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FROM PLOWSHARES TO SWORDS:
THE AMERICAN ECONOMY IN
WORLD WAR II

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ABSTRACT

This paper examines the U.S. economy in World War II. It argues that the mobilization must be viewed as a rapidly evolving historical process rather than, as is often the case a single undifferentiated event. For example, the employment of unemployed resources, a factor often cited to explain the success of the mobilization, was important during the national defense period, but was relatively unimportant during the period of active U.S. involvement. On the financial side, money creation was more important during the first year of active involvement than in subsequent years. The most significant legacy of the war, viewed in relation to the prosperous era that followed, may have been the change in the macroeconomic regime. The paper also discusses the limitations of the basic time series.

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I. Introduction

Between 1939, when World War II began, and 1944, when U.S. output reached its wartime peak, the U.S. economy grew at a remarkable rate. Frequently, it was described as a "production miracle." In many ways it was the obverse of the Great Depression. Between 1929 and 1933 real GDP collapsed, shaking the faith of Americans in their economic system; between 1939 and 1944 real GDP rose by a similar percentage restoring the faith of Americans in their economic system -- provided its given a strong dose of centralized control. The Great Depression was without doubt the most important macroeconomic event of the twentieth century; the mobilization of the American economy in World War II is a close second. Yet the economic history of the Great Depression has been studied in great depth, while World War II remains comparatively unknown.

This paper is concerned mainly with three questions about the war economy. First, where did the United States find the resources it needed? Second, what financial arrangements were used? Third, what were the long-run economic consequences? The paper argues that the answers traditionally given to these questions need to be modified. There is a tendency, for example, to focus on a single factor, usually the high level of unemployment prevailing before the war, to explain the growth of real output, although at times the entry of more women into the labor force is also mentioned. As we will see, however, no single factor can explain the expansion of real output during the war.

Modifications in the traditional picture are needed in part because we tend to think of the war as a single, undifferentiated event rather than as an unfolding historical process. The emphasis on the role of unemployment flows from our tendency to forget the substantial changes

that took place between the outbreak of the war in Europe and Pearl Harbor. In December 1941, when all out mobilization began, unemployment had already fallen to about 6 percent of the labor force -- other ways had to be found to increase production.

In the section on long run consequences I argue that attempts to link postwar prosperity in the United States to changes on the real side -- to the new initiatives in education, to the capital constructed during the war, or to the favorable position in world trade in which the U.S. found itself -- are likely to prove disappointing. Instead, the key factor appears to have been the new macroeconomic regime.

The paper also provides a discussion of the meaning and limitations of the basic time series, and thus to facilitate comparisons between the United States and other countries.

II. The Production Miracle

Estimates of real GNP and real military expenditures at 1958 prices are plotted in figure 1; the data are in table 1. The basic story is clear. Real GNP rose about 55 percent between 1939 and the peak in 1944.¹ The share of military spending in GNP rose from 1.4 percent in 1939 to 45 percent in 1944 (42 percent at current prices).² Or to put it some what more

¹ Percentage changes in this paper are measured as the natural logarithm of a variable at the end of a period less the natural logarithm at the beginning, multiplied by 100. A 50 percent increase measured by differences in natural logarithms corresponds roughly to a 65 percent increase measured as the absolute difference divided by the initial value. One advantage of using natural logarithms is that when a variable rises to a peak and then returns to its initial position, the percentages are the same in absolute value going up and going down.

² Subsequent revisions of the national accounts make the war economy look even stronger. The 1987 revisions, for example, show real GDP (almost the same in the war years as GNP) rising 69 percent between 1939 and 1944. I prefer the 1958 estimates, however, because the biases discussed below suggest that, if anything, the standard figures overestimate real GDP in the war economy.

dramatically, civilian real GNP in 1944 was only slightly below the level of 1939. The United States managed the war by putting its civilian sector "on hold" and turning the increase in GNP over to the military. Below I will examine how this result was achieved. First, however, I need to consider the conceptual problems that underlie wartime estimates of real GNP, real military spending, and related variables.

A. Measurement Problems

The difficulties inherent in measuring national income were magnified by the war. They can be considered under three headings.

(1) The inclusion of war output. Robert Higgs argued that most war output, perhaps all, should be excluded from GNP because war output doesn't constitute part of the current or future flow of goods and services that contribute directly to welfare. War output should be treated, in his view, as an intermediate product. Thus, his estimate of real GNP declines between 1941 and 1944.³ Higgs is following the distinguished precedent of Simon Kuznets, who would have included (in peacetime) only the formation of durable war goods.⁴ Kuznets, however, conceded that in a major war there were really two end purposes of economic activity, production of goods for consumers and production of goods for the war, and included both in his measure of aggregate output.

The point is debatable. Many expenditures ordinarily included in GDP without question would have to be excluded if the Kuznets-Higgs criteria was invoked. Medical care, for

³Higgs, "Wartime Prosperity," p. 45.

⁴ Kuznets, National Product.

example, would have to be excluded because it doesn't contribute directly to the flow of goods and services that create utility. Or perhaps, following Kuznets, one would exclude ordinary checkups from GDP (peacetime expenditures), and include radiation therapy for cancer (wartime -- two end purposes!). Indeed, the frequency with which the discussion of illness is carried out with military metaphors reveals an underlying psychological analogy. Cancer "invades the body," the Nixon Administration launches a "War on Cancer," and Paul Ehrlich discovers a treatment for syphilis, a "magic bullet."⁵ Munitions production, in other words, -- like medical expenditures, like expenditures for police and fire protection, like expenditures for physical capital for that matter -- is important because it will increase the flow of consumption in the future.

The Higgs and Kuznets measures are useful for making the point that Americans were better off once the war was over and production could be redirected toward civilian goods.⁶ But for other purposes, such as comparing the performance of the United States with that of other countries, an output measure that includes munitions makes more sense.

(2) Pricing the output of the war industries. One cannot assume that prices for tanks or planes specified in government contracts agreed to by desperate buyers with unlimited access to the public purse corresponded to the value of those goods. Using postwar munitions prices (as is done in figure 1) is a partial solution because with the return of peace munitions prices were determined in something closer to a competitive market. But even then, the rapid pace of

⁵ Sontag, Illness as Metaphor, pp. 63-65, and passim.

⁶ The point can also be made effectively by examining aggregate consumption (as Higgs does) or the sum of aggregate consumption and net investment.

technical change during the war makes it hard to evaluate the output of 1942 or 1943 by the prices paid subsequently for essentially different weapons.

Kuznets made an attempt to solve this problem in National Product in Wartime. He began by noting that resources provide a common denominator between the civilian and military sectors. Guns and butter both require labor to produce them. It is possible then to produce estimates of war output in terms of prewar resource costs by deflating spending on war goods by an index of resource costs.

But how does one go from war output at resource costs to war output at final product prices? Kuznets then estimated efficiency in the war sector relative to efficiency in the nonwar sector, basing his estimate on scattered bits of qualitative and quantitative data. He concluded that the level of efficiency in the war industries was substantially below that of similar civilian industries in 1939 because the latter had matured slowly under peacetime conditions. Despite significant increases in efficiency between 1939 and 1943, the war industries, in Kuznets's view, still suffered from labor and raw material hoarding, and other wasteful practices. By deflating a resource cost series by his efficiency index, Kuznets produced estimates of final product prices. We will examine Kuznets estimates below.

(3) Prices in the Civilian Sector. Price controls and rationing produced the usual problems in the civilian sector. Quality deteriorated; cheap fillers were added to candy bars, maintenance expenditures on rental properties were reduced, and so on. So called "Forced uptrading," the elimination of lower priced lines of merchandise, was a major problem. And classic black markets developed. One could buy off-ration meat, gasoline, or tires for the right price if one knew the right people.

The Bureau of labor statistics tried valiantly to cope with these problems. When a lower-priced line disappeared, for example, the Bureau counted part of the difference between the lower-priced and the higher-priced lines as a price increase. But inevitably, adjustments were incomplete.

Figure 2 shows four measures of real net national product, including three attempts to adjust the estimates for the shortcomings discussed above. The vertical axis measures percentage changes from a base of 100 in 1939. The top line is Kendrick's "National Security" estimate of real NNP. The lowest line adjusts Kendrick's National Security version of NNP by the ratio of Kuznets's GNP deflator adjusted for inefficiency in the war industries and for mismeasurement in the deflators used to measure the flow of goods to consumers, to the Commerce Department's GNP deflator.⁷

The other two lines are based on a different approach to adjusting for the distortion in the official indexes. The idea, developed by Friedman and Schwartz, is to use current nominal income to interpolate the price index during the war because changes in current income were probably less vulnerable to measurement error. The lowest line records the original Friedman and Schwartz estimates; the middle line records an attempt by Geoffrey Mills and myself to improve on the Friedman and Schwartz estimates by using wages paid as an additional

⁷ Kuznets, "Long-term Changes," p. 40. I also tried simply adjusting Kendrick's national security outlays by the adjusted deflator for gross war output from Kuznets, National Product, p. 84 extrapolated forward to equal Kendrick's deflator for national security outlays by the end of the War. The result was quite similar -- evidently, the most important adjustment Kuznets made was for inefficiency in the production of war goods. Kuznets himself, Capital, p. 471 later abandoned the attempt to adjust for inefficiency in munitions production.

interpolator.⁸ Clearly, measurement errors in the price indexes make it impossible to make precise statements about the increase in output. It is fair to conclude, however, that real NNP rose between 40 and 50 percent between 1939 and 1944.

B. Guns vs. Butter

A good overview of the composition of output can be had by using the traditional decomposition of GNP into consumption, investment, net private exports, and government spending. This is done in figure 3. The deflators have not been adjusted for any of the problems discussed above. Here, however, I will be looking at one sector relative to another, which to some extent reduces the problem caused by the understatements in the deflators.

Government spending (the top section of each bar) increased rapidly in 1942 and 1943 and peaked in 1944. Most of this increase came out of the increase in total GNP. Private consumption was squeezed a bit in 1942, and then rose a bit in 1943 and 1944. The decline in consumption would be greater if we adjusted for the problems in the deflator. But the overall impression created by the figure would not be changed: the United States put civilian consumption "on hold" during the war while generating the means to defeat the axis by squeezing private investment and expanding total output.

Certain forms of consumption, consumer durables in particular, were cut back sharply during the war, but other forms, food in particular, increased. These changes are another reason that it is hard to claim that consumer welfare mirrored the aggregate consumption figures. A

⁸ Milton Friedman and Anna J. Schwartz, Monetary Trends, 101-104; Geoffrey Mills and Hugh Rockoff, "Compliance with Price Controls."

family that could not buy a new refrigerator might spend the same amount on entertainment or unrationed food; but their welfare would not be as high as it would have been in an unconstrained market.

Private investment spending, however, was squeezed, although this was partly offset by government spending on industrial plant and equipment (synthetic rubber factories, for example) that would be sold to the private sector after the war. Private net exports were also squeezed, actually turning negative during the war. (A view of exports that includes Lend-Lease and other government transfers is presented in section II.D.)

Government purchases of goods and services, shown in figure 3 excludes spending in the private sector that is war related, such as privately financed plant expansion, and includes government spending that might be classified as civilian. Figure 4 shows three alternative measures of war spending each as percentages of GNP (both figures in current dollars). The lowest line is simply the sum of Army (which included the Air Force) and Navy spending as shown in the Federal Budget.⁹ The top line is the Commerce Department estimates of "National Security" expenditures. The middle line is government purchases of goods and services less civilian purchases in 1938 (total government less army and navy). In the peak year, 1944, for example, Army and Navy spending was 37.25 percent of GNP, Government purchases of goods and services net of nominal spending on civilian purchases in 1938 was 40.33 percent of GNP, and the official Commerce Department estimates of national security spending was 42.18 percent of GNP. Thus, there seems to be fairly good agreement among the different measures: maximum

⁹ The budget figures are for a fiscal year that ends on June 30. To make them comparable to calendar year figures, I averaged the estimate for one fiscal year estimate with the estimate for the succeeding fiscal year.

mobilization was reached in 1944 with around, perhaps a bit more than, 40 percent of the economy devoted to the war effort.

C. The Level of Consumption

Many historians have maintained that real consumption was high during the war -- "Americans never had it so good," and Americans on the home front engaged in a "carnival of consumption."¹⁰ But skepticism is justified, as Higgs has recently stressed, because of the measurement errors in the price indices. The standard estimates of consumption produced by the Commerce Department go some way toward justifying the "never-had-it-so-good" view. Real per capita consumption rises sharply in 1940 and 1941, drops slightly in 1942, but then rises in 1943 and 1944, so that the level in 1944 is an all time high. If one divides total consumption by the resident civilian population, rather than total population, the results are even more dramatic: the decline in 1942 disappears, and average consumption in 1943 is already well above past achievements.

In addition to the attempts to adjust the NNP deflator discussed above, there have also been efforts aimed at the consumption deflators. A number of years ago I constructed a consumer price index that incorporated adjustments for rationing, the decline in the maintenance of rental property, and similar problems. And Harold Vatter constructed an upper bound estimate of the consumer price index by assuming that the price level reached in 1947 (after

¹⁰ Both phrases are quoted in Higgs, "Wartime Prosperity," pp. 49 and 58. The original quotations are from Melman, The Permanent War Economy, p. 15 and Blum, V was for Victory, p. 90.

controls were removed) had effectively been reached by 1945 although the inflation was hidden by controls.¹¹

Figure 5 shows per capita consumption calculated using these deflators, and perhaps somewhat inappropriately in this case, the alternative NNP deflators. It now appears that consumption per capita may have been depressed in the years of total war (1942-1944) compared with the years of neutrality (1939-1941). Higgs's emphasis on the fall in real per capita consumption from the level reached in 1941 thus partly justifies his challenge to the claim that Americans's "never had it so good."

But while Higgs's basis of comparison, 1941 or 1946, makes sense to us now, these are probably not the years that most Americans, or most historians, had in mind when they dwelt on how good Americans had it during the war. The war years look pretty good compared with the Great Depression. Note that in figure 5 none of the estimates of real per capita consumption fall below the level of 1939. Yet real per capita consumption in 1939 was the highest of the decade, exceeding real consumption even in the boom year 1929. Legally, 1941 was the last year of peace for the United States, so it is logically correct to compare consumption during the war years with the level reached in 1941. But in 1941 the U.S. was rapidly rearming, so it was psychologically correct for Americans to treat 1941 as part of the war boom.

