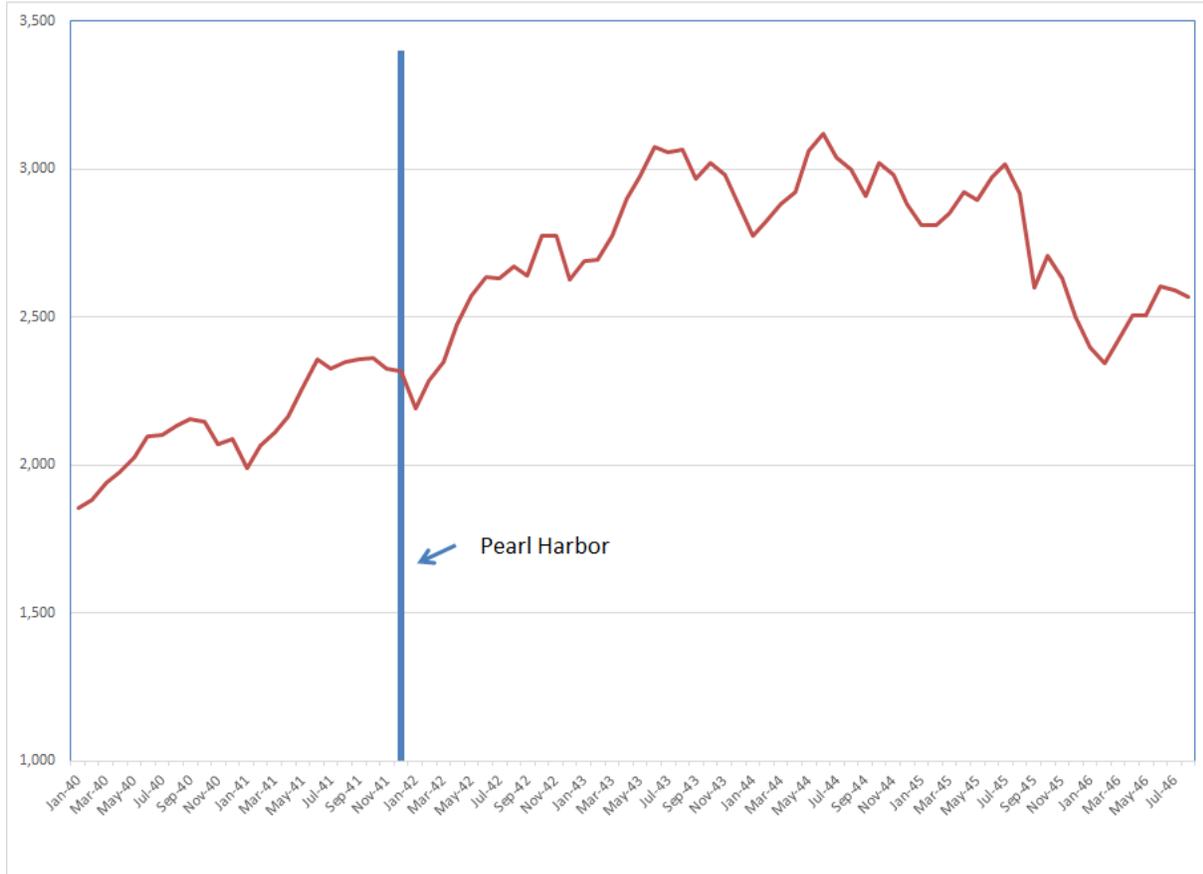


Figure 1. Total Hours Worked per Week, 1940-1946.

Note: Total hours worked per week is measured in millions of hours on the left axis.

Sources: Dewhurst (1947, 690-92, column 14).

