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UNTIL IT'S OVER, OVER THERE: THE U.S. ECONOMY IN WORLD WAR I

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ABSTRACT

The process by which the US economy was mobilized during World War I was the subject of considerable criticism both at the time and since. Nevertheless, when viewed in the aggregate the degree of mobilization achieved during the short period of active US involvement was remarkable. The United States entered the war in 1917 having made only limited preparations. In 1918 the armed forces were expanded to include 2.9 million sailors, soldiers, and marines; 6 percent of the labor force in the 15 to 44 age bracket. Overall in 1918, one fifth or more of the nation's resources was devoted to the war effort. By the time the Armistice was signed in 1919 a profusion of new weapons was flowing from American factories. This essay describes how mobilization was achieved so quickly, including how it was financed, and some of the long-term consequences.

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Until it's Over, Over There: The U.S. Economy in World War I[1]

This paper reexamines the economic and financial history of the United States during World War I. The key fact is that a rapid and substantial transformation of the US economy was accomplished in the 20 months of active US involvement. By the time the Armistice was signed a flood of munitions, a foretaste of World War II's Arsenal of Democracy, was issuing from America's factories. This result, I argue, was mainly a response to financial incentives. More exotic forms of controls, such as the Priorities System developed by the War Industries Board, probably were put in place too late to have much effect. Nevertheless, the halo created by successful conversion of the economy and victory on the battlefield gave these brief experiments with non-market controls an enduring authority that shaped economic policy for years to come.

Here, for those who find it helpful, is the roadmap. Section 1 presents the chronology of American involvement, and contrasts the World War I expansion with previous expansions. **(**A list of key dates is contained in the chronology at the end of the paper.) Section 2 describes how resources were mobilized and allocated to the war sector. Section 3 on the financing of the war, is divided into three parts: monetary policy, fiscal policy (taxes), and debt policy. Section 4 discusses the War Industries Board and other government agencies that were charged with regulating prices and production. Section 5 discusses the production of munitions. Section 6, the concluding section, on the legacies of the war for the United States, is divided into three parts: the costs of the war in terms of resources, the impact of the war on the role of the United States in international capital markets, and the institutional and ideological legacies of the war.

1. The War Boom in Historical Perspective

The outbreak of the war in Europe in 1914 touched off a severe financial disturbance in the United States. The New York Stock Exchange was closed – because the market might be demoralized when European holders of U.S. securities dumped them – and a run on the banks began, manifested at this stage mainly by precautionary withdrawals of cash by Midwestern banks from their eastern correspondents. These events might have produced a full-fledged financial panic. But the issue of emergency currency under the Aldrich-Vreeland Act calmed things down, and there was no suspension of convertibility of deposits into gold as had occurred in earlier panics, such as the panic of 1907.[2] (Friedman and Schwartz 1963, 172)

When the war began the United States was in a recession. European purchases of goods for the war, mainly food and munitions, soon turned things around and created a long economic boom. This story was to be repeated after the outbreak of the Second World War, although the U.S. economy was considerably further from full employment in 1939 than it was in 1914. The National Bureau of Economic Research records an economic expansion beginning in December 1914 and ending in August 1918, a period of 44 months. The Civil War expansion, perhaps the most obvious comparison for contemporaries once the U.S. entered the war, was almost the same length, 46 months, from June 1861 to April 1865. Any comparison of the magnitude of the expansion, however, would be speculative. The South obviously was decimated, and considerable controversy exists over the impact of the war on the Northern economy. All of the Civil War expansion, moreover, took place during the period of active warfare.[3] Nearly two thirds of the World War I expansion took place during the period of U.S. neutrality. It might make sense, therefore to look to a peacetime expansion for a basis of comparison. As we look backward in time, the first peacetime expansion to match or exceed the length of the World War I expansion was the gold-rush expansion from 1848 to 1853.[4]

Table 1 provides a comparison among the three expansions. Although estimates vary, it is possible, moreover, as shown in the second line of table 1, that the magnitudes of the expansions were also similar. The similarity between the booms was more than accidental. Both the gold-rush expansion and the expansion during the period of U.S. neutrality in World War I were propelled by a rapid gold-backed expansion of the stock of money. In one case the gold was being panned from the streams and dug from the mountains of California; in the other the gold was coming from Europeans to pay for food and arms. But in both cases the result was inflation, real income growth, and a long boom.[5]

Once the United States entered World War I, the basis of monetary expansion shifted from gold to fiat money, as the newly created Federal Reserve monetized a significant portion of the debt being issued. In this respect the inflationary pressures were similar to those generated during the Civil War by the issue of greenbacks. Perhaps the best way to regard the World War I expansion then, is as a combination of the two previous long expansions: as a gold backed peacetime expansion from 1914 to 1917 similar to the gold backed peacetime expansion of the early 1850s, and as a "paper" backed wartime expansion from 1917 to 1918 similar to the paper backed expansion of the Civil War. Although contemporaries might have been tempted to believe that the expansion of the economy was unprecedented, and therefore attributable to unprecedented techniques of mobilization, there was in fact a strong resemblance to earlier expansions.