Additional insight into how consumers fared can be gained by looking at the major components of consumption. Production of new consumer durables, particularly those containing

¹¹ Hugh Rockoff, "Indirect Price Increases," pp. 407-420; Harold Vatter, "The Material Status," pp. 221-22.

metal, was curtailed drastically during the war; automobile production, for example, was halted. The impact on consumers, however, was cushioned by running down business inventories and by postponing normal replacements until after the war. Construction of new housing and repair and maintenance expenditures on existing housing declined during the war, but the effect on consumers was cushioned because to some extent current consumption could be maintained while repair and maintenance could be postponed until after the war. The expansion of the armed forces also reduced pressures on the civilian housing stock: the number of civilians per occupied dwelling declined from 3.63 in 1940 to 3.30 in 1944.¹² Housing shortages were severe, however, in war production centers such as the aircraft and shipbuilding centers on the Pacific Coast. It would have been difficult in any case for new construction in those areas to keep up with the influx of workers seeking jobs in defense plants. But uncertainties about the postwar viability of the plants, rent controls, shortages of construction materials, and so on, hampered construction.

Civilian food consumption (table 5) appears to have held up well. Total civilian consumption of calories fell slightly from the high level recorded for 1941, but the average during the war (when many heavy consumers of calories were in the armed forces) was comparable to the late Depression and early prewar years. Protein consumption, owing to an abundance of meat, fowl, and eggs reached an all time high. Table 5, moreover, probably understates food consumption because neglects the black market. Toward the end of the war for example, beef, which was rationed, sometimes moved from ranches to black market slaughter houses to restaurants or households, completely bypassing legal channels. It is doubtful that these

¹² Vatter, "Material Consumption," p. 226.

supplies were counted by the Department of Agriculture. Column 3 shows consumption of vitamin C which rose to a new high during the war, partly as a result of a government supplementation program. Column 4 shows pounds of meat (beef, pork, and lamb) consumed per year. Today, reaching a higher level of meat consumption would be considered a sign of moral and intellectual bankruptcy; but at the time it was considered a sign of prosperity. Wartime meat shortages were the result of large increases in demand combined with price controls, rather than decreases in supply.

Edible fat consumption was down somewhat during the war, particularly butter consumption -- the United States did not literally have guns and butter. The reasons are not clear, although it is probable that the long-term decline in butter consumption played a role. Ice cream consumption, which had been rising for a long time, continued to rise. The United States did have guns and ice cream. The decline in edible fat consumption was a major concern, and the meat rationing system was designed to provide each family with an adequate fat ration. The concern about fat aside, food production held up well.

Clothing, on the other hand suffered from quality deterioration. Only shoes were rationed, however, because of the shortage of high quality leather and rubber. And, although shoe inventories were run down, overall sales of shoes stabilized during 1942-1944 at five percent above their 1941 level.¹³

Other areas of consumption also suffered somewhat owing to wartime strains. The build up of the army and navy medical services undoubtedly hurt civilian medical care, and the rapid pace of internal migration exposed large numbers of people to new disease environments. Vatter

¹³ Vatter, "Material Status," p. 233.

summarized as follows. "Except for malaria, typhoid, and smallpox, the incidence of most diseases among the civilian population increased as compared with 1940."¹⁴ Long hours in hastily constructed industrial plants increased the rate of industrial accidents. Shipbuilding, a dangerous business in the best of times, was especially dangerous when undertaken by inexperienced workers in yards crowded with supplies.

Overall, Vatter's judicious conclusion appears correct. "Although there were specific pockets of civilian deprivation and harsh regional differences, particularly with respect to durable commodities, the overall flow of per capita consumer goods and services was maintained at a surprisingly high level."¹⁵

D. The Foreign Sector

In the Spring of 1940 Britain began placing large scale orders with American factories. Initially, Britain paid for weapons by running down its dollar balances by \$235 million, by selling \$335 million worth of U.S. securities requisitioned from British holders, and by transferring over 2 billion in gold. The policy of was known, correctly, as "Cash and Carry."¹⁶

In March 1941, however, the United States began paying for the weapons, under "Lend-Lease." This euphemistic name was meant to suggest that weapons would only be lent or leased temporarily to our future allies -- they would be returned after the war was over! Various forms of compensation, such as the right to British military bases, were exchanged for lend-lease

¹⁴ Vatter, "Material Status," p. 236.

¹⁵ Vatter, "Material Status," p. 238.

¹⁶ Friedman and Schwartz, A Monetary History, p. 550.

weapons. But the main purpose of the title and the compensation provisions was to defuse potential criticism from the still potent, although diminished, anti-war forces in Congress.

Lend-Lease lasted from March 1941 until June 1945. Altogether some \$50 billion was spent under the Act. Figure 6 shows the effects of Lend-Lease on the balance of trade of the United States. Both the relatively small increase in exports (relative to GDP which was also increasing) in 1940-1941 under cash and carry, and the unprecedented increase in 1942-1945 under lend-lease are evident.¹⁷ Thus, even though the increase in exports in 1940 and 1941 forecast the exhaustion of Britain's ability to pay, these amounts were small compared with what followed.

It is sometimes claimed that lend-lease "boosted" the economy. The intended picture is Keynesian. The government, in this view, increased spending on arms for its future allies, and this produced a multiple increase in real GDP. Lend-lease weapons more than paid for themselves. True, unemployment was still high in March 1941 when lend-lease was inaugurated; but the economy was then expanding smartly under monetary and fiscal stimuli already in place. During the winter of 1942 the U.S. reached full employment. In 1942, 1943, and 1944 when large lend-lease transfers had to be made, they had to be made the old fashioned way -- at the expense of the production of other goods.

E. The Production Possibilities Curve

¹⁷ The increase in imports during the War was partly the result of military purchases in foreign countries, although other imports increased as well.

The production possibilities curve provides a way of describing the increase in war production that clarifies the economic and technological possibilities open to the United States at each point in time. In figure 7 real civilian output is plotted on the horizontal axis and national security outlays (both at 1929 prices) on the vertical axis. As you can see, joining the points for 1938 to 1942 and then for 1943 to 1948 produces a clear picture.

Between 1938 and 1941 the United States made gains in both civilian and war production by reemploying unemployed resources, by moving toward the production possibilities curve. Between 1941 and 1942, however, some civilian output had to be sacrificed to achieve more war production, the movement was back along the production possibilities curve. The curve then shifted upward, the result of mobilizing additional labor and employing it in the numerous war production plants coming on line. The exact position of the curve in 1943-45 depends on the deflators. Here I have not adjusted the official deflators for the ills described previously. If I were to do so the high points on the graph (1943-45) would migrate toward the southwest. But in any case, it is clear that the shift in the curve permitted the United States to produce a vast supply of munitions in 1943-45 with a surprisingly small reduction in civilian output. With peace came a second movement along a production possibilities curve, this time away from guns and toward butter, leaving the economy in 1948 producing war goods at about the same rate as 1941 but with a much higher level of real civilian output.

III. The Factors of Production

In this section I use a total factor productivity framework to analyze the shift in and movements along the production possibilities frontier.

A. The Labor Force

The domestic crude death rate (column 4, table 6) remained around the level reached in the late 1930s, additional evidence that the civilian economy remained on hold, experiencing neither extreme stress in health and nutrition levels, nor rapid improvement. The crude birthrate, column (6), increased slightly during the war and then dramatically in 1946. The 1946 increase, reflected, partly, the reuniting of couples separated during the war. But there was more to the "baby boom," which lasted well into the 1950s, than these romantic interludes. The baby boom was a response to the rise in real per capita income, and perhaps even more important, to the rise in economic security that came with the return of full employment.

The crude death, when the deaths of military personnel stationed overseas are included, column (3), rose substantially in 1944 and 1945 with the intensification of the fighting. Nevertheless, it is also clear that neither the supply of labor to the homefront, nor the supply of labor to the fighting fronts, was seriously compromised by the losses sustained in 1944 and 1945. The United States could have fought much longer and harder had it proved necessary.

Column (5) shows the crude death rate for military personnel stationed overseas. If it appears somewhat low, as it probably does to someone more familiar with the losses sustained by the other belligerents, it is because of the large number of support personnel in the U.S. military. The death rates for men headed for the killing lines, for riflemen and bomber crews, were extremely high. Indeed, losses in rifle companies were so high in the European theater that American commanders had to contend with a severe shortage of riflemen despite their superiority in men and material in almost every other category.

To achieve the "production miracle" the United States increased the supply of labor by increasing the hours and intensity of work, especially in the munitions sector, and by inducing additional workers to join the paid labor force. Average hours worked per week increased only about 7 percent between 1940 and 1944, from 43.9 hours to 47.0 hours, and remained below the level of 1929, 48.7 hours.¹⁸ Hours and intensity increased greatly, of course, in the factories producing munitions.

The contributions to the total increase in labor made by the increase in the total number of workers, the increase in the annual number of hours worked, and the residual increase in Kendrick's estimate of total labor inputs, which I have labelled "reallocation," are shown in figure 8. Reallocation is the effect of moving a worker from, say, a low paying job in southern agriculture to a high paying job building tanks in Detroit and the differential effect of longer hours in the highly paid war industries. The increase in the size of the labor force was the most important factor. But at the peak in 1944 all three factors were making substantial contributions to the increase in labor inputs. Annual hours fell back to their prewar level, and by 1948 had fallen noticeably below the level of 1937. But the gains in total employment and from the reallocation of labor remained. The southern agricultural worker who moved to Detroit to build tanks stayed on to build automobiles.

In figure 9 the increase in the paid labor force is divided into three components: the amount contributed by the reduction in unemployment (of both men and women), by the increase in the number of women participating, and by the increase in the number of men participating. Between 1940 and 1944 the labor force increased by 17.6 million workers. The reduction in the

¹⁸ Kendrick, Productivity Trends, pp. 310, 315.

number of unemployed workers contributed about 42 percent of the increase, increased participation by women contributed about 28 percent, and increased participation by men, about 30 percent.

The numerical preciseness of the estimates hides gray areas. On the one hand, many of the workers who were not participating in the labor force in 1940 but who entered between 1940 and 1944 had been discouraged workers. On the other hand, many of the workers reemployed in 1940 and 1941 were set to work producing civilian goods and then reallocated to war goods. And a substantial part of the labor force designated as unemployed in 1940 actually had jobs in Emergency relief agencies such as the Civilian Conservation Corps and the Works Progress Administration -- agencies that were shut down as wartime jobs were created. These workers were being reallocated to more productive jobs rather than moving from unemployment to employment.¹⁹ The same could be said of many women who entered the labor force, they began producing for the market rather than for the home, a reallocation that adds to GNP partly because home production is not adequately valued in GNP.

Who were the women who entered the labor force? A breakdown by marital status (available only for selected years) is shown in figure 10. The increase in the number of women in the labor force (from 1940) is divided into four categories: married women with husband present (which includes husbands absent in the military), married women without husband present, single women, and widowed and divorced women.²⁰ Married women with husband present made up the bulk of the entrants, although there were entrants in all four categories. The

¹⁹ Michael Darby, "Three and a Half Million."

²⁰ The totals here are March estimates and so differ slightly from the total reported in figure 10 which are annual averages of monthly figures.

image of American women building the weapons of war while their husbands served in the armed forces is not without a foundation in fact.

The shifts between 1944 and 1948 are more surprising. The number of women (with husbands present) in the paid labor force increased by another 1.3 million between 1944, the peak of the mobilization, and 1948. Decreases were recorded, but these were confined to single women and to married women with the husband not present. A full analysis is beyond the scope of the paper. Undoubtedly, part of the story is a change in attitudes. Women who worked during the war developed a taste for work, and at least some employers realized that they would make good workers. But another part of the story must be improved economic conditions combined with the long-term trend toward increased labor force participation of women. Increased family incomes permitted young single women and married women with husbands not present to return to school.²¹

Together, the additional sources of labor made it possible for the United States to significantly increase the amount of labor devoted to producing munitions without significantly reducing the amount of labor in other sectors. Between 1939 and 1943 workers in durable manufacturing increased by a factor of 2.4, from 4.7 million to 11 million. At the same time employment in most other sectors held roughly constant. Perhaps the major exceptions were agriculture and household workers.²²

²¹ For a fuller discussion of impact of the War on the role of women in the labor force see Goldin, "The Role of World War II."

²² Household workers are not accurately counted in the data underlying this breakdown of the labor force because it is based on surveys of businesses.

Figure 11 is based (very roughly) on the British sector-of-origin breakdown of the labor force: Group I consists of workers in durable manufacturing, Group II workers in agriculture, mining, government, transportation, and public utilities, and Group III workers in non-durable manufacturing, construction, finance, and services. The idea is that the goal of mobilization is to reallocate as many workers "as possible" from groups II and III to I.

My attempt to match the British sectors-of-origin breakdown is only approximate because I have allocated all durable manufacturing workers to category I, and I have allocated all non-durable manufacturing workers to category III. A closer look at industry by industry data would produce some adjustments in the boundaries among the categories. By way of comparison consider Harrison's estimates.²³ In 1940 he estimates 8.4 percent of the U.S. labor force was in Group I industries; using durable manufacturing as a proxy gives 9.5 percent.²⁴ In 1943 Harrison estimates 19.0 percent of the U.S. labor force was in Group I industries; using durable manufacturing as a proxy gives 17.2 percent. The durable goods proxy therefore seemed close enough for present purposes.

This breakdown further illustrates the decision by the United States to put the Civilian sector on hold. Category I employment rose, while category II remained about constant, and category III fell, but only slightly and only in the peak years 1943 and 1944.

²³ Harrison, "Resource Mobilization," p. 186.

²⁴ The source on which Harrison relied (U.S. War Production Board, American Industry in War and Transition, gives total labor force figures that differ slightly from those in Historical Statistics, so the discrepancy between my proxy and Harrison's estimates may result from differences in the underlying numbers as well as from conceptual differences.