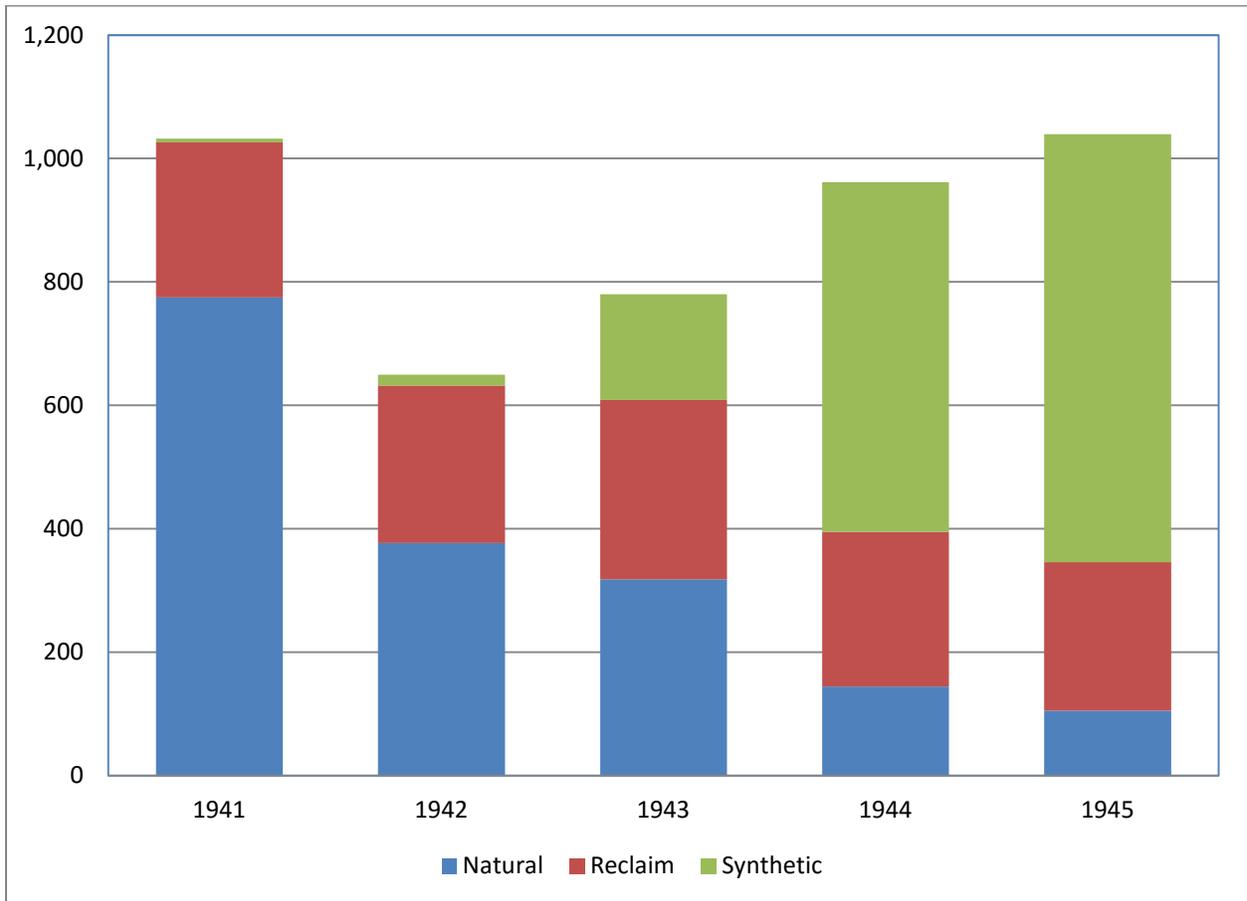


Figure 2. U.S. Consumption of Rubber by Type, 1000s of Long Tons, 1941-1945

Source: Rockoff (2007, Table 3, 53),

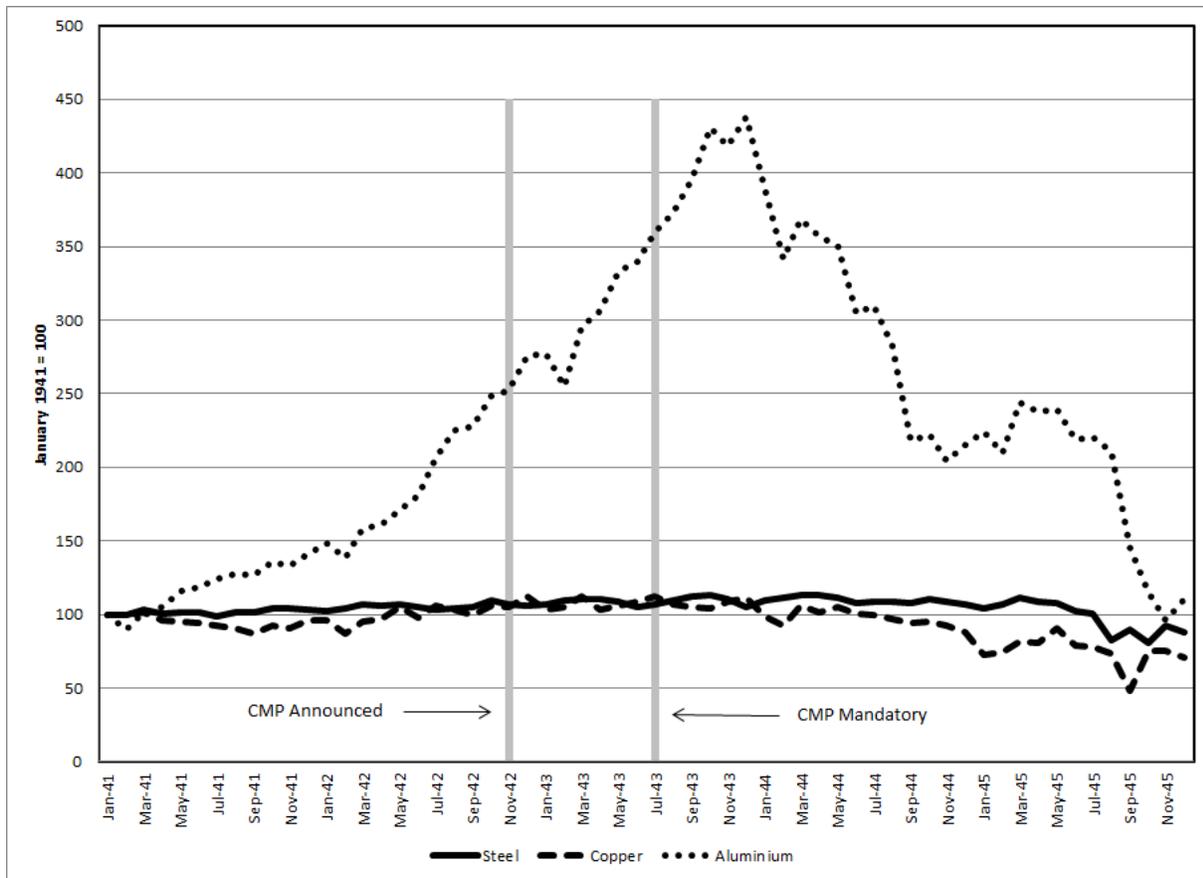


Figure 3. Production of controlled materials, monthly January 1941 to November 1945, Production in January 1941 set to 100.

Sources: Steel, NBER Historical Data Series m01135b, Copper, NBER series m01247b, both available at <http://www.nber.org/databases/macrobistory/>. Aluminium: United States Department of the Interior Bureau of Mines, Mineral Industry Surveys, Primary Aluminum, January 1947.