The long period of U.S. neutrality made the ultimate conversion of the economy to a wartime basis easier than it otherwise would have been. Real plant and equipment were added, and because they were added in response to demands from countries already at war, they were added in precisely those sectors where they would be needed once the U.S. entered the war. Bethlehem Steel, for example, was expanded by adding facilities and through acquisitions into a major integrated steel maker during the period of neutrality in response to demands for steel coming mainly from Europe.

America's own efforts to arm, "preparedness" as it was known at the time, also contributed to the expansion of the war sector, but only to a small extent until the final months before U.S. entry into the war. Large sectors of the public were opposed to any involvement in the war. The antiwar sentiments of Wilson's still charismatic Secretary of State William Jennings Bryan were widely shared within the Democratic Party, especially in the Middle West. When the war in Europe began in August 1914, Federal spending was running at about $65 million per month (about 2.28% of GDP on an annual basis), by January 1917, three months before U.S. entry, spending was running at $85 million per month, but at a higher price level (about 2.22% of GDP on an annual basis). (Firestone 1960, table A-3, 111-13).

Why America eventually entered the war is a complex question, and a thorough discussion is far beyond the scope of this paper. America's cultural and emotional ties to the Allies and the opposition stirred by Germany's use of submarine warfare, the factors usually cited, were undoubtedly important. Economic factors, of course, were not absent from American motives. Our opposition to submarine warfare was based partly on our insistence on our rights as neutrals to carry on a profitable trade with the Allies. And some cynical and conspiracy minded historians have seen the growing indebtedness of the Allies to the U.S. as another reason why an Allied victory became important to the United States. In any case, America's entry into the war in April 1917 unleashed a torrent of Federal spending. Spending rose

from month to month, reaching a peak of $2,087 million in January of 1919, about 32.43 percent of GDP on an annual basis. (Firestone 1960, table A-3, 111-13).

2. The Reallocation of Resources

The surge in Federal spending produced a rapid and massive shift in production from civilian to military goods. Of the available data, the data on persons engaged by sector provides the most direct way to form a picture of the extent to which resources had to be reallocated to meet the demand for munitions. In addition to being of interest in their own right, the data on persons engaged are less synthetic and more reliable than the data on hours worked or on capital employed. As it turns out, moreover, the broad-brush picture formed by looking at data on persons engaged does not change very much when one turns to the data on the allocation and utilization of capital. Table 2 shows estimates of persons engaged and annual hours per person engaged from 1914 to 1920.

The rapid expansion of the military and the civilian government are immediately evident. Between 1914 and 1918 the United States added nearly 3 million people to the military and more than half a million to the civilian government. As might be expected, the workforce in the nonfarm sector, primarily manufacturing, was also expanded by nearly 3 and 1/3 million workers, an increase of more than 12 percent. Agriculture, on the other hand, lost a relatively small number of workers, about 1.4 percent of the initial agricultural labor force. The timing of expansion was different, however, in the public and private sectors. In the public sector most of the increase in the workforce occurred between 1916 and 1918, the period of active U.S. involvement. In the nonfarm private sector, on the other hand, most of the increase occurred between 1914 and 1916, the period of U.S. neutrality, when 2.5 million workers were added. The increase during 1916-1918, the period of active U.S. involvement, was considerably smaller: another 790 thousand workers, less than 3 percent of the 1916 labor force. The importance of the period of neutrality in preparing the economy for war is clearly evident in these figures. Once the U.S. entered the war it could concentrate on building up its armed forces, the task of building up its industrial base having been substantially completed.

Overall these were very substantial increases, especially given the disruption in the flow of immigrants to the United States.[6] As might be expected, the increase in the labor force was matched by a decline in unemployment. Unemployment, according to official figures, declined from 3,120,000 in 1914 (7.9 percent of the labor force) to 2,043,000 (5.1 percent of the labor force) in 1916, and to 536,000 (1.4 percent of the labor force) in 1918. (U.S. Bureau of the Census 1975, 135.) To be sure, the draft removed many of the young men who would be looking for their first job

from the civilian labor force, so the extremely low rate of unemployment in 1918 is not comparable to the peacetime rate. Nevertheless, the figures do show that the U.S. had a large pool of unemployed workers on hand who could be drawn into the labor force, offsetting the slowdown in immigration.