B. The Stock of Capital

The United States mobilized by converting existing factories and by building new ones. Ford halted automobile production, and began turning out tanks; Ford also built a huge plant at Willow Run for mass producing B17 bombers. A good deal of the plant and equipment built during the war was converted to the production of civilian goods after the war. In a famous article published in 1969, Robert J. Gordon put a price tag on this addition to the capital stock: "45 Billion [1958 dollars] of U.S. Private Investment Has Been Mislaid." The \$45 Billion was mislaid, of course, by economist not by businessmen. Much of this capital, which had been financed by the Defence Plant Corporation and other federal agencies, was sold to private firms at bargain prices after the war, and so was undercounted in the official estimates of the capital stock.²⁵

Although the wartime expansion of industrial capital was crucial to the war effort, it is easy to exaggerate it as a contribution to the stock of capital. In 1945 gross private capital stocks (exclusive of government owned privately operated capital created during the war) were 910.9 billion (\$1958 dollars) so that Gordon's estimate of \$45 billion represented an addition of about 5.0 percent. If we use a narrower base, nonresidential structures and equipment, the corresponding figure is 11.3 percent. These are important numbers for economists estimating production functions;

²⁵ There was some controversy over whether the transfer took place at bargain prices. See George Jaszi, "Comment," for the other side.

their potential contribution to an understanding of postwar U.S. prosperity, however, is limited.

C. Total Factor Productivity

My starting point is John W. Kendrick's well known estimates of total factor productivity.²⁶ Kendrick's capital series may understate the increase in the stock of capital during the war because it omits some government-owned-privately-operated capital. For that reason I have adjusted his estimates of capital inputs upward by multiplying them by one plus the ratio of Gordon's estimates of government-owned-privately-operated capital to Kendrick's estimates of total domestic capital.²⁷ This adjustment, however, has a relatively small effect on the overall results.

Each bar in figure 12 shows the percentage increase in real NNP in that year over 1940. It is then divided into the amounts contributed by increases in the factors of production and other sources. Increased inputs, especially labor, provided the bulk of the increase in output. Comparing 1944 with 1940, we find that increased supplies of labor contributed 73 percent of the increase in output, increased supplies of capital contributed about 3 percent, and increased total factor productivity contributed about 24 percent.

²⁶ Kendrick, Productivity Trends, Table A-XIX.

²⁷ Gordon, "45 million," Table 4.

The most important lesson is that no single factor accounts for the rise in output. The reduction in unemployment, the increases in the labor force participation rates of men and women, the increase in hours, the reallocation of the labor force to more productive sectors, the increase in the stock of capital, and the increase in total factor productivity all played a role. There was nothing miraculous about the increase in output -- it was the result of an across-the-board effort to mobilize resources.²⁸

IV. Financing the War

A. Taxes, Bonds, and Money

It is a commonplace that there are three ways of financing government spending: taxes, borrowing, and printing money. This is, to be sure, a simplification that ignores other sources of finance that may be important during wartime, including the liquidation of existing assets, the commandeering of resources both domestically and from conquered nations, voluntary contributions both domestically and from abroad, and even financial transactions such as the refinancing of government debt. In the United States during World War II the most important form of commandeering was the drafting of men into the armed services. The difference between the pay draftees would have required to serve voluntarily and what they were actually paid was a tax that went unreported in the standard

²⁸ We should note that the share attributed to total factor productivity may be exaggerated. Greater intensity of work effort (for example, speed up on production lines), faster depreciation of existing capital, and overstatement of output because of underestimate of price increases, all get thrown into the residual labelled total factor productivity.

financial accounts. Similarly, the difference between what true volunteers could have earned in the civilian sector and what they earned in government service could be considered a gift to the government.²⁹ Despite these qualifications, the traditional tripartite division is useful for understanding how the war was financed.

In a world in which money consisted solely of paper issued by the government the calculation of the tripartite division would be straightforward. Taxes would be measured by tax receipts, borrowing by the interest bearing debt issued, and money creation by the amount of paper money issued. The existence of the banking system, however, creates an additional complication. When the government prints paper money or creates deposits for itself on the books of the central bank, the banking system receives additional reserves that it uses to expand its asset holdings while creating additional deposit money; or as it is sometimes put, the government shares the seignorage with the banking system. Thus, part of the interest-bearing debt issued by the government, the part held by banks or by individuals who have financed their acquisition of debt with bank loans, must be considered as financed indirectly by money creation.

If one assumes that all government debt acquired by commercial

²⁹ In addition to true volunteers (not induced to volunteer by the threat of the draft) in the armed services one could also consider the "Dollar a year men" in this context. These were executives who worked for the War Production Board and other agencies for the nominal sum of a dollar per year. Their civilian employers, who continued to pay their salaries, could be considered as gifting these salaries to the federal government. It has been argued, however, that these companies often received various long-term benefits from having their employees in Washington.

banks was financed by money creation and that none of the debt held by the public was so financed -- or that the overstatement in the first balances the understatement in the latter -- then we get the following: on average during the years of large wartime deficits (1942-1945) taxes accounted for 47 percent of total spending, money creation 26 percent, and borrowing from the public 27 percent.³⁰ The monetary share can be further divided into spending financed directly by government created money (6 percent) and spending financed indirectly by money created by the banking system (20 percent).

Figure 13 shows the year to year changes in each source of finance relative to the year to year change in government expenditures. Taxes could finance only about one quarter of the increase in spending between 1941 and 1942: it takes time to legislate, levy, and collect new taxes. The tax fraction increased rapidly to over 50 percent between 1942 and 1943. And between 1943 and 1944 the increase in taxes was sufficient to permit a reduction in the reliance on printing press. But the further increase in spending between 1944 and 1945, partly the result of the unexpectedly strong resistance put up by the Germans and Japanese,

³⁰ My estimates differ slightly from those reported by Friedman and Schwartz, A Monetary History, p. 571, which I discovered after making my calculations: taxes 48 percent, money 21 percent, and borrowing 31 percent. Friedman and Schwartz evidently used the annual change in M2 to compute the seignorage that went to war finance, assuming implicitly, as they note, that none of the seignorage shared with the banking system was diverted to other uses. If one replaces M2 with M4, the largest monetary aggregate that Friedman and Schwartz report, then the results of their calculation are very similar to mine. The similarity in results using different methodologies suggests that we are in the right ballpark.

required increased reliance on money creation, so that with respect to reliance on the printing press 1944-45 appears to be something of a reprise of 1941-1942.

B. Money and Inflation

Between June 1939 and June 1945 the stock of money (M2) increased by a factor of more than 2.5, from \$48.4 billion to \$125.3 billion. Most of the increase can be accounted for by changes in the monetary base by a factor of 2.40, from \$17.3 billion to \$41.6 billion. The increase in the monetary base for the war period as a whole can be explained in turn by the decision to finance part of the war by printing money.

But during the national defense period the increase in the stock of monetary gold was the dominant force behind the increase in highpowered money which increased from \$13 billion to \$22.7 billion between 1938 and 1941 before levelling off for the remainder of the war. Cash and carry and the arrival of private capital seeking a safe haven explain the rapid increase in the stock of monetary gold before Pearl Harbor. Both factors were brought to a halt by American entry into the war. Indeed, because of the halt in the expansion of the stock of monetary gold, the increase in highpowered money was actually less in 1942 than it had been in the years immediately preceding.

The increase in the stock of money during the war in turn produced intense inflationary pressures. To some extent these pressures were contained by price controls and rationing,

particularly during 1943-1945.³¹ Between 1938 and 1947 (the first full postwar year for which we can rule out any distortion in the price indices produced by controls) most of the price indices in table 12 show an increase of around 50 percent. Over the same period M2 grew about 117 percent and real NNP about 43 percent. The increase in money per unit of output, 74 percent, therefore considerably outraced the increase in prices. The resulting monetary "overhang" probably reflected an understandable decision to delay the final dispersal of wartime accumulations: the overhang was gradually run down during the early postwar years.

V. The Long-Run Consequences of the War

Measuring the costs (and benefits) of World War II is, as John Maurice Clark wrote with respect to World War I, "either a relatively simple matter of tabulation and fiscal allocation; or else it is an economic problem of insoluble difficulty."³² Like Clark, all I can offer are a few calculations that may shed some additional light on a complex issue. Subsection A estimates the cost of the war by comparing the actual path of consumption in the war and postwar years with a counterfactual path based on the assumption that the war was avoided. Subsection B, based on the work of Kendrick and Denison looks at the direct impact of the war

³¹ I discussed these controls at length in Drastic Measures, chapters 4 and 5.

³² Clark, The Costs of the World War, p. xi, quoted in Goldin and Lewis, "American Civil War," p. 300.

on the stocks of human and physical capital. Subsection C looks briefly at the relation between the war and the change in macroeconomic regimes, what may well be the most enduring legacy of the war.

A. The Impact of the War on the Flow of Goods to Consumers

Some years ago Claudia Goldin and Frank Lewis measured the economic cost of the American Civil War by discounting the differences between the actual flow of goods and services to consumers and a counterfactual flow based on the assumption that the war was avoided, a technique, that as far as I know, they originated.³³ The idea is that the loss of life, the destruction of physical capital, the disruption of trade relations, and so on that occur during a war are important only to the extent that they reduce the flow of consumer goods in the long run below what it otherwise would have been.

In the exercise that is shown in table 13 I made the following assumptions. (1) An aggressive monetary and fiscal policy would have produced a vigorous economic expansion between 1941 and 1946, even if the war had not occurred. It is possible to argue, of course, that in the absence of the war the Depression would have dragged on indefinitely, making the case for attributing any cost to the war via foregone consumption problematic. (2) In 1946, if there had been no war, real GNP would have been equal to the higher

³³ Goldin and Lewis, "American Civil War."

level of GDP that obtained in 1943. (3) The gap between the counterfactual GDP and the actual GDP would have gradually narrowed and almost disappeared by 1960.³⁴ In other words, I assume that 1960 was an equilibrium year in the sense that the economy had returned to "desired" levels of capital and labor. (4) In the absence of the war the ratio of consumption to GDP would have been .60 from 1941 to 1950; after 1950 I use the actual ratio of consumption to GDP. (The ratio was .59 in 1941, the last prewar year, and .61 in 1960, the fourth postwar cyclical peak.) (5) I discount differences between the counterfactual consumption path and the actual path with an interest rate of 5.0 percent, about twice the rate on corporate and government bonds during and after the war, and hopefully representative of the average rate of interest.

The result of this computation, the sum of the last column in table 13 is a cost of the war amounting to about \$148 billion at 1940 prices, about 2.27 years of consumption in 1941. This is actually a slightly higher cost than Goldin and Lewis estimate for the North in the Civil War (1.8 years), reflecting the greater intensity of mobilization during World War II.

B. The Effects on the stocks of labor and capital

³⁴ This is a rather strong, and potentially controversial, assumption. Some modern growth theories imply that consumption would remain permanently higher. See Mankiw (1995) for a recent survey.

An alternative to the Goldin-Lewis approach is to identify explicitly the losses caused by the war. Human capital losses were undoubtedly the most important direct losses; damage to the physical capital stock was relatively small -- the most important losses being ocean shipping. The most straightforward way of calculating the loss of human capital is to compute the present discounted value of the future earnings of the men and women killed in the war and the loss in earnings of those who were partially or totally disabled.

I assumed that the typical soldier or sailor entered the military at age 18 in 1941, and that barring injury or death, would have earned the average real earnings in the economy in each year of his or her working life, and then would have retired at age 65. I then adjusted those earnings for the expected death rate for civilians, and discounted the result at an interest rate of 5 percent. Multiplying the expected lifetime real earnings by the number of people killed (364,111) yielded a total cost for men and women killed of 12.9 billion in 1940 dollars. The total number of men and women suffering non-mortal wounds was 281,881. I assumed that the earnings capacity of each wounded man or woman was reduced, on average, 25 percent, yielding a total of 2.5 billion in 1940 dollars in diminished work capacity resulting from wounds. The total loss from war-related deaths and injuries thus came to about 15.4 billion.

A number of technical questions could be raised about this calculation, as well as the philosophical question of whether it

makes sense to put a dollar value on a human life. For one thing, the calculation assumes that veterans earned the average income of all employees. In fact, veterans typically earned more on the job and suffered less unemployment than nonveterans, partly because women and blacks were under represented in the veteran population.³⁵ The ability of the United States to replenish losses of labor through immigration (including highly skilled labor -- this was the era of the "brain drain") raises a further problem. U.S. losses were spread throughout the world economy in the postwar period to the extent that the places that would have been filled by men killed or injured were filled instead by additional immigrants. The distribution of income within the United States was undoubtedly different from what it would have been had there been no war. The extent to which total output of the economy was altered, however, is debatable.³⁶

Leaving these doubts and qualifications to one side, however, the estimate of 15.4 billion appears reasonable. It amounted to about one quarter of consumption in 1940; and to about 10 percent of the Goldin-Lewis type estimate of total losses.

To the extent that American economists think about the long-term effects of the war on the labor force, it is probably more in terms of the increase in human capital than the loss of life. The

³⁵ See Taussig, Those Who Served, pp. 51-52.

³⁶ J.M. Clark, in his study of the costs of World War I, computed the loss to the heirs of the killed and wounded a calculation most relevant to determining how much the government needed to spend to create an equitable financial burden among those surviving the War.

increase in the educational attainments during War were relatively small, but they are, nonetheless, surprising given the war effort, and they ushered in a period of rapid improvement. Perhaps, the best way of seeing this is by considering Edward F. Denison's index of the amount of education, measured by its ability to produce output. Denison constructed his index by weighting years of schooling by the relative earnings of each level of schooling. This index rose from 100 in 1941 to 103.3 in 1947, to 107.1 in 1953, and to 111.2 in 1959. In 1948, according to Denison, 8.8 percent of the male labor force had 4 or fewer years of schooling; by 1959, this group had fallen to 5.8 percent.³⁷ Even more dramatic were the changes at the other end of the education distribution. In 1948, 12.3 percent of the male labor force had 1 or more years of college; by 1959, this group had risen to 18.3 percent. By 1976, the last year in Denison's table, the percentage of males with one or more years of college had risen to 32.5 percent.

The education revolution cannot be attributed primarily to the war. The growing faith in education, and particularly higher education, as a way of bringing everyone into the mainstream of American life had produced important developments, such as the high school movement and the land grant college acts, long before the World War II. But the "G.I. Bill of Rights" (officially, the Servicemen's Readjustment Act of 1944) undoubtedly accelerated the expansion of higher education. The bill provided help to veterans

³⁷ Denison, "Slower Growth," p. 43.

in a number of ways: medical care, low interest home mortgages, vocational rehabilitation, job placement, unemployment benefits, and stipends that covered tuition and living expenses for veterans attending trade schools or colleges. The educational benefits were viewed as a double-edged sword. They would help veterans upgrade their skills, while keeping down the number of job seekers in what was expected to be a weak postwar job market. Overall some 10 million veterans received educational benefits between 1944 and 1956, when the program ended.