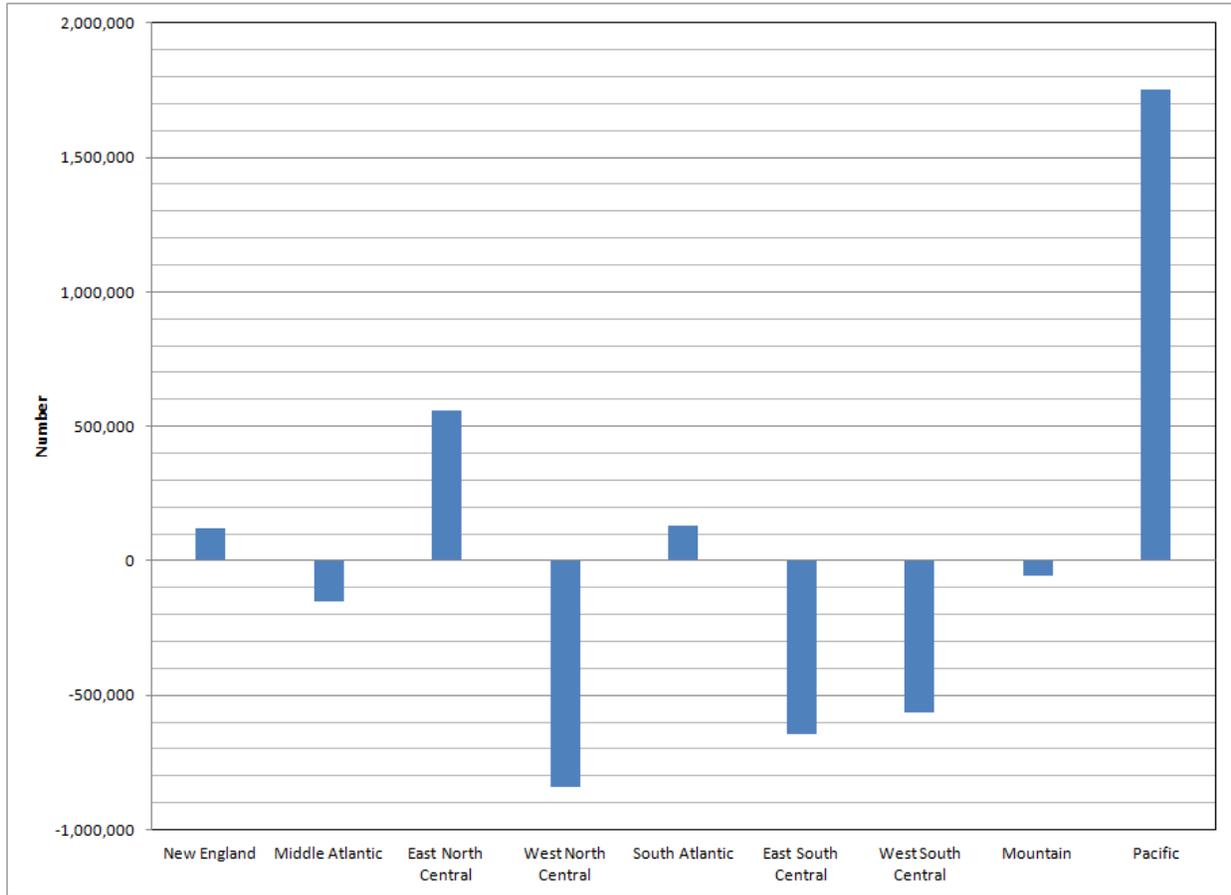


Figure 4.

Interregional Migration of the Civilian Population in the United States, April 1940-
November 1943.

Note. New England: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island. Middle Atlantic: New York, New Jersey, Pennsylvania. East North Central: Ohio, Indiana, Illinois, Michigan, Wisconsin. West North Central: Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas. South Atlantic: Delaware, Maryland, Dist. of Columbia, Virginia, North Carolina, South Carolina, Georgia, Florida. East South Central: Kentucky, Tennessee, Alabama, Mississippi. West South Central: Arkansas, Louisiana, Oklahoma, Texas. Mountain: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada. Pacific: Washington, Oregon, California.