Workers were drawn into the labor force by the availability of jobs in manufacturing. Perhaps there was also an expectation that wages in these jobs would rise higher. But during the first phase of the mobilization during the period of U.S. neutrality, a rise of wages in manufacturing of 7.61 percent was more than offset by the increase in the cost of living of 8.34 percent, so that real wages actually fell about .7 percent. It wasn't until the second phase of the mobilization that real wages rose. Nominal wages in manufacturing rose 38.8 percent between 1916 and 1918, outstripping increases of 32.2 percent in the cost of living. (U.S. Bureau of the Census 1975, D727, p.164 and D740, p.166). This pattern is somewhat different from the Civil War when real wages fell significantly during the period of actual conflict. The greater degree of disruption to the economy (for example, the cutoff in the supply of southern cotton), the depreciation of the dollar, and perhaps differences in labor organization may explain the more favorable experience of labor during World War I.

Data is also available on hours worked, and thus on hours worked per person. Some key figures are shown in Panel B. of Table 2. Questions naturally arise about the reliability of this data. Is it really true, for example, that military personnel were working fewer hours in 1918 when many Americans were engaged in battle, than in the peacetime army of 1914? The decline in hours worked in the nonfarm sector, however, was to some extent real, and reflected the long-term downward trend in hours worked, and the vigorous push made by the labor unions, with some help from the Federal government, for the eight-hour day. The increase in hours that one might have expected in this sector in a war economy was concentrated among management and technical personnel. Factories had to be converted from civilian to military production, and that meant long hours for draftsman, engineers, personnel managers, and so on. Provided there were sufficient workers to cover all the shifts at the factory, however, it wasn't crucial that hours of low-skilled workers be extended.

3. Financing the War

Table 3 shows the sources of finance for the war broken into 4 components: taxation, borrowing from the public, direct money creation, and indirect money creation. Taxation and borrowing are familiar terms. I'll discuss some of the details concerning them below. Direct money creation, as Friedman and Schwartz define it, is the amount of

deposits and currency created by the Federal Reserve System. This money was used either by the public as currency or by the banks as reserves, and it was matched on the books of the Federal Reserve by holdings of U.S. government bonds. Although the institutional details differed the effect was much as if the government had simply printed money and used it to pay soldiers, much as it had done with the "greenbacks" in the early phase of the Civil War. Indirect money creation is the additional deposits produced by the commercial banking sector, and not backed one for one by reserves. The exact amount of the additional money funneled by the banking sector into the war effort is not known for certain. But it is reasonable to argue, as Friedman and Schwartz do (1963, 221), that "Since the increase in bank-created money was matched primarily by an increase in government securities held by the banks or their customers, the rise in bank-created money may be regarded as indirectly associated with the financing of war expenditures." Thus it appears that the bulk of the war effort (58 percent) was financed by borrowing from the public; the remainder about evenly split between taxes (22 percent) and money creation (20 percent).[7]

These methods exhaust the means by which the government *financed* the war. But they do not exhaust the means by which the government acquired resources. Perhaps the most important additional means of acquiring resources was through the draft. Millions of young men were drafted into the armed forces. Their salaries as soldiers were in many cases far below what they could have earned in the private sector, and to an even greater degree below what they would have needed to earn in the military to serve voluntarily. The difference may be regarded as a tax. But it is not the conventional sort of tax that is shown in Table 3.[8]

3.1 Monetary Policy

Monetary creation of this magnitude produced inflation in this war as it had in earlier wars and as it would in future wars. Table 4 shows the key variables. The lower panel is the same as the upper panel except that all of the variables are index numbers with the value in 1914 set at 100, because this makes comparing rates of change in different series easier. A quantity theorist would not be surprised by the data. High-powered money (also commonly known as the monetary base) about doubled over the course of the war years. The money supply in the hands of the public, whether measured narrowly as M2 or broadly as M4 also about doubled during the war, indicating that the money multiplier, a function of the deposit-reserve ratio of the banks and the deposit-currency ratio of the public, was relatively stable. Since real output, column [4], rose about 25 percent, money per unit of output, column [5], only

rose by a factor of 1.7. If velocity had been stable, prices would have risen by the same ratio. In fact, however, prices rose by more -- they also about doubled, whether measured by the GNP deflator, column [6] or the cost of living index, column [7]. So velocity, the mysterious equalizer in the quantity equation, by definition also rose during the war. One reason may be that inflation itself discouraged the public from holding cash and so added to the pressure on prices.

The general outline of this story – the government prints money to finance a war producing inflation – is common, of course, to other American wars and to the other countries fighting World War I. But Friedman (1952) and Friedman and Schwartz (1963, 567-71) argue that the inflation during World War I was unusually intense compared with the Civil War and World War II. Overall, the price rise in World War I was about the same as in the Civil War and more than the rise in World War II. If we ordered the wars, for example, by casualties, the Civil War would be first, World War II would be next, and World War I would be last. There seems to be too much inflation in World War I. Friedman and Schwartz attribute the difference between World War I and World War II partly to the lower level of velocity during World War II, which made it easier for the government to acquire real resources by creating money, and partly to the decline in velocity in World War II, perhaps the result of the cutoff in the supply of consumer durables which encouraged saving.