While the G.I. Bill did contribute to the postwar boom in higher education, this can at most explain only a small share of the postwar prosperity in the United States. A similar conclusion could be drawn concerning other changes on the real side of the economy. While wartime construction of plant and equipment did partially offset the decline in private investment spending during the war, it is likely that had a similar boom taken place in peacetime the increase in the capital stock would have been much larger. It is true, as often pointed out, that the United States gained a temporarily favorable position in world trade compared with some of its chief industrial rivals as a result of the war. But the United States was not export oriented. In 1929 exports were 4.4 percent of GDP; in 1949 they were 4.6 percent. It is doubtful that war related improvements in the terms of trade effecting such a small part of the economy could be the key to prosperity.

The most likely explanation for the postwar prosperity, in my view, was the change in the macroeconomic regime that prevented a

recurrence of the sort of financial crisis that had undermined prosperity in 1930-1933.

C. The Postwar Macroeconomic Regime

The war played a major role in converting American macroeconomists to Keynesian economics. When the war began it was widely believed that the 1930s had shown that monetary policy was ineffective. The Federal Reserve had done its best, but -- "You can't push on a string." While a few diehards rejected this view, it was not until Milton Friedman and Anna J. Schwartz published A Monetary History of the United States that the profession as a whole began to rethink the view that monetary policy was ineffective. Meanwhile, Keynes's General Theory had convinced a brilliant generation of young American economists that increased government spending could restore and maintain full employment. The case for Keynesian policies, however, remained a theoretical one in the late 1930s. Deficit spending under the New Deal had not cured the Depression.

The war provided the missing evidence. As Herbert Stein shows, by the end of the war a consensus had developed that full employment should be a major policy objective of the federal government, and that this objective should be achieved by fiscal policy.³⁸ The war, of course, also produced an extraordinary increase in the stock of money, but monetary policy had been

³⁸ Herbert Stein, The Fiscal Revolution, pp. 169 - 196.

discredited by the Depression. Alvin Hansen's stagnation thesis, moreover, had argued that wartime levels of federal spending were not a temporary aberration. If private investment was permanently depressed then high and growing levels of government spending would be needed to fill the gap.

The wartime experience, however, was not decisive. During the war inflation had been checked to an extent by wage and price controls, and rationing. This was not part of the Keynesian promise. Thus, in the early postwar years American economists were concerned that Keynesian economics also implied a permanent set of direct controls. As Paul Samuelson put it in the first edition (1948) of his classic textbook, "The war years have shown fiscal policy to be a very powerful weapon. Indeed, some would argue that it is like the atomic bomb, too powerful a weapon to let men and government play with; that it would be better if fiscal policy were never used."³⁹

But the early postwar experience seemed to suggest that this danger could be avoided. An initial surge in inflation was followed for several years by fairly stable prices and relatively full employment. Alvin Hansen made this point explicitly in his influential A Guide to Keynes.

Keynesian critics, however, have exaggerated the dangers of inflation and wage control in a full-employment society. The price inflation of 1946 - 1947 in the United States was a product of the war, not a test of peacetime full employment. Indeed from January 1948 to December, 1948, the United States enjoyed full employment without

³⁹ Samuelson, Economics, p. 410.

inflation despite the absence of price and wage controls.⁴⁰

For economists who analyze macroeconomic fluctuations from a monetary standpoint the ascendancy of Keynesian economics may seem to make the postwar prosperity more rather than less mysterious. But there is a connection. Although Keynesian economics, as it was then understood in the United States, downplayed the role of monetary policy it did not eliminate it altogether. Monetary policy was assigned what was then viewed to be the marginal task of fighting recessions by keeping interest rates low. Keynesian economics, in other words, although it did not think monetary policy important, did insure that monetary policy would be used to fight recessions aggressively.

In addition to the revolution in economic thought, three institutional changes reduced the probability of a paralyzing financial crisis. (1) Deposit insurance, introduced in 1934, reduced the likelihood that individual failures would spiral into full blown panics. (2) The accumulation of federal debt by banks during the war greatly strengthened their balance sheets, bringing them a long way toward the once utopian dream of 100% reserves. (3) The accumulation of a good share of the world's stock of monetary gold during the war, particularly during the years of neutrality, and the monetary arrangements established under the Bretton Woods agreement that made the dollar the most important international reserve currency, effectively freed the Federal Reserve from the

⁴⁰ Alvin Hansen, A Guide to Keynes, p. 229.

real and psychological constraints of the gold standard. Together these changes made the combination of banking panic and federal reserve passivity that had produced the Great Depression a thing of the past. The new stance of active monetary and fiscal policy may have contained within it an unhealthy bias toward inflation, but that is another story.

VI. Conclusion

While the dramatic collapse between 1929 and 1933 has been studied and re-studied, the equally dramatic expansion between 1939 and 1943 has been neglected. This is unfortunate because the war contributed nearly as much to reshaping the political economy of the United States as did the Great Depression. As a result, while economic historians can usually divide the Great Depression into a long list of phases, they usually tend to think of the war as an undifferentiated lump. At times this leads to an exaggeration of certain aspects of the wartime experience.

The neglect of the surge in the economy in 1940 and 1941 leads to an exaggeration of the amount of unemployed resources available when conversion moved into high gear in 1942. Instead, the U.S. relied on variety of means to increase production: the labor force participation of men and women increased, labor was drained from low-wage occupations, hours of work were increased, private domestic investment was reduced, and so on. The focus on the war as a whole has also led economic historians to downplay the role of the printing press in war finance. Beginning with the Civil War,

the printing press has been a stopgap method for financing wars that was phased out as tax increases become productive, and so it was in World War II.

It is natural for economic historians to focus on the material legacies of the war -- on losses of physical and human capital, on changes in the terms of trade, and so on. A close look, however, shows that the most long lasting legacies may have been intellectual and institutional: a new macroeconomic regime that reshaped monetary and fiscal policy and profoundly influenced employment and inflation for decades afterwards.

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GNP and MILITARY EXPENDITURES