Source: Dewhurst (1947, 44 - 45).

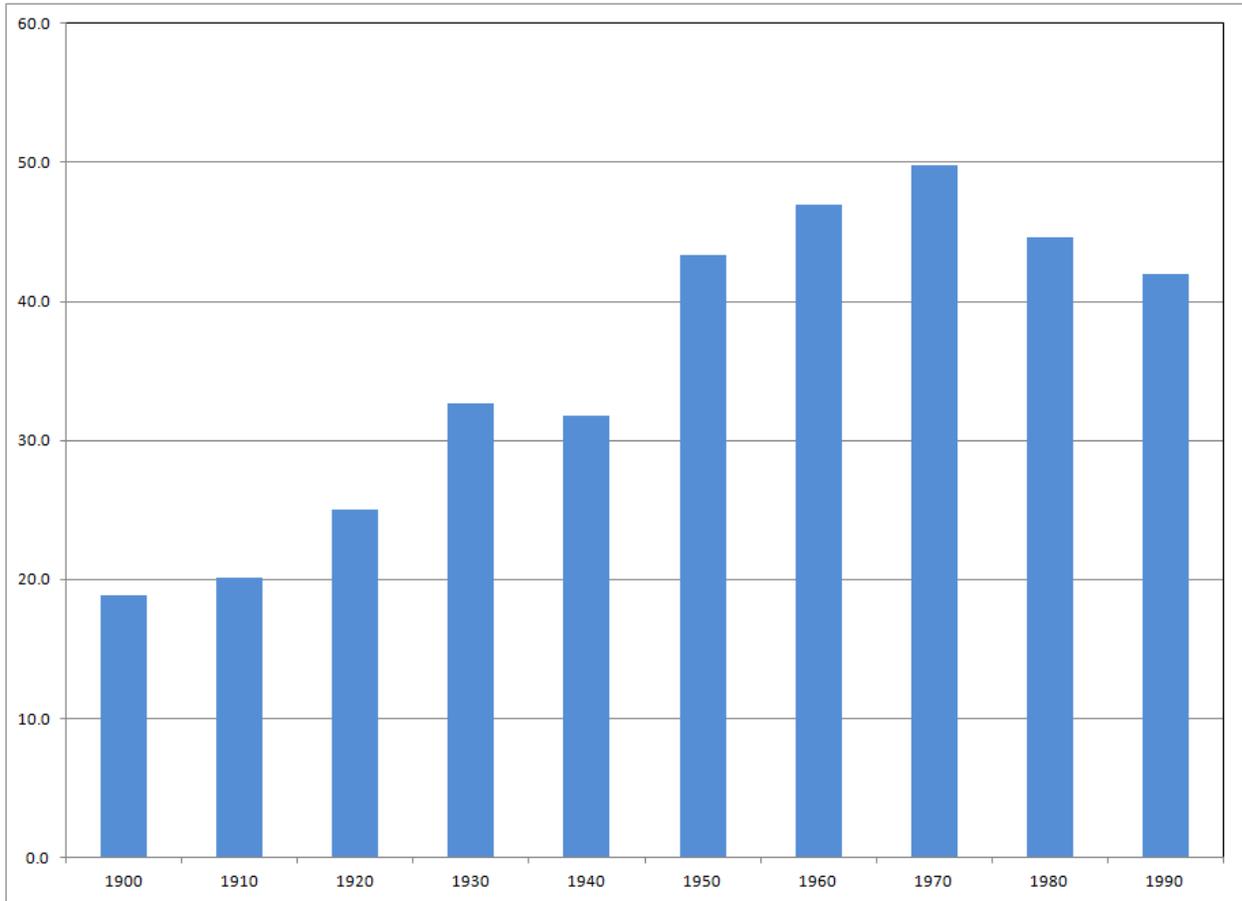


Figure 5. Percentage of Nonwhite Americans residing in a state different from the state in which they were born, by census year, 1900 – 1990.