A minor monetary mystery concerns the rapid increase in the amount of currency in circulation. All types of monetary assets, of course, rose rapidly during the war, but the amount of currency rose faster. In March 1917, the month before U.S. entry into the war, the deposit-currency ratio was 8.34; in May 1919, the month of the postwar price peak, the ratio was 6.57. These numbers imply about $834 million of "extra currency" in circulation in May 1919.[9] The fall in the deposit-currency ratio was significant for the financing of the war because it meant that the government could raise more resources from seignorage for each dollar of new money created.

A number of explanations have been offered, all of which may tell us something about what was happening. Contemporaries pointed to the use of U.S. currency abroad such as currency used in Cuba, Canada, and Europe. Contemporaries also suggested that the founding of the Federal Reserve had led to a greater use of currency because the presence of the Federal Reserve added to the safety and convenience of the currency. Since the Federal Reserve was a relatively new institution when the war began (the end of 1913) this effect may still have been in process during the war. Philip Cagan (1958), however, noted that currency in circulation also rose in World War II a

development that he attributed to the rise in income tax evasion and the greater use of currency by military personnel and by civilian workers moving into areas where they did not have established banking relationships.

Another factor that may have been at work was a change in the structure of payments. At a time when many factory workers were still receiving their pay in a weekly pay envelope, a rapid increase in industrial payrolls as a result of the shift of resources into the industrial sector and the increase in wages, might have produced an increase in the use of cash. Figure 1 shows indexes of cash held by the public and manufacturing payrolls. There does appear to be an association, although the index of manufacturing payrolls is more volatile. In particular, it falls dramatically during the postwar slump, while currency in the hands of the public falls more slowly.

3.2 Fiscal Policy

Over time the opinion of economists about the best way to finance wars, whether to emphasize taxes or borrowing (few could be found to support money creation), has changed dramatically. Adam Smith argued that taxes were best because they conveyed the real cost of wars to the general public. Deficit finance hid the costs of wars and made them too easy. Later Smith's argument was combined with the argument that the burden of financing wars shouldn't be passed on to future generations to become part of a balanced budget orthodoxy. John Maynard Keynes changed that. Deficits would be acceptable until the point of full employment was reached. More recently, neoclassical economists, most prominently Robert J. Barro (1987, 1989), have argued that deficit financing should be used to prevent tax rates from jumping up during wartime and creating counterproductive disincentives. This approach, the "tax smoothing" approach, may well be dominant at the present time.

Although men of affairs at the time of World War I did not hold clear theoretical positions, there was a widespread consensus among politicians and business leaders that a substantial fraction of the war should be financed by taxation. To William Gibbs McAdoo, Wilson's energetic Secretary of the Treasury, this initially meant 50 percent, although he later thought 33 percent would do. J.P. Morgan, the famous and influential investment banker, suggested a lower figure, 20 percent. There was no precise theory behind these figures, but rather an intuition that too much borrowing or too high a level of taxes would be bad for the economy. McAdoo main concern was that excessive issues of debt would be inflationary. This concern was probably not tied closely to the idea that debt would have to be monetized to be inflationary. There is no mention of monetary policy in connection with debt

in his *Memoirs* (1931). Rather, McAdoo seems to have believed that government debt was directly inflationary. Added to the fear of inflation from excessive issues of debt was the belief that government at all times should be financed by heavily progressive income and wealth taxes. McAdoo also believed, however, that too high a level of taxation would discourage business, and perhaps undermine support for the war, hence the balance he sought between taxes and borrowing.

The War Revenue Act of 1917 provided a number of sources of revenue. The most potent moneymaker was an excess profits tax that levied a graduated tax, running from 20 to 60 percent, on profits that exceeded an amount determined by the rate of return on capital in a base period. Corporate and personal income taxes, moreover, were raised by adding "surtaxes." The effect on personal income taxes of the War Revenue Act, and subsequent legislation, can be seen in Table 5. For incomes starting at $50,000 the rate in 1913-1915 was a relatively small amount, 1.5 percent; by 1918 it had climbed to 18.3 percent. Excise taxes were increased (or in a few cases imposed for the first time) on alcoholic beverages, tobacco, railroad passenger traffic, and luxuries and semi-luxuries including yachts, jewelry, and chewing gum. The War Revenue Act of 1918 (signed on February 24, 1919 – tax law is always a fight) followed the general outline of the Act of 1917 but tinkered with the rates. Wilson and his progressive advisors intended that the rich would bear the main burden of paying for the war (along with the undeserving poor who used alcohol, tobacco, and chewing gum!). There was considerable support for this idea even in the business community because of memories of war profiteering during the Civil War and the Spanish American War. Few businessmen wanted to see war profiteering happen, and even fewer wanted to risk being accused of it.[10] But as we will see, much of this effort to make the rich pay was undermined by the way in which the debt was structured.