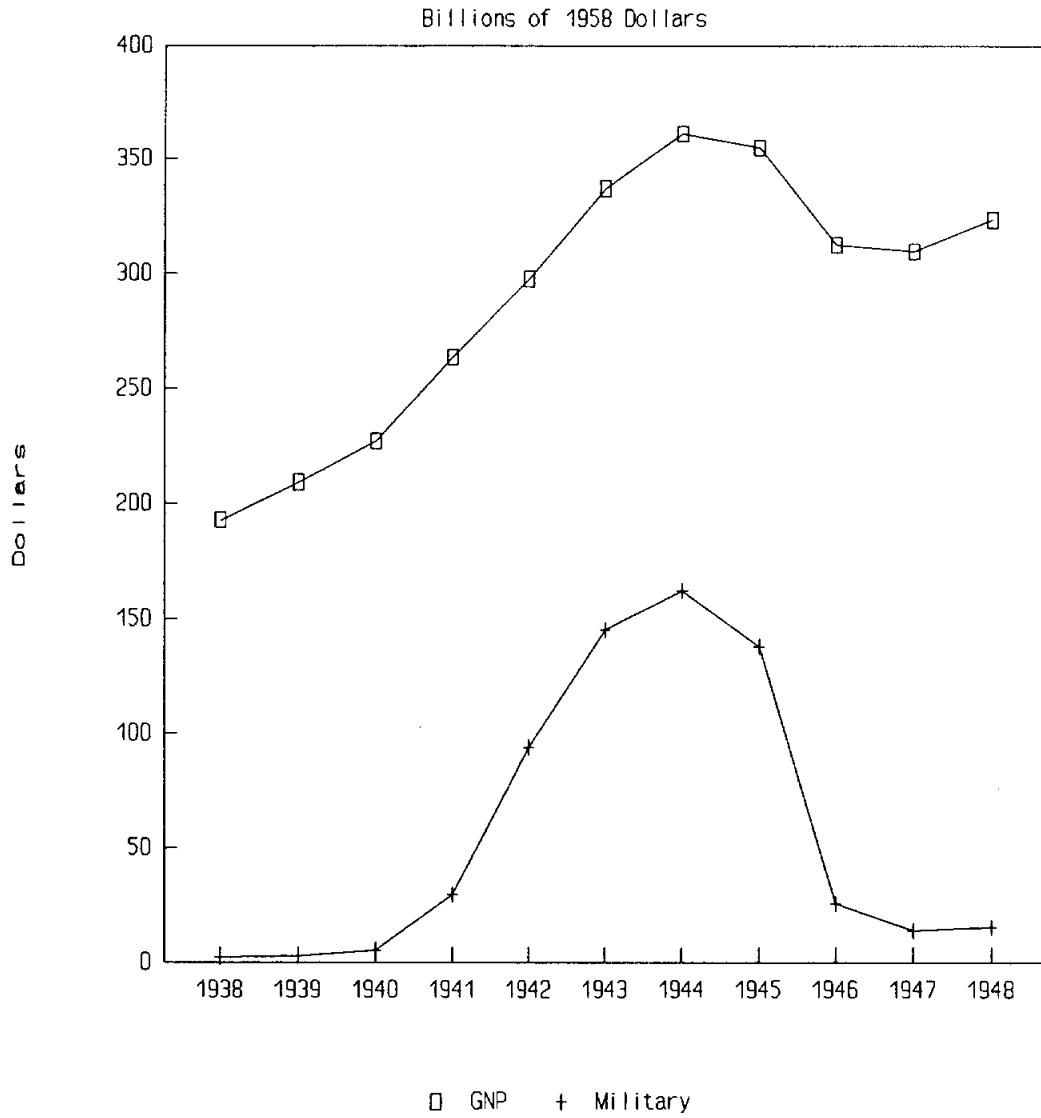


Figure 1

Estimates of Real NNP

Percentage Increase from 1939

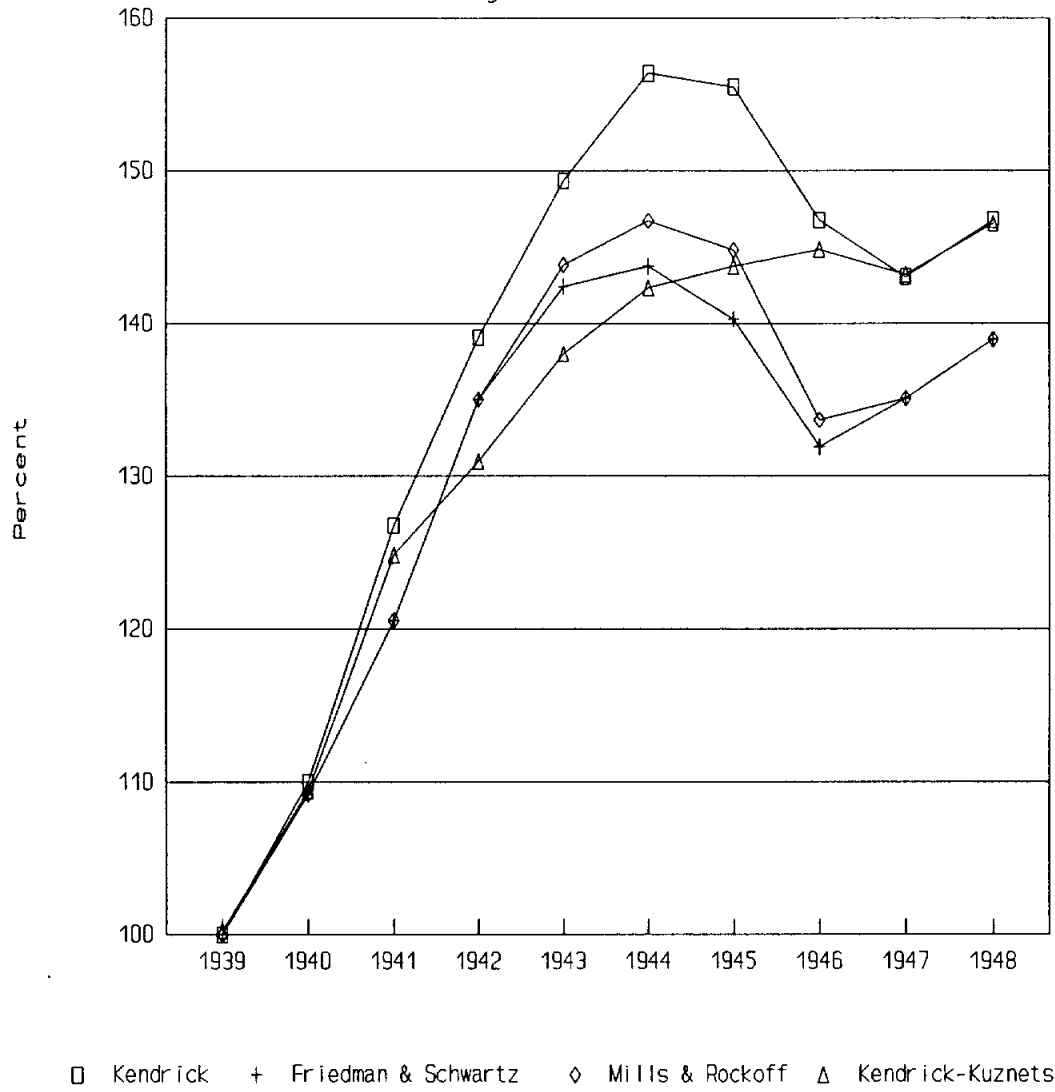


Figure 2

GNP by Type of Expenditure

Billions of 1958 Dollars, 1938-48

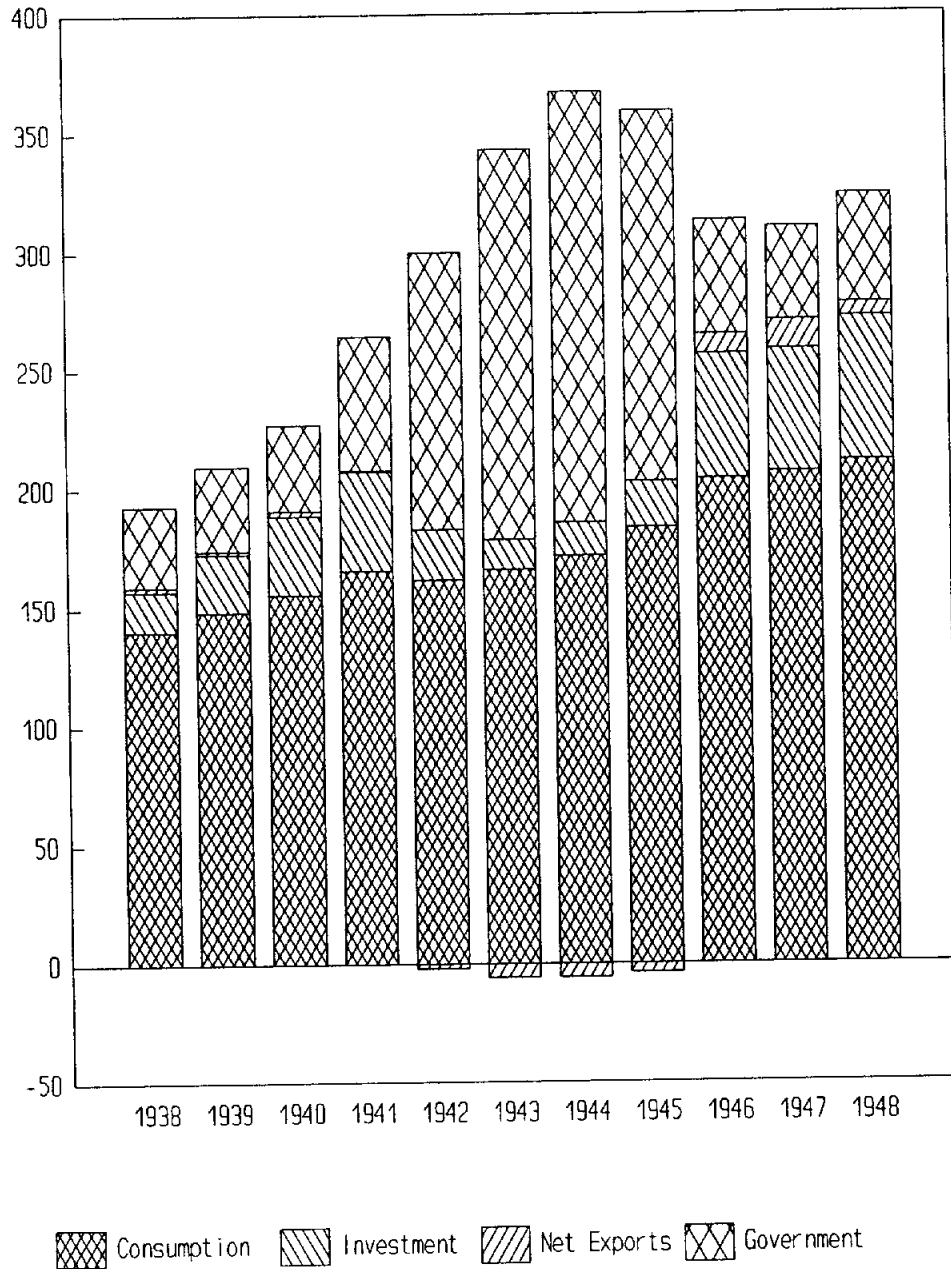


Figure 3

Alternative Measures of War Spending

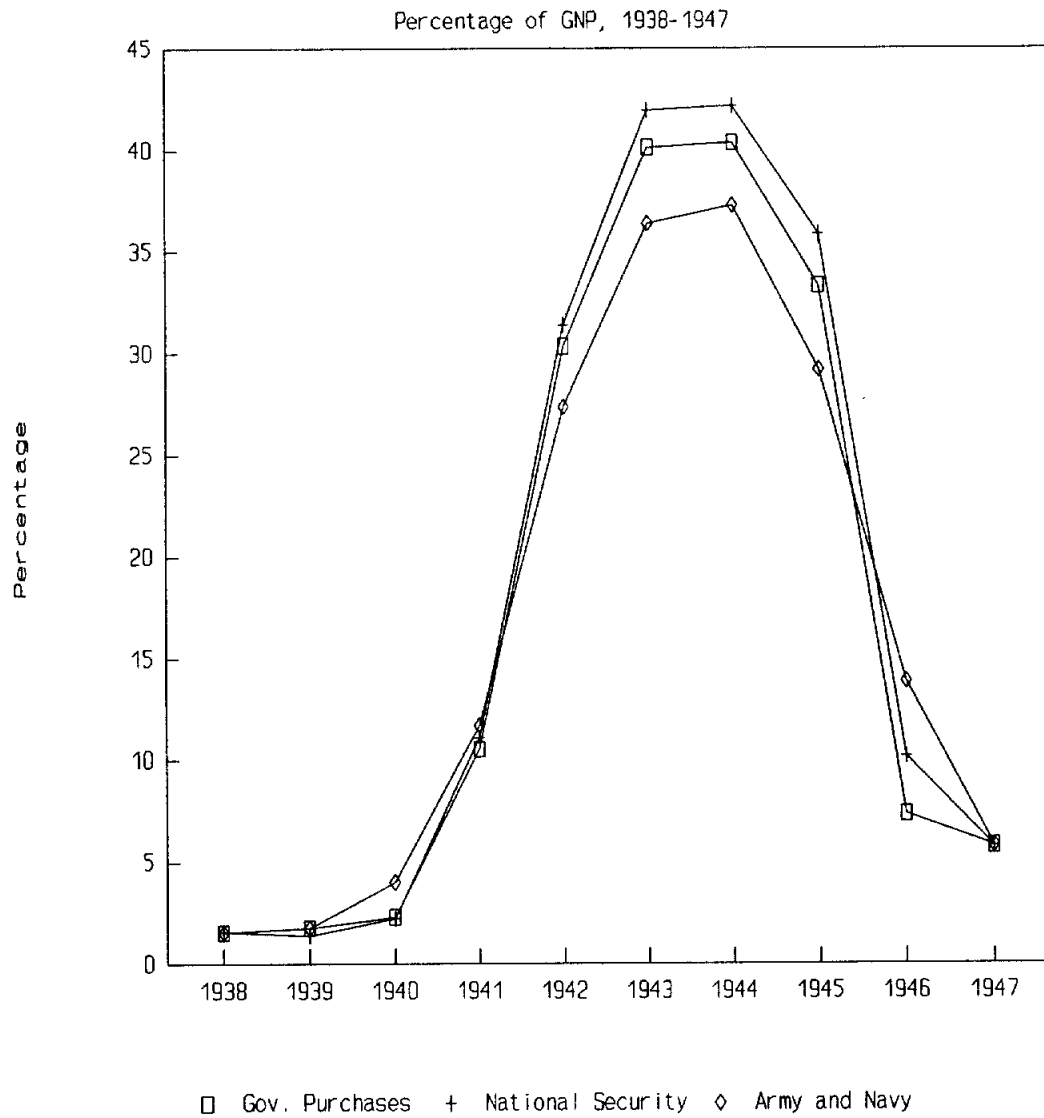


Figure 4

Estimates of Per Capita Consumption

Alternative Deflators, 1939-1948

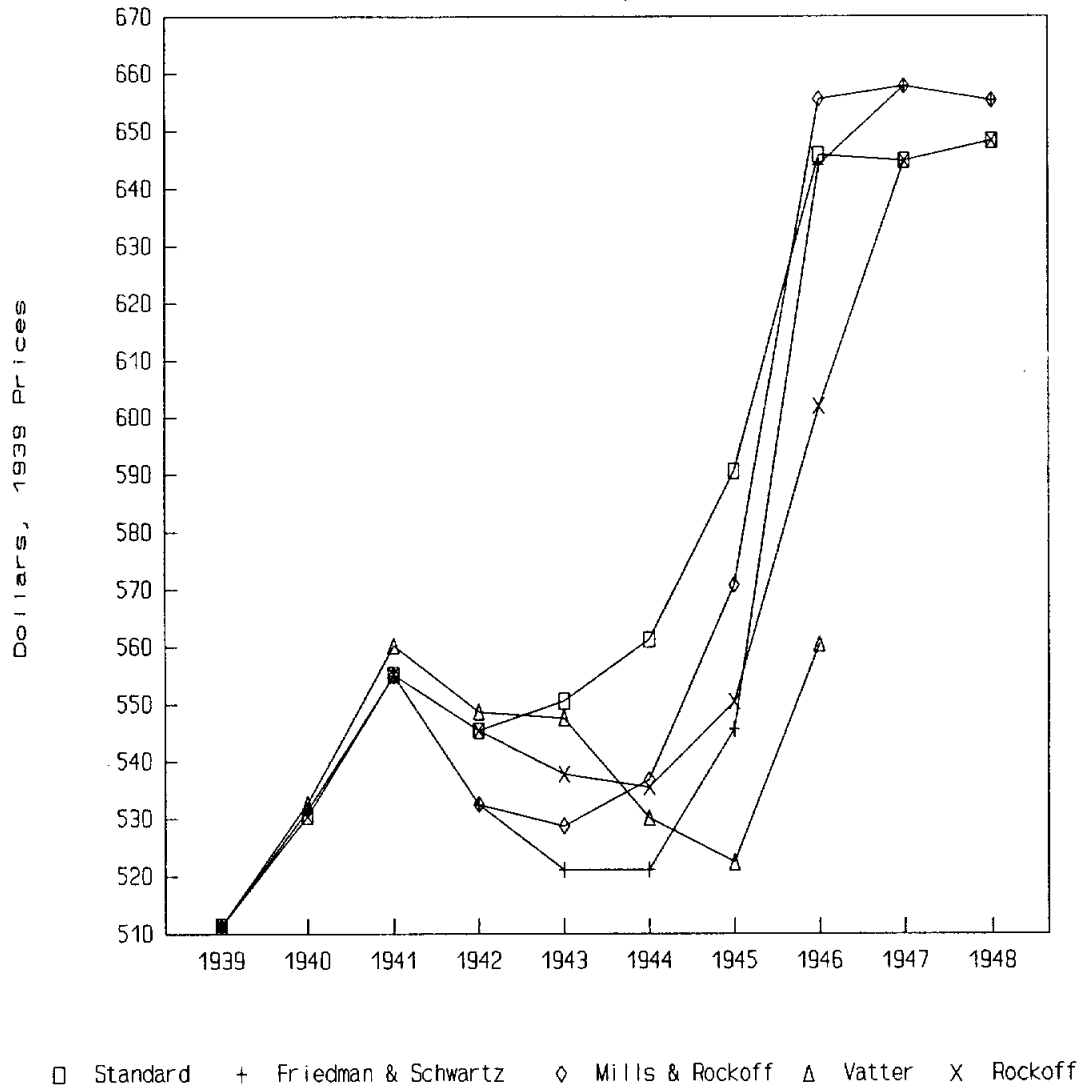


Figure 5

Exports and Imports, 1938-1948

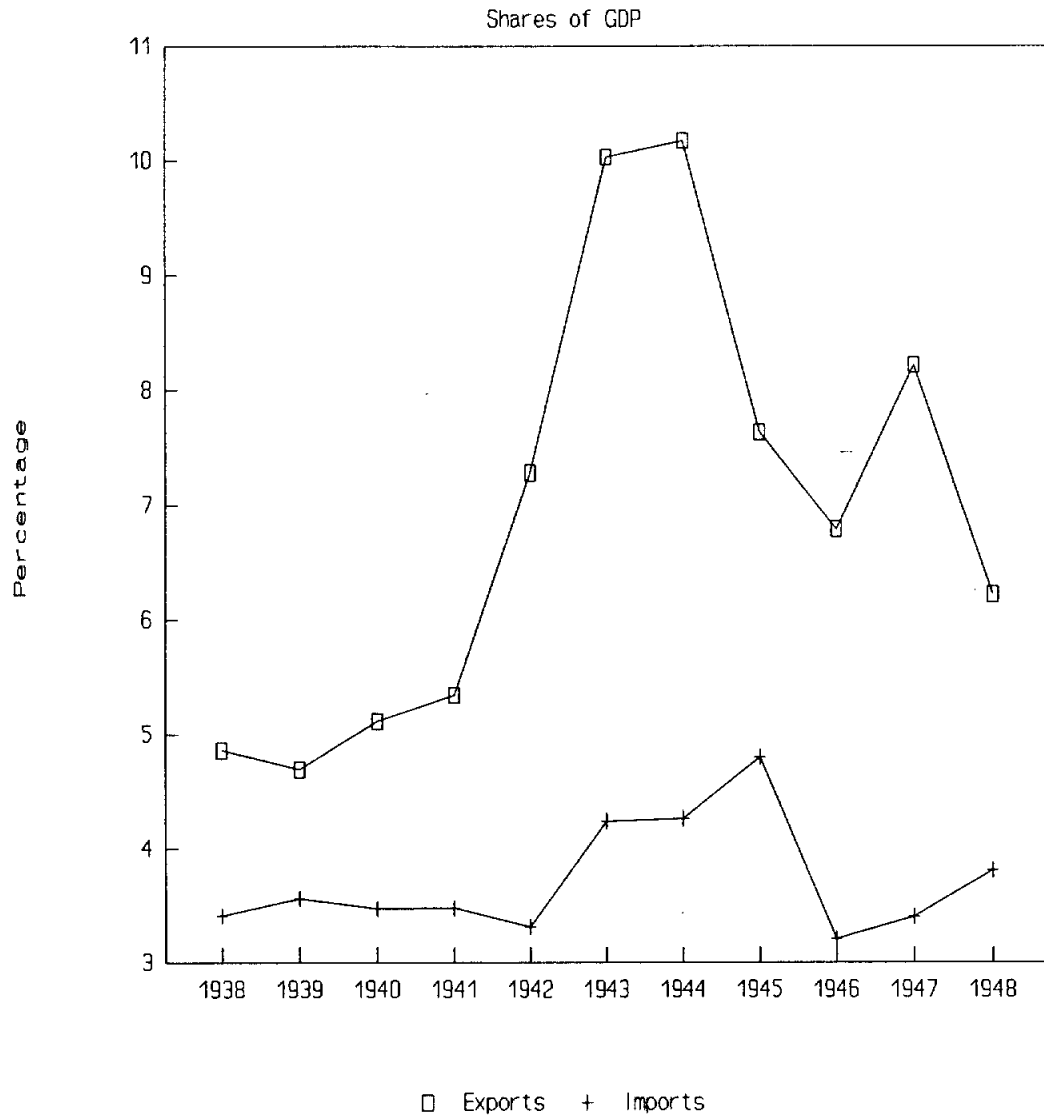


Figure 6

GUNS VS. BUTTER

Total Outlays Billions of 1929 Dollars

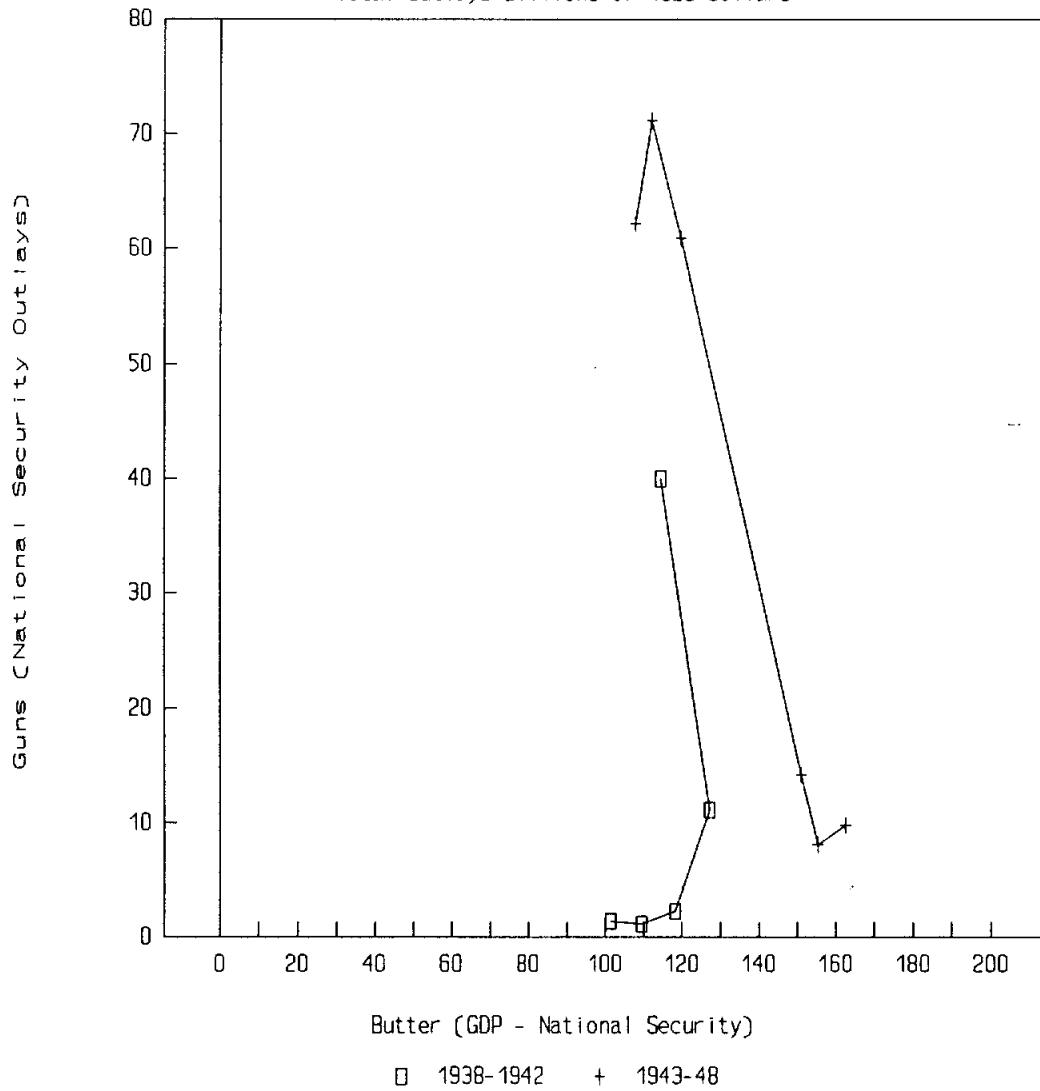


Figure 7

Sources of the Increase in Labor

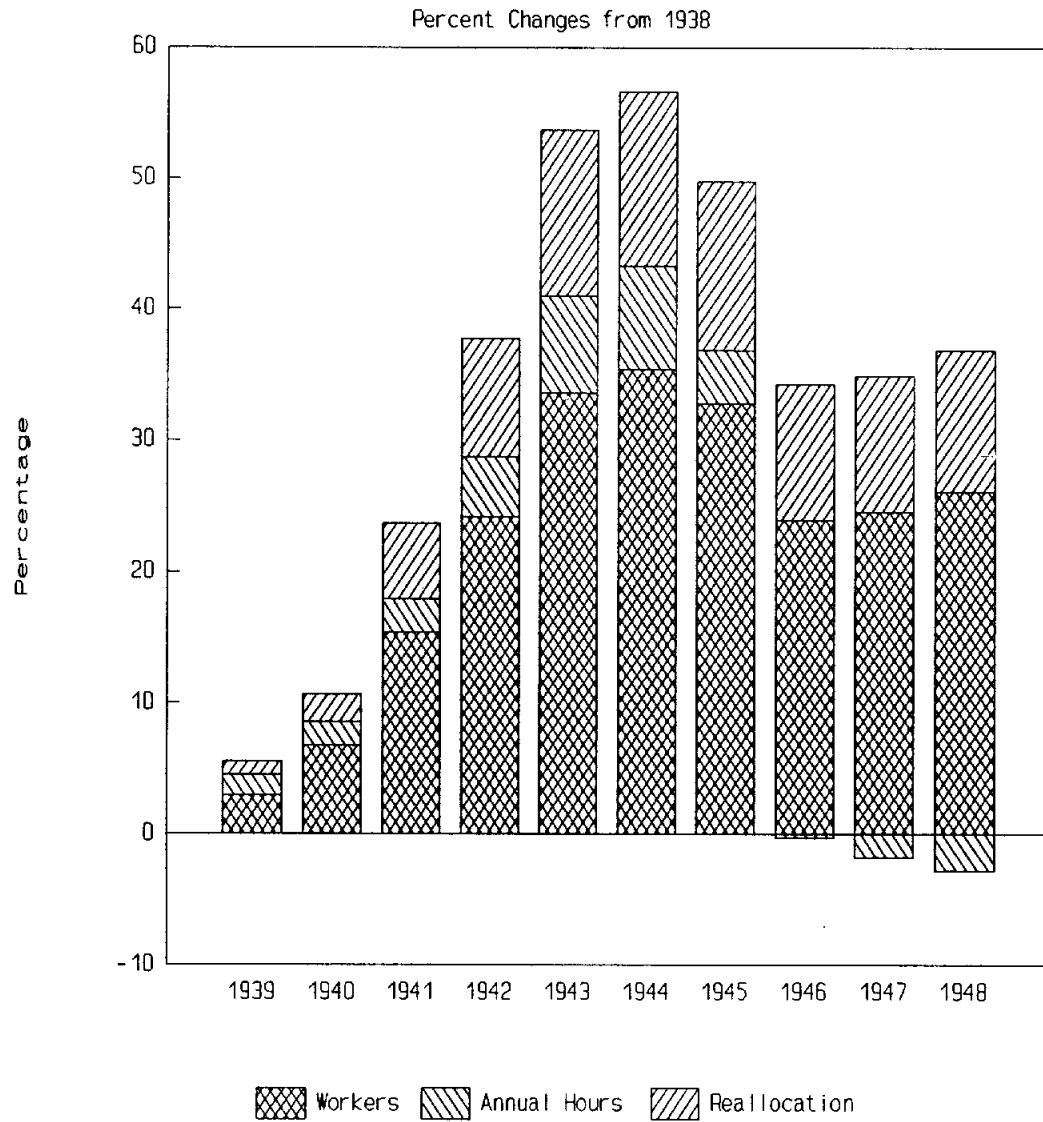