Source: Carter et al (2006, Table Ac13-32).

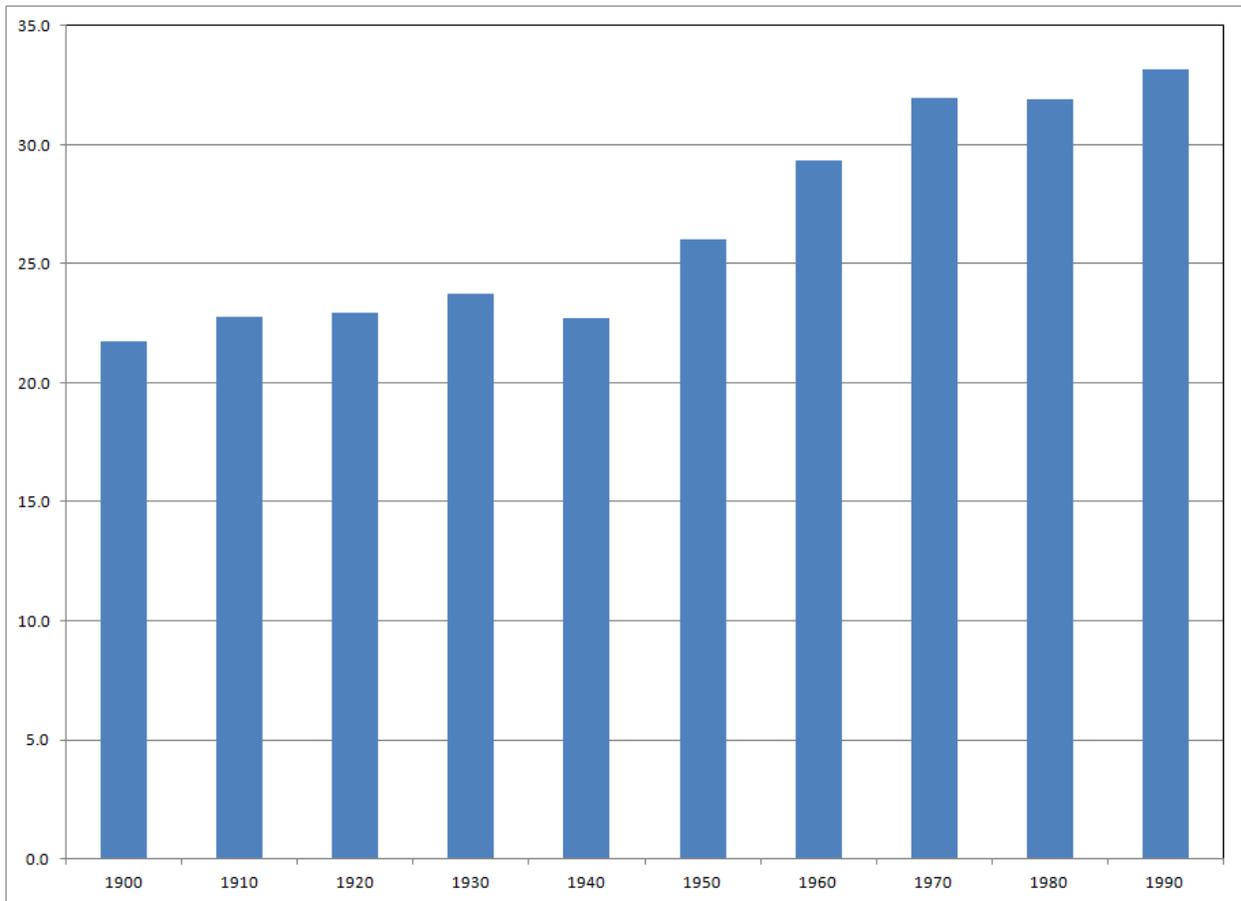


Figure 6. Percentage of White Americans residing in a state different from the state in which they were born, by census year, 1900 – 1990.