3.3 Debt Policy: Capitalizing Patriotism

When the war began McAdoo turned to the record of Samuel Chase, Lincoln's Secretary of the Treasury, for lessons on how to finance a war. McAdoo believed that Chase had made a major error in turning the marketing of the government's securities over to a private firm, Jay Cooke and Company. McAdoo would make no such mistake. He expected bankers, insurance executives, and ordinary citizens to donate their services to the government. While he acknowledged that Jay Cooke and Company had succeeded to some degree in marketing the bonds to middle class Americans, McAdoo thought that he could push Cooke's policy much further. McAdoo crisscrossed the country on

an exhausting speaking tour urging the public to express its support for the war by buying war bonds, enlisted leading artists such as Howard Chandler Christy and Charles Dana Gibson to paint posters urging the purchase of bonds, and arranged Allies at which movie stars such as Douglas Fairbanks and Mary Pickford exhorted the crowd to buy bonds. (Kennedy 1980, 105). The Boy Scouts were enlisted under the slogan "Every Scout to Save a Soldier." Even the names of the bonds reflected the emphasis on patriotism. While one of the most popular Civil War issues was known prosaically as the 5-20 (callable after 5 years, redeemed at 20), the World War I debt consisted of "Liberty bonds," and a final issue after the armistice of "Victory bonds." This campaign, despite detractors such as Senator and future President Warren G. Harding, who worried about the hysterical nature of the campaign, undoubtedly created enormous social pressures to buy bonds. When, for example, the Comptroller of the Currency learned that a national bank charter had been granted to six applicants from a "certain western state" who had between them bought only $200 worth of Liberty bonds, the charter was revoked. (Whittlesey 1950, 175).

But how effective were the campaigns? What price, to put it differently, were investors willing to pay to help make the world safe for democracy? It is difficult to compare the Liberty bonds with other private and public issues: the volume was huge, and the Liberty bonds had numerous special features designed to enhance their appeal. Some issues were exempt from Federal Income Taxes, some could be used at par to pay Federal Inheritance taxes, although income from them was not exempt. And perhaps most important, they enjoyed a privileged position as collateral for bank loans. The key properties of the Liberty Loans are shown in Table 6.

Despite their complex structure, much could be learned from figure 2, which shows the successive coupons on the Liberty bonds, the rates on triple A rated industrial bonds, and the rates on municipal bonds.[11] It is evident at once that the Liberty bonds were priced to sell purely as financial investments. The coupon on the Liberty bonds (which was also the yield to maturity since the bonds were sold at par) came within a few basis points of the yield on municipal bonds when bonds were initially offered. No individual who bought a Liberty bond actually made a personal sacrifice in the sense that they earned a much lower rate of interest than could have been earned on a comparable bond of similar risk.

The First Liberty bonds fell below par, although only a bit, shortly after they were issued. The fall may have been due in part to the inherent limits of social pressure. When bonds are sold people can display their patriotism by announcing their purchase and by pointedly asking others how many Liberty bonds they have bought. After the initial offering, it is hard to prevent people from selling bonds and readjusting their portfolio. And few people are likely to go

around asking their neighbors how many bonds they have sold. Mainly, however, the fall in the price of Liberty bonds was due to the rise in interest rates.

Figure 3 plots market yields for two federal issues, the First and Fourth Liberty Loans, and the return on municipal bonds during the period 1918 to 1925.[12] The First Liberty Loan yielded less than the municipals, as might be expected from their greater security, but the yield of the fourth liberty loan was similar to the yield on municipals.[13] The difference between the Fourth Liberty Loan and the First was due to the limits on the tax exemption on the fourth issue compared with the first. On the Fourth Liberty loan only the first $1,275 in interest (the interest on $30,000 worth of bonds) was exempt, and then only until two years after the war was over.[14] The difference that tax exemption for the life of the bond (the exemption in the First loan) could make can be seen from the rates shown in Table 5.

Since the bonds were sold at a maximum of par, and had coupons set to yield a competitive return, it is doubtful that the huge bond rallies and other efforts to "capitalize patriotism," in McAdoo's stirring phrase, sharply reduced the future tax burden on middle income taxpayers of wartime borrowing. McAdoo claimed that he had saved taxpayers millions by holding the maximum coupon to 4.25 percent (McAdoo 1931, 381). But as we have seen, with a coupon of 4.25 percent and important tax exemptions the loans were competitive with other low-risk securities. The only holders who benefited substantially from owning the liberty bonds were taxpayers in very high tax brackets, a fact that McAdoo, a dyed-in-the-wool Progressive, neglected to mention in his *Memoirs* (1931).