Figure 8

The Increase in the Labor Force

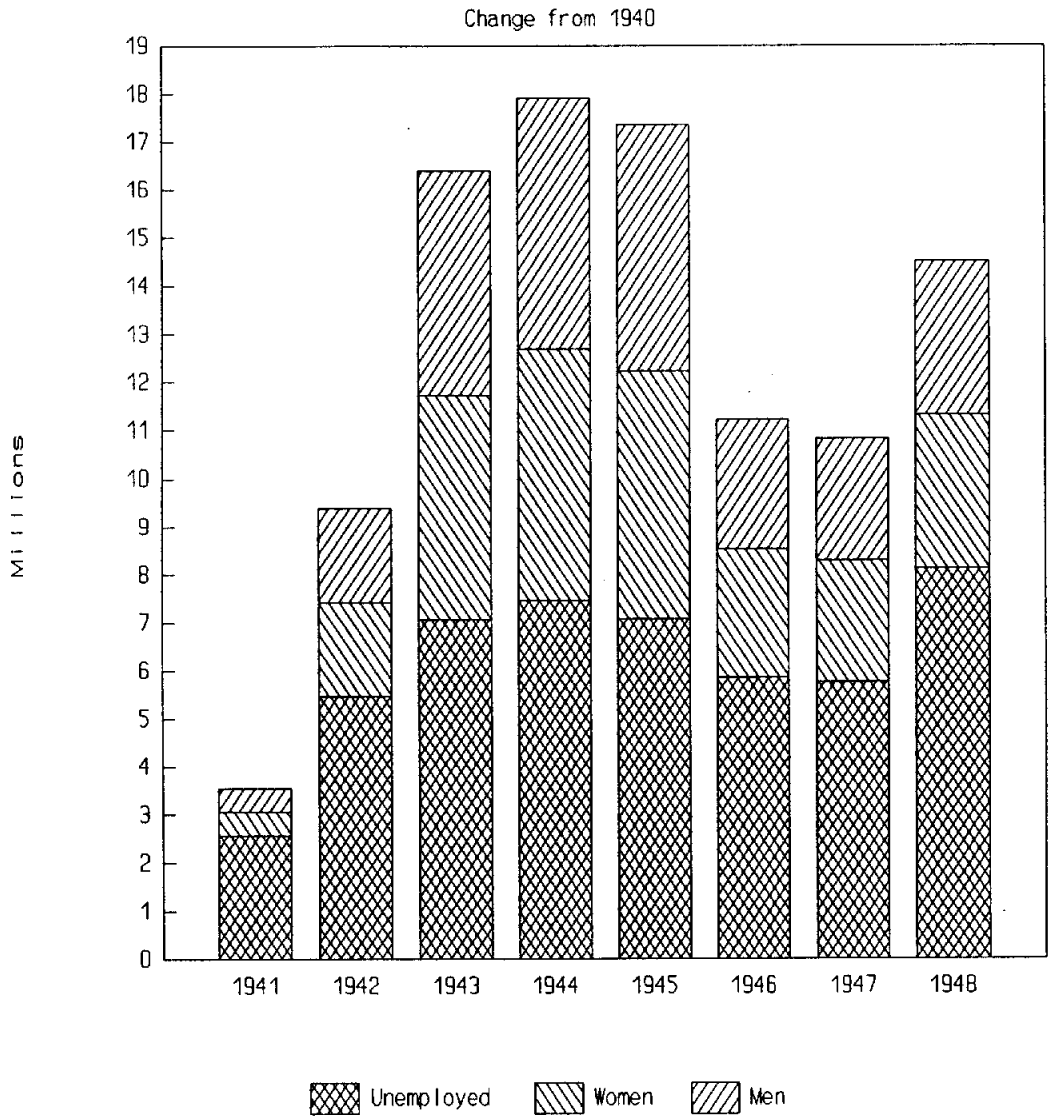


Figure 9

Sources of the Increase in Female Labor

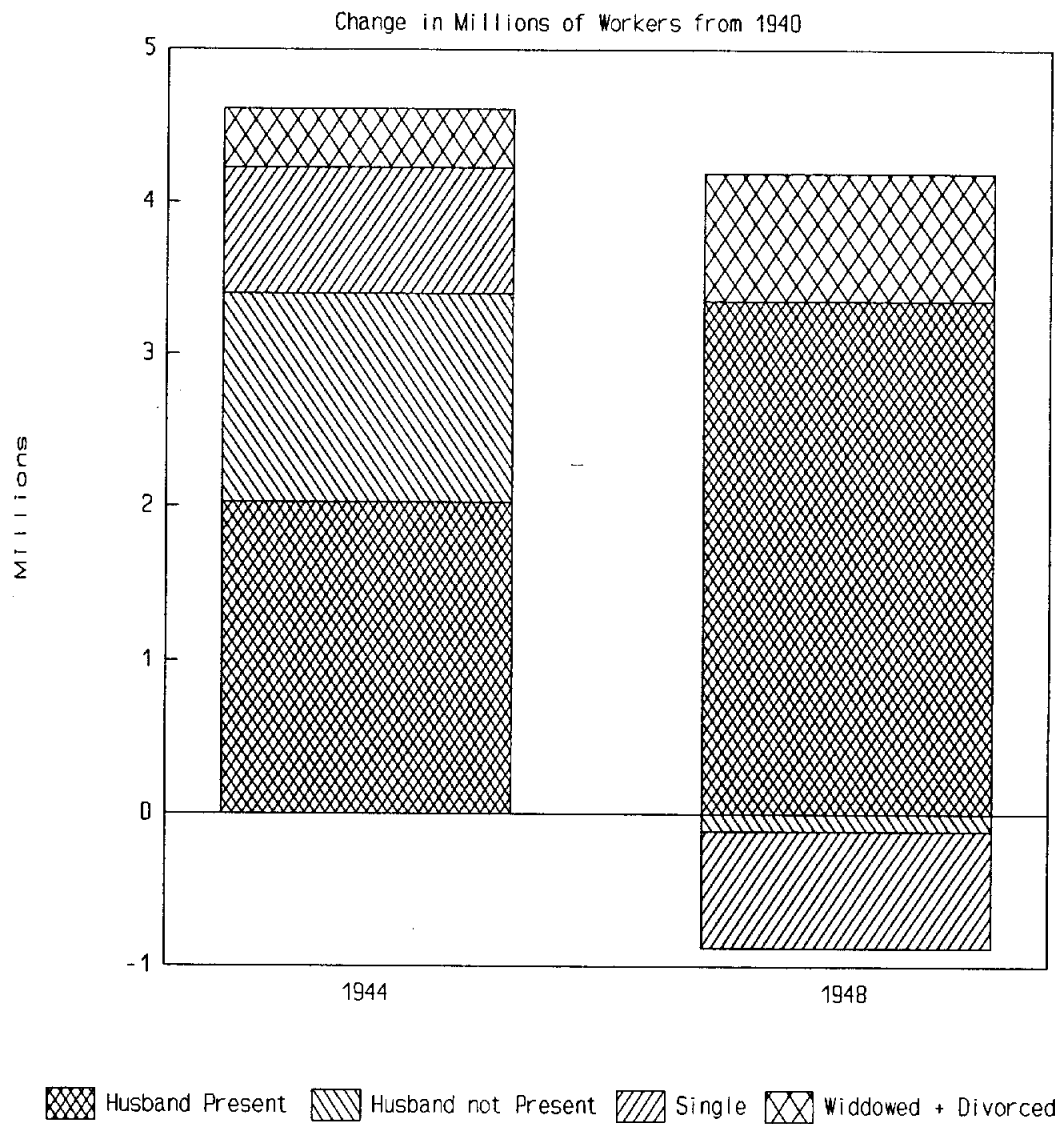


Figure 10

The Composition of the Labor Force

British Sectors-of-Origin, 1938-48

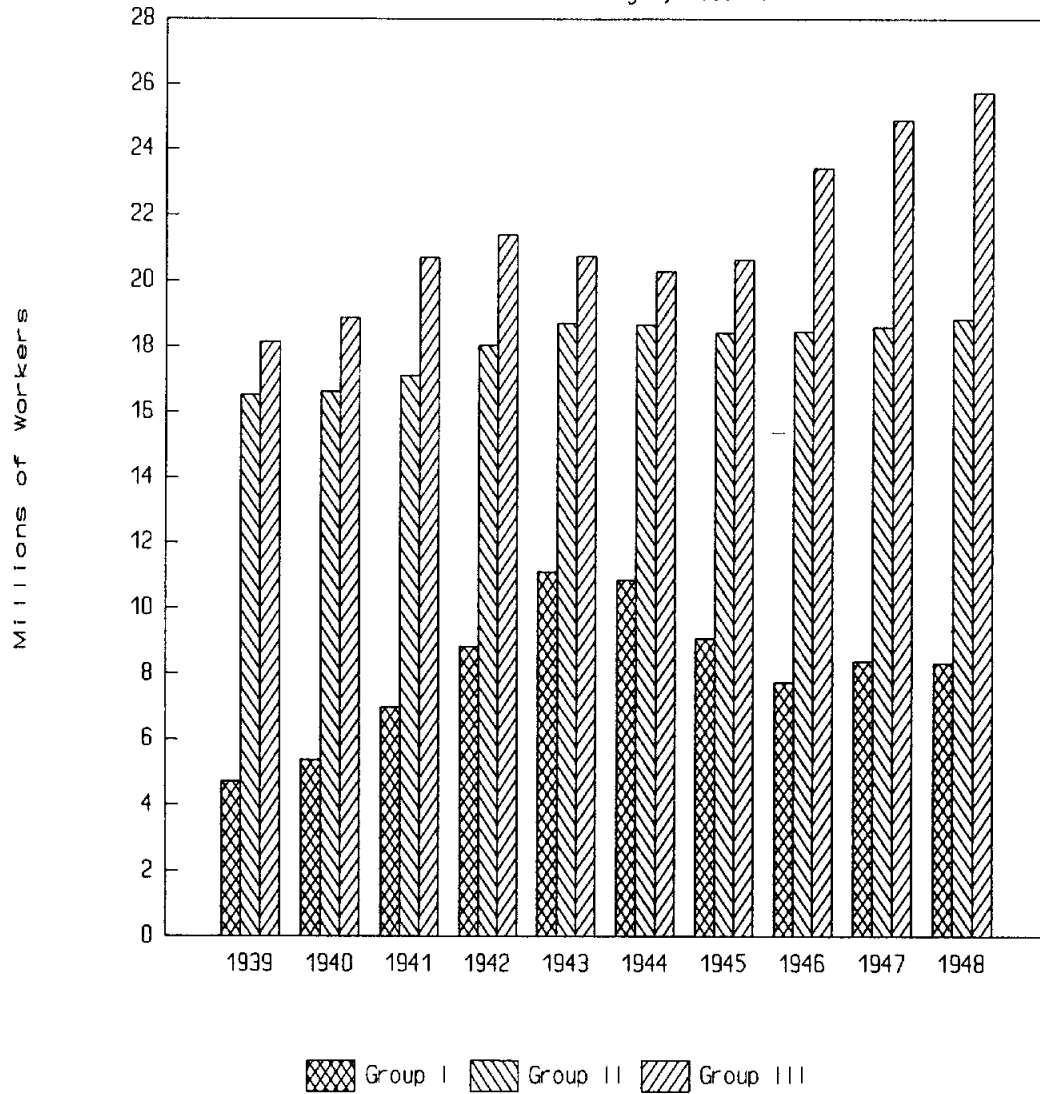


Figure 11

Sources of the Increase in Output

Percentage Increase from 1940

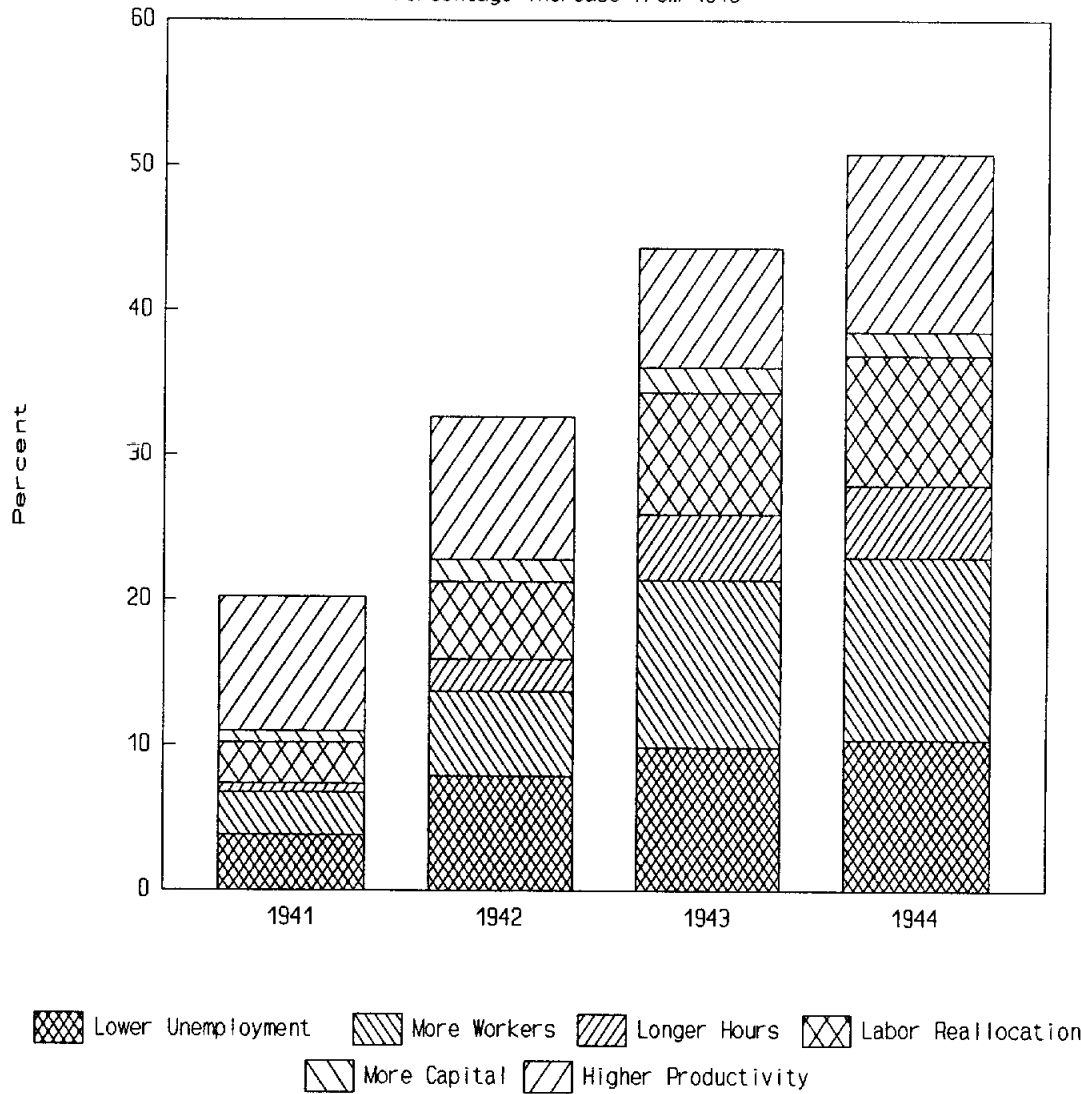


Figure 12

Financing the War Effort

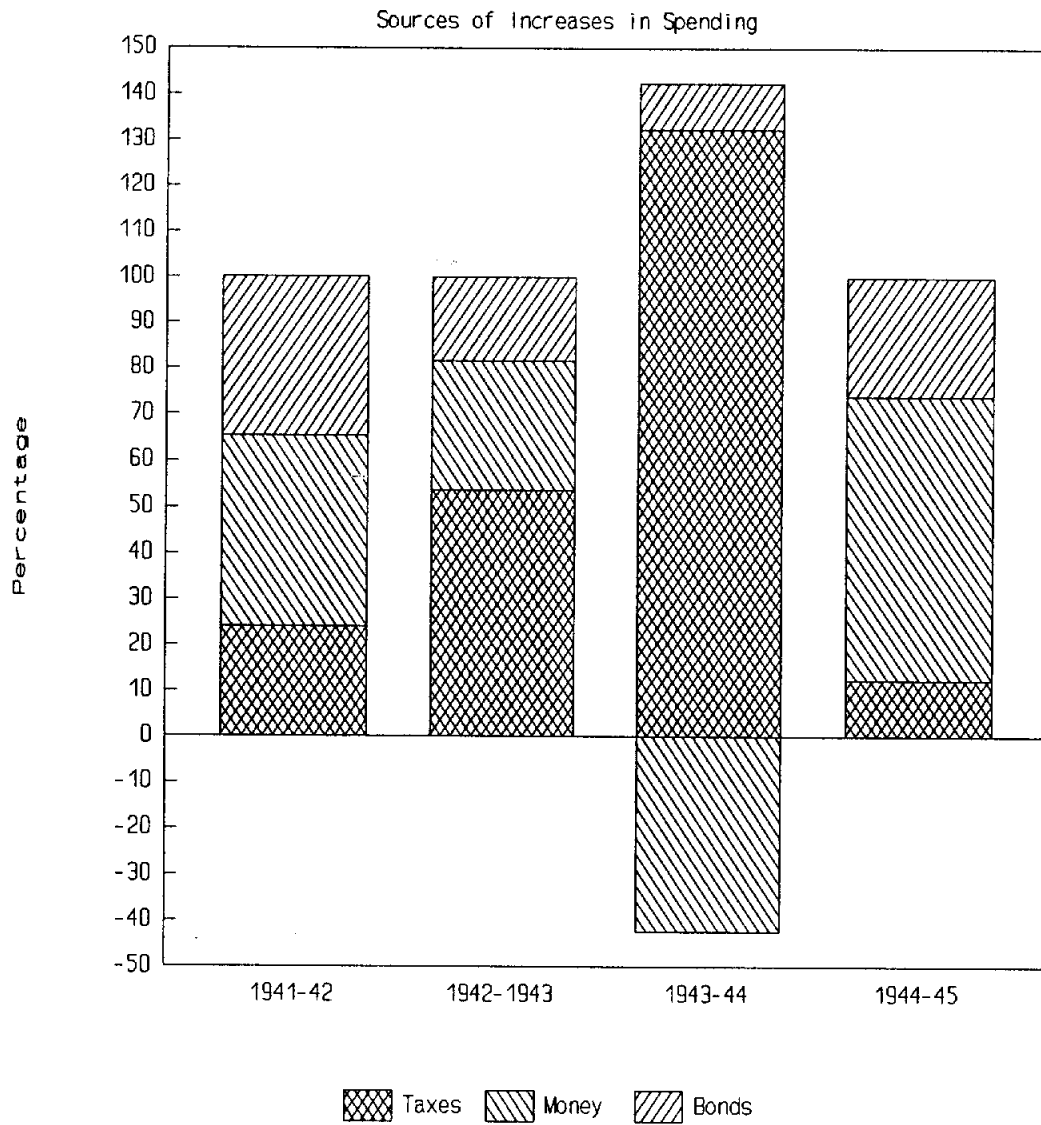


Figure 13

Reference Tables. (The letter at the top of each column indicates the quality of the data.)

Table 1. Gross National Product, 1938-48.						
	GNP (Billions Current Dollars)	Military Expenditures (Billions Current Dollars)	Ratio	Real GNP (Billions \$1958)	Military Expenditures (Billions \$1958)	Ratio
	(1)	(2)	(3)	(4)	(5)	(6)
	A	A	A	A	A	A
1938	\$84.7	\$1.0	1.2	\$192.9	\$2.5	1.3%
1939	90.5	1.2	1.3	209.4	2.9	1.4
1940	99.7	2.2	2.2	227.2	5.5	2.4
1941	124.5	13.8	11.1	263.7	29.6	11.2
1942	157.9	49.4	31.3	297.8	94.1	31.6
1943	191.6	79.7	41.6	337.1	145.2	43.1
1944	210.1	87.4	41.6	361.3	162.4	45.0
1945	211.9	73.5	34.7	355.2	138.4	39.0
1946	208.5	14.7	7.1	312.6	25.7	8.2
1947	231.3	9.1	3.9	309.9	13.9	4.5
1948	257.1	10.7	4.2	323.7	15.4	4.7

Sources: Column (1), U.S. Bureau of the Census (1975), series F1; (2), series F68; (4), series F3; and (5), series F67 (adjusted by the ratio of nominal military expenditures to nominal government purchases).