Source: Carter et al (2006, Table Ac13-32).

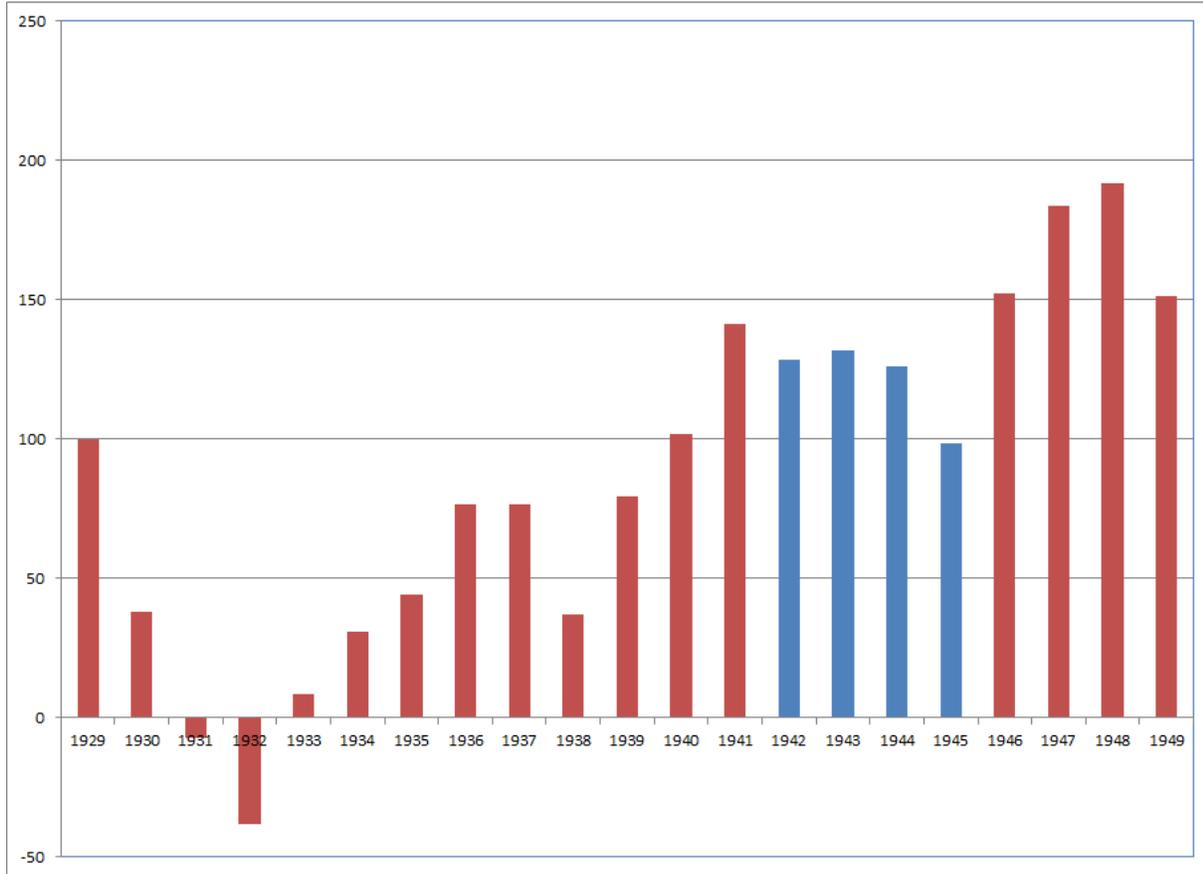


Figure 7. Real After Tax Profits of Nonfinancial Corporations, 1929 (=100) – 1949.

Source: US. Bureau of Economic Analysis, Nonfinancial corporate business: Profits after tax (without IVA and CCAAdj) [A466RC1A027NBEA], retrieved from FRED, Federal Reserve Bank of St. Louis, August 18, 2016. GDP deflator retrieved from Measuringworth.com, August 18, 2016.