The most telling evidence, in my view, on how much patriotism affected the holding of government assets is the contrast, or rather lack of contrast, between the war and postwar periods in figure 3. If people were holding bonds for patriotic reasons then the gap between the return on municipals and on Liberty bonds would be larger than otherwise. Once the war ended, and the patriotic motive for holding Liberty bonds disappeared, the gap should narrow. But we simply don't see this in figure 3. True, interest rates do rise during the war and fall afterwards. But the gap between the return on the municipals and either of the Liberty bonds, which would reflect the non-pecuniary returns from investing in a patriotic asset, remains more or less the same. The Armistice seems to have no effect on the difference between the return on municipals and the return on liberty bonds. The simplest explanation is that patriotic motives were not sufficient to alter market prices of assets during the war.

If lowering the cost of the war to middle income taxpayers was not the point, what was? Two possibilities seem most likely. (1) By encouraging savings, the bond campaigns may have reduced the tendency of people to dump private securities to buy war bonds. Capital losses on individual private security holdings, even if not widespread, would have

created problems for individual investors and for institutional holders such as banks, trust companies, and insurance companies. (2) It may be that the main goal was simply to produce the result that actually occurred: to produce over-subscriptions for the bond issues. Each of the bond issues, as shown in table 6 was sold at par and "over-subscribed." In other words, offers to buy exceeded the amount the government put on sale. Over-subscription demonstrated public enthusiasm for the war and Wilson administration's policies, and this was clearly on McAdoo's mind. As he noted in his *Memoirs* when recalling his thinking prior to the issue of the first Liberty Loan:

> Suppose hundreds of millions of the bonds were left on our hands? The moral effect of such a failure would be equal to a crushing military disaster. It would not only dishearten our own people, but also the nations across the sea whose fortunes were joined to ours; and it would give our enemies new confidence and courage. (McAdoo 1931, 380).

Although McAdoo professed to fear a shortfall of hundreds of millions, it is obvious that any shortfall would have produced a public relations problem. The size of the offering, to put it somewhat differently, introduced a discontinuity in the politics of the issues. Suppose 1000 bonds are offered for sale. From an economic point of view it matters little whether the government receives offers for 999 or 1001. But from a political point of view, the first case is a disaster, while the second is a success – the public supports the war effort. Indeed, from a political viewpoint, the rallies themselves may be the point, to show America's enemies that America supports the war. When viewed from this perspective, the management of Liberty bond issues – the coupons, the tax exemptions, and so on -- makes perfect sense.

There was also an attempt (modeled on a similar British plan) to sell war bonds in small denominations to the young and poor. These "War Savings Certificates," were first issued in January 1918. They sold for $4.12 (about $60 in today's money using the CPI) and were worth $5.00 at maturity in January 1923. The price increased one cent per month until sales were stopped in December 1918. The interest works out to about 4.5 percent. For those who did not have $4.12 on hand, savings stamps costing $.25 each could be purchased. Each stamp was pasted on a special board, and when the buyer had enough they could be exchanged for a war savings certificate. The "War Savings Certificate" under various names became a permanent feature of the financial landscape. It was continued after the war, used in World War II, and continued in various guises since then. After the attack on the twin towers in New York, the idea of a new issue of war bonds, presumably in low denominations, was revived for a short time, and generated some interest in Congress.

The purpose of the war savings certificates in World War I, as in subsequent reincarnations, was to provide a vehicle for people of limited means, especially young people, to express their patriotism and at the same time to teach them the value of thrift. In American high schools young women were encouraged to knit for the war effort, and young men to buy savings stamps. The program contributed a modest amount to the actual financing of the war. At the end of

August 1919, the total amount of debt issued to finance the war amounted to $26.4 billion. Of this amount $0.93 billion consisted of war savings certificates, about 3.5 percent of the total. (Schultz and Caine 1937, 540). It could be argued, however, that the War Savings Certificates represented additional real savings, as opposed to other issues that were partly monetized, and these were real savings that might not otherwise have been available.

4. The Role of the Government in Managing the War Economy

For economic historians perhaps the most interesting aspects of the war economy were the attempts to control the economy through centralized price and production controls. There was a wide array of government agencies charged with influencing or controlling economic activities. The three most important were (1) the War Industries Board and its autonomous Price Fixing Committee, which dealt with industrial production and prices, (2) The Food Administration, which dealt with agricultural prices and production, and (3) the Fuel Administration, which dealt with fuel prices and production. The work of these agencies can be evaluated either at the microeconomic level or the macroeconomic level. In other words, we can ask how individual policies of these agencies affected individual markets given overall economic conditions, or we can ask a larger question about the overall impact of regulation on general movements of economic activity, industrial production, and munitions production.

When viewed in terms of macroeconomic impact, it is clear that the overall impact of the programs on the fundamental economic problem of reallocating resources to the war effort, whether positive or negative, was rather small. Many of the regulatory agencies were not put in place until after the U.S. entered the war, and of course, they could not function effectively until sometime after that. Inevitably, there was a period during which people were recruited for the war agencies, and learned by doing, before successful policies could be put in place. Bernard Baruch's tenure at the War Industries Board is often viewed, for example, as a great success. Baruch has been described by his admirers (not the least of whom was Baruch himself!) as a kind of Czar who replaced an inefficient system of Laissez Faire with an efficient system of central planning. But Baruch was not appointed until February 1918 only nine months before the armistice. The heralded system in which the War Industries Board would take control of the allocation of all steel produced by the U.S. steel industry went into effect in June 1918, only 5 months before the armistice.

Figure 4 plots monthly steel production (steel was probably the single most important industrial material for the war effort) and the Miron-Romer index of industrial production. Vertical lines indicate the relatively short period of U.S. involvement, and the even shorter period of Baruch's storied term as head of the War Industries Board. Evidently, steel

production and industrial production had effectively reached their maximums by the time the U.S. entered the war. Production could only be increased substantially by investing in new plant and equipment – older equipment, and manufacturing facilities had already been brought online. Given the enormous task of equipping the American Expeditionary Force, and the likelihood that the war was entering a decisive phase, it made sense to allocate resources to current production, rather than building plant and equipment that might come on line too late to make a difference. In World War II, the United States followed a different policy – sometimes to the frustration of her Allies – of first building the factories to produce munitions.

There is a sharp dip in industrial production in January 1918. Steel production was especially hard hit. This was probably a result of the congestion on the railroads that brought the shipment of raw materials, particularly coal, almost to a halt. Schools and factories were closed for lack of fuel and partly as a result of the fuel crisis the nation's railroads were nationalized.[15] The congestion was caused by a number of factors including an extremely cold winter, and the unprecedented demands on the railroad network. The railroads had been built with the idea that goods would be flowing west as well as east, south as well as north, but now the bulk of shipments were heading to a few east coast ports. Early attempts to create a priority system for war related shipments had made things worse, as even McAdoo whom Wilson put in charge of the railroads, acknowledged. The natural tendency was to give preference to any railroad car claiming to carry war goods, and to hold up cars containing "unimportant" civilian goods. The result was long lines of cars loaded with war goods, and no one to unload them. Once the traffic jam on the railroads was untangled industrial production returned to what it had been before the winter crisis.

There is no evidence, then, that the policies introduced by Baruch as head of the War Industries Board (and the policies being introduced by the Food Administration, Fuel Administration, and other agencies) significantly increased the flow of materials into the war effort.

The focus of Baruch's efforts was in holding down the price of industrial materials and in creating a priorities system for determining the order in which producers would fill contracts for industrial materials. With prices for steel fixed and the order books filled, producers faced intense pressure because each agency booking an order – the most important were the army, the navy, the Railroad Administration, and the War Shipping Board, – wanted their order filled first. Funneling all contracts through the War Industries Board and having the War Industries Board set the priority for each contract solved industry's problem. If someone from one of the major claimant agencies wanted to know why a particular order was not being filled, the answer would be "go see the War Industries Board."

Most historians have taken it as self-evident that a system in which authority was concentrated in a single all-powerful government bureau would work better – deliver more and better munitions – than one in which each agency separately could influence the order in which contracts were filled by bargaining separately with producers and using financial incentives. The Navy under its vigorous Secretary Josephus Daniels did continue to bargain with suppliers and never ceded complete authority to the War Industries Board. The assumption most historians make, despite their affection for Daniels, a vociferous Progressive, is that things would have worked better had the navy been brought into the fold, and would have worked less well if the heads of other agencies had followed Daniels's example.

An economist might ask whether allowing some authority to individual agencies to make their preferences felt by offering financial incentives, might have improved the allocation of resources. One problem with this approach, of course, is that while the budgets of claimant agencies were nominally fixed, the penalties for exceeding an agency's budget in wartime were weak. An agency that went over its budget could always defend itself by claiming that the excess spending was necessary to win the war. And in truth, whatever the nominal budget of an agency, the financial resources to pay for a deficit of any magnitude were always there: if all else failed the money could be printed. On the other hand, there were problems in delegating all priority making to a central authority. The War Industries Board did not necessarily have the expertise to value the ultimate contribution of a particular project to the war effort. The priority system championed by Baruch, moreover, had its own problems.

In principle the system was simple and this was the source of much of its appeal. Each contract would be given a rating (for example A, B, C, etc.) by the War Industries Board, and then producers would be required to fill contracts with A priorities before they filled contracts with B priorities, and so on. When this system was tried in World War II, however, it was plagued by "priorities inflation." Each decision maker would give each contract crossing his desk an A. When prime contractors were given the authority to pass along priorities to subcontractors, they also tended to assign an A rating to every contract. When the system became clogged with A ratings, the War Production Board (the World War II counterpart of the War Industries Board) created a new, higher priority, A1. And when the problem recurred, still higher priorities were created, hence "priorities inflation." In World War II, when the system was given a longer trial, it was abandoned. Replacing price signals with priorities is not as simple as it sounds.

In any case, the period of time during which Baruch was in charge of the War Production Board and in which his ideas could be tried was too short, as shown in figure 4, to test the strengths and weaknesses of the system.

5. The Production of Munitions

How well did the American economy perform the ultimate job of supplying the American armed forces and those of America's Allies with the weapons of war? There has been a tendency in the literature to stress the negative side of the picture. Our Allies produced most of the artillery used by American forces in France. Less than a quarter of the aircraft used by American pilots at the front were of American manufacture. It was hard to find an airplane in which to use the much ballyhooed Liberty Engine, and so on. But the basic reason American arms played such a small role was the short period of active American involvement. When one takes a closer look at the production figures one sees, in case after case, a steeply upward sloping logistic curve.

This point is illustrated in Table 7, which shows total production of various munitions, and production at the monthly peak (usually October 1918). When President Roosevelt in May 1940 called for a production capacity of 50,000 airplanes per year the number was considered astonishing, a typical example of Rooseveltian bravado. But as shown in Table 7, production of the (then) high-powered Liberty Airplane Engine had reached an annual rate of 46,000 in October 1919. In a few cases, American production was a factor before the Armistice. The United States, for example, produced the major share of the smokeless powder used by the Allies. And American technological skills were beginning to have an impact. The Liberty Airplane engine, despite its problems, had great potential. And U.S. aeronautical engineers, including Wilbur Wright, successfully tested a flying bomb, the "bug" bomb, as it was known, that foreshadowed the German weapons of World War II. One can see in the production figures for World War I, to put it somewhat differently, the first stage of the "production miracle" of World War II.

6. The Legacies of the War for the U.S. Economy

Did World War I produce a major break with the past? Was the American economy fundamentally different after the war than it had been before? To answer these questions, or at least to begin to, I will look at (1) the cost of the war in terms of resources, (2) the change in the role of the United States in international capital markets, and finally (3) the long-run changes in ideas about the role of the government in the economy brought about by the war, the least tractable but possibly most important consequence of the war.

6.1 The Costs of the War

The United States mobilized about 4.800 million men in World War I. About 2.086 million went overseas, and about 1.390 million saw combat. Although it is true that America's losses paled in comparison with those of the European combatants, and were substantially less than those America experienced during the American Civil War, they were nonetheless substantial. About 204,000 Americans suffered non-mortal wounds, and about 117,000 died. Of those who died it is estimated that about 50,000 died in battle, and about 67,000 died from disease. The most important disease was pneumonia, which accounted for about 40,000 deaths. Of these, about 25,000 were attributed to the influenza-pneumonia epidemic. (Ayres1919, *passim*). Compared to the total U.S. population in 1920 of 106,466,000 or the total labor force of 42, 434,000 these numbers may look relatively small: deaths were only .11 percent of the population, and only .28 percent of the workforce. But they had a major psychological impact, not only on the families and friends of those killed or wounded, but on the country as a whole, certainly enough to produce strong reservations about any future involvement in a European war.

The most detailed and thoughtful effort to measure the economic costs of the loss of life and other costs of the war is John Maurice Clark's (1931) *The Cost of the World War to the American People*. Indeed, Clark's study seems to stand alone. There has been no similarly exhaustive study of the impact of World War II. In part, the lack of a similar study for World War II reflects the revolution of ideas held by economists. Although Clark believed that increased spending could have a multiplier effect on aggregate demand (Dorfman 1970), his analysis was essentially neo-classical: resources allocated to the war effort had alternative uses. By the end of World War II most U.S. economists were Keynesians. Wartime spending increased total GDP by more than the initial spending: the war had, from an economic point of view, almost no costs. The war paid for itself by increasing total output through the

multiplier process. In World War I, moreover, the U.S. economy was already at full employment when active American involvement began. World War II was different. Although the economy was expanding rapidly in 1941, there was still considerable slack when the U.S. entered the war.

To estimate the costs of the war Clark began with The Treasury's estimate of total expenditures by the Federal government to June 30, 1921 ($27.2 billion) and then made certain additions and subtractions to bring the total closer to