Table 2. Alternative Estimates of Real Net National Product, 1938-1948.
(Billions of \$1929)

	NNP Kuznets (No Adjustment for errors in the price indexes)	NNP Friedman and Schwartz	NNP Mills and Rockoff
	(1)	(2)	(3)
	A	A	A
1938	85.4	85.4	85.4
1939	92.3	92.3	92.3
1940	101.2	101.2	101.2
1941	113.3	113.3	113.3
1942	131.0	131.0	131.0
1943	141.0	141.0	143.1
1944	142.9	142.9	147.2
1945	138.1	138.1	144.4
1946	127.0	127.0	129.2
1947	131.1	131.1	131.1
1948	136.2	136.2	136.2

Sources: (1) and (2), Friedman and Schwartz, Monetary Trends, p. 108; (3) Mills and Rockoff, "Compliance," p. 203.

Table 3. Commerce Department Estimates of Personal Consumption Expenditures, 1939-1948. (Billions of current dollars)

	Personal Consumption (Billions, current dollars) (1970 estimate)	Personal Consumption (Billions, current dollars) (1987 estimate)	Real Per Capita Consumption (\$s, 1939 Prices) (1970 estimate)	Real Per Capita Consumption (\$s, 1939 Prices) (1987 estimate)	Real Per Resident Civilian Consumption (\$s, 1939 Prices) (1987 estimate)
	(1)	(2)	(3)	(4)	(5)
	B	B	B	B	B
1939	\$66.8	\$67.0	\$510	\$511	\$513
1940	70.8	71.0	531	530	532
1941	80.6	80.8	559	555	563
1942	88.5	88.6	539	546	562
1943	99.3	99.5	547	551	590
1944	108.3	108.2	558	561	613
1945	119.7	119.6	589	591	648
1946	143.4	143.9	649	646	660
1947	160.7	161.9	645	645	652
1948	173.6	174.9	648	648	655

Sources: (1) U.S. Bureau of the Census, Historical Statistics, series F48; (2) U.S. Council of Economic Advisors, Annual Report, p. 244; (3) column (1) deflated by total population (Historical Statistics, series A6) and prices (derived from the lower half of F48); (4) column (2) deflated by population and prices (Annual Report, p. 246); (5) similar to (4) but deflated by resident civilian population (Historical Statistics, series A8).

Table 4. Alternative Estimates of Personal Consumption Expenditures, 1939-1948

	Real Per Capita Consumption, 1939 dollars (Alternative Deflators)				
	Commerce Department	Friedman and Schwartz	Mills and Rockoff	Rockoff	Vatter
	(1)	(2)	(3)	(4)	(5)
	B	B	B	B	B
1939	\$511	\$511	\$511	\$511	\$511
1940	530	531	531	530	533
1941	555	555	555	555	560
1942	546	533	533	546	549
1943	551	521	529	538	548
1944	561	521	537	536	530
1945	591	546	571	550	522
1946	646	644	656	602	560
1947	645	658	658	645	na
1948	648	655	655	648	na

Sources and Methods: (1) is the same as Table 3, col. 4. The other columns were derived by replacing the Commerce Department's deflator for personal consumption expenditures with another as follows: (2) Friedman and Schwartz, *Monetary Trends*, Table 4.8, col. 4; (3) Mills and Rockoff, "Compliance," p. 203; (4) Rockoff, "Indirect," p. 417; (5) Vatter, "Material Status," p. 222.

Table 5. Civilian Food Consumption

	Calories (Per day)	Protein (Grams, per day)	Vitamin C (Mgs. per day)	Meat (Pounds, per year)	Edible Fat (Pounds, per year)
	(1)	(2)	(3)	(4)	(5)
	B	B	B	B	B
1938	3260	90	114	127.1	45.3
1939	3340	92	116	133.6	46.4
1940	3350	93	115	142.2	46.4
1941	3410	94	115	143.7	47.6
1942	3320	97	117	140.3	44.9
1943	3360	100	115	146.8	41.5
1944	3350	99	125	154.2	40.9
1945	3300	102	125	145.2	39.1
1946	3320	102	123	154.1	40.0
1947	3290	97	119	155.3	42.0
1948	3200	94	112	145.5	42.6

Sources: (1) Historical Statistics, series G851; (2) G856; (3) G855; (4) G881; (5) G886.

Table 6. Vital Statistics, 1938-1948

	Population, including armed forces overseas	Armed Forces overseas	Crude Death Rate	Crude Death Rate, excluding overseas armed forces	Crude Death Rate, Armed Forces Overseas	Crude Birth Rate
	(1)	(2)	(3)	(4)	(5)	(6)
	A	A	A	A	A	A
1938	129,824,939	na	na	10.6	na	19.2
1939	130,879,718	na	na	10.6	na	18.8
1940	131,820,000	150,725	na	10.8	na	19.4
1941	133,402,000	281,000	10.5	10.5	10.9	20.3
1942	134,860,000	940,000	10.5	10.3	27.6	22.2
1943	136,739,000	2,494,000	11.0	10.9	16.4	22.7
1944	138,397,000	5,512,000	11.4	10.6	29.2	21.2
1945	139,928,000	7,447,000	10.8	10.6	15.1	20.4
1946	141,389,000	1,335,000	9.9	10.0	5.6	24.1
1947	144,126,000	680,000	10.0	10.1	2.7	26.6
1948	146,631,000	538,000	9.9	9.9	2.4	24.9

Note: Rates in (3)-(6) are per 1000.

Sources: columns (1)-(5), Vital Statistics, 1950, pp. 145-46; column (6), Historical Statistics, series B5.

Table 7. Labor Force

	Employed Civilian Labor Force	Total Unemployed	Armed Forces	Male	Female
1000s, Annual Averages Monthly Data					
	(1)	(2)	(3)	(4)	(5)
	A	A	A	A	A
1938	44,142	10,390	340	NA	NA
1939	45,738	9,480	370	NA	NA
1940	47,520	8,120	540	41,940	14,160
1941	50,350	5,560	1,620	43,070	14,650
1942	53,750	2,660	3,970	44,200	16,120
1943	54,470	1,070	9,020	45,950	18,830
1944	53,960	670	11,410	46,930	19,390
1945	52,820	1,040	11,430	46,910	19,304
1946	55,250	2,270	3,450	43,690	16,840
1947	57,812	2,356	1,590	44,258	16,683

Sources: (1)-(5); U.S. Bureau of the Census (1975, D5, D8, D30, D36). Note the sum of columns (1)-(3) differs slightly from the sum of columns (4) and (5).

Table 8. Composition of the Labor Force, 1938-48.

	Group I	Group II	Group III
	(1)	(2)	(3)
	B	B	B
1938	NA	16,586	NA
1939	4,715	16,515	18,119
1940	5,363	16,619	18,849
1941	6,968	17,106	20,695
1942	8,823	18,023	21,368
1943	11,084	18,695	20,717
1944	10,856	18,633	20,263
1945	9,074	18,386	20,634
1946	7,742	18,445	23,415
1947	8,385	18,589	24,900
1948	8,326	18,813	25,732

Sources: (1), U.S. Bureau of the Census, Historical Statistics, series D131; (2), Statistics, the sum of series D128, D133, D139 and Kendrick, Productivity Trends, Table A-VI, col. 7; (3), Statistics, the sum of series D129, D132, D134, D137 and D138.

**Table 9. Total Factor Productivity, 1938-49.
(Index Numbers)**

	Output	Labor Input	Capital Input	Capital Adjusted for GOPO	Total Factor Input	Adjusted Total Factor Input
	(1)	(2)	(3)	(4)	(5)	(6)
	A	A	B	B	B	B
1938	100.0	100.0	100.0	100.0	100.0	100.0
1939	108.8	105.7	99.9	99.9	104.2	104.3
1940	116.4	111.2	101.4	101.4	108.7	109.0
1941	142.5	126.7	104.8	105.1	121.3	121.6
1942	161.3	145.7	107.6	108.7	136.2	136.9
1943	181.3	171.0	107.7	109.9	155.1	156.5
1944	193.6	176.2	106.5	109.2	158.8	160.4
1945	191.3	164.4	104.8	107.9	149.5	151.1
1946	172.6	140.4	107.0	110.1	132.0	133.2
1947	169.3	139.2	113.6	116.5	132.8	133.9
1948	172.9	140.5	120.5	123.6	135.5	135.4
1949	170.2	135.2	125.7	128.8	132.6	133.3

Sources: (1),(2),(3) and (5), Kendrick, Productivity Trends, Table A-XIX; (4) and (6), see text.

Table 10. The Balance of Payments of the United States, 1938-1948 (\$ millions)

	Exports	Imports	Balance of Goods and Services	Private Transfers	Government Transfers	Net Capital Flows	Transactions in Official Reserve	Errors and Omissions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	A	A	A	A	A	A	A	
1938	4336	3045	1291	-153	-29	441	-1799	249
1939	4432	3366	1066	-151	-27	1498	-3174	788
1940	5355	3636	1719	-178	-32	1457	-4243	1277
1941	6896	4486	2410	-179	-957	-1031	-719	476
1942	11769	5356	6413	-123	-6213	-92	23	-8
1943	19134	8096	11038	-249	-12658	1078	757	34
1944	21438	8986	12452	-357	-13785	377	1350	-37
1945	16273	10232	6041	-473	-6640	516	548	8
1946	14792	6985	7807	-673	-2249	-4417	-623	155
1947	19819	8202	11617	-682	-1943	-6538	-3315	861
1948	16861	10343	6518	-697	-3828	-1372	-1736	1115

Sources: (1), Historical Statistics, series U1; (2) U8; (3) U15; (4) U16; (5) U17; (6), the sum of U18 through U23; (7) U24; (8) U25.

Table 11. Monetary Statistics, 1938-1948. (Dollar Amounts in Billions)

	Highpowered Money	Deposit-Currency Ratio	Deposit-Reserve Ratio	M1	M2	M3	Monetary Gold
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	A	A	A	A	A	A	A
1938	14.6	4.21	7.12	29.7	44.8	55.5	13.007
1939	17.3	3.68	7.02	33.3	48.4	59.3	16.195
1940	21.8	3.14	7.22	39.7	55.3	66.2	20.049
1941	23.0	3.59	6.5	46.3	62.3	73.2	22.713
1942	25.2	4.09	5.23	54.1	69.8	80.7	22.759
1943	29.5	5.48	4.68	73.5	91.1	103.1	22.399
1944	35.6	5.72	3.98	83.9	105.1	119.0	21.194
1945	41.6	6.10	3.93	98.1	125.3	141.7	20.294
1946	44.3	6.40	4.22	107.5	140.1	158.7	20.341
1947	44.5	6.67	4.48	112.1	146.0	166.8	21.417
1948	45.2	6.28	4.65	112.0	147.8	169.3	23.74

Sources: (1)-(3), Friedman and Schwartz, A Monetary History, Table B-3, columns (1)-(3), June dates; (4)-(6), Friedman and Schwartz, Monetary Statistics, Table 1, columns, (8), (9), and (11), June dates; (7) Cagan, Determinants and Effects, Table F-7, column (1).

Definitions and Notes: (1) is the sum of bank reserves and currency held by the public. (2) is the ratio of bank deposits to bank reserves. (3) is the ratio of bank deposits to currency held by the public. (4) is currency held by the public plus demand deposits in commercial banks. (5) is (4) plus time deposits in commercial banks. (6) is (5) plus deposits in mutual savings banks and the postal savings system. (7) is all gold coin and monetary bullion within the United States (except earmarked gold). Columns (1)-(3) generate an estimate of M2 according to the formula $M2 = H(dr(1+dc)/(dr+dc))$ where H is highpowered money, dr is the deposit-reserve ratio, and dc is the deposit-currency ratio. This estimate differs slightly from column (5) which incorporates certain refinements developed between the publishing of the two volumes.

Table 12. Prices, 1938-48

	GNP Deflator (1958)	GNP Deflator (1987)	NNP Deflator Adjusted by Friedman and Schwartz (1929)	NNP Deflator Adjusted by Mills and Rockoff (1929)	NNP Deflator Unadjusted (1929)	Consumer Price Index (1982-84)	Wholesale prices, industrial commodities (1967)	Wholesale prices, all commodities (1967)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	B	B	B	B	B	B	B	B
1938	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1939	98.4	99.1	99.3	99.3	99.3	98.6	99.8	98.3
1940	100.0	100.9	100.4	100.4	100.4	99.3	101.4	100.0
1941	107.5	107.3	108.3	108.3	108.3	104.3	109.0	111.4
1942	120.7	112.8	122.5	122.5	122.5	115.6	116.8	125.7
1943	129.4	114.7	138.6	136.6	133.5	122.7	118.7	131.6
1944	132.6	115.6	148.9	144.5	137.5	124.8	120.5	132.3
1945	136.0	122.0	155.5	148.6	141.6	127.7	122.1	134.8
1946	151.9	153.2	156.8	154.1	151.6	138.3	133.6	153.8
1947	169.9	171.6	169.5	169.5	169.5	158.2	163.1	188.9
1948	181.3	183.5	180.6	180.6	180.6	170.9	177.2	204.4

Sources: (1) Historical Statistics, series F5; (3) Friedman and Schwartz, Monetary Trends, table 4.8, col. 3; (4) Mills and Rockoff, "Compliance," 203; (5) Friedman and Schwartz, Monetary Trends, table 4.2, col. 10; (7) Historical Statistics, series E24; (8) Historical Statistics, series E23.

Note: Original base period in parentheses.

Table 13. Actual and Counterfactual Consumption, 1941-1960
 (Billions of 1940 dollars)

	Consumption	Counterfactual Consumption	Weighted Counterfactual less actual Consumption
	B	C	C
1941	69.2	70.8	1.5
1942	69.2	85.0	14.3
1943	71.2	101.9	26.5
1944	73.8	110.4	30.1
1945	78.6	106.0	21.4
1946	85.7	101.9	12.1
1947	87.3	97.9	7.6
1948	89.4	98.8	6.3
1949	91.5	97.2	3.7
1950	96.2	103.1	4.2
1951	98.4	105.9	4.4
1952	101.6	107.9	3.5
1953	105.9	111.3	2.9
1954	108.6	113.3	2.4
1955	115.2	119.2	1.9
1956	118.7	122.1	1.6
1957	121.5	124.5	1.3
1958	123.4	126.0	1.1
1959	129.7	131.9	0.9
1960	133.2	135.1	0.7

Source: See Text.