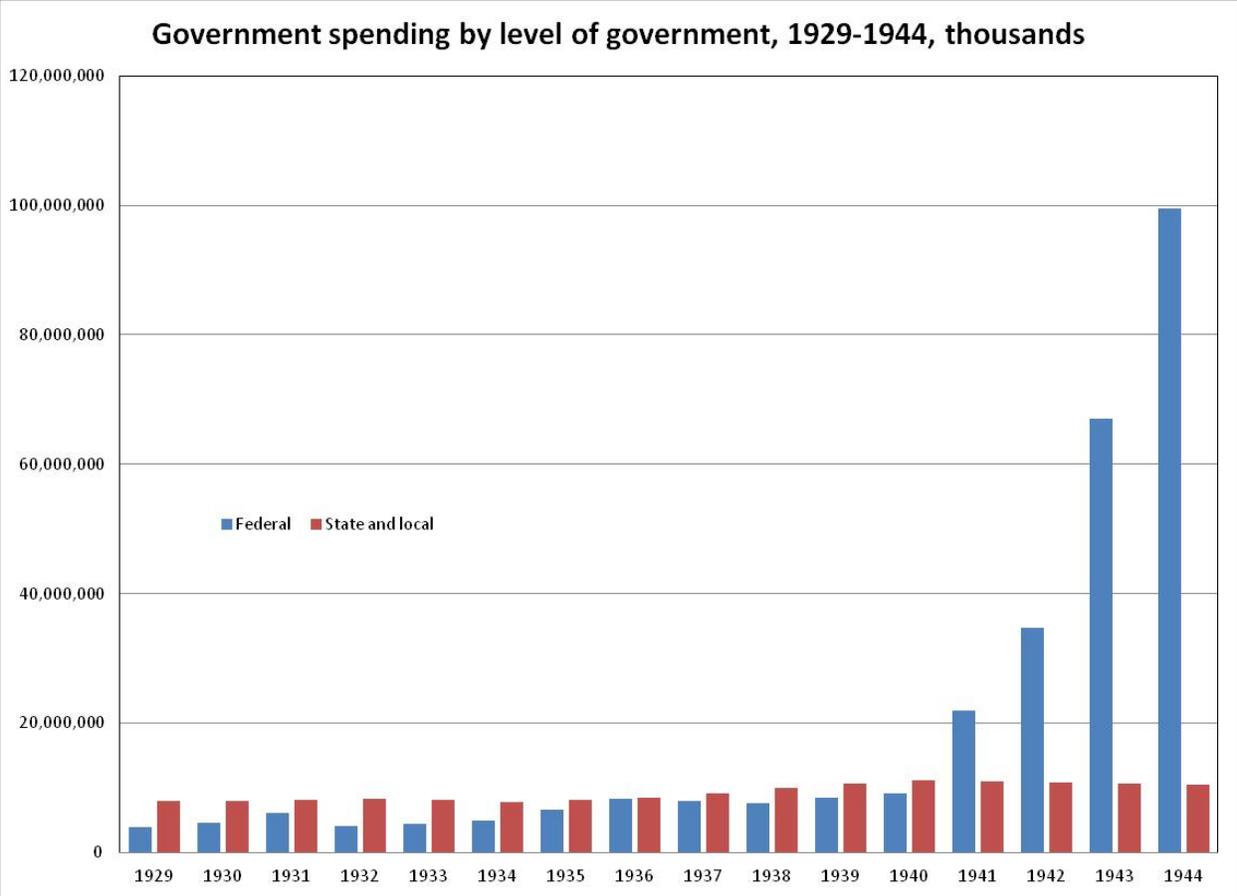


Figure 8. Federal and state and local spending in the Great Depression and World War II.

Source: Carter et. al. (2006, Table Ea10-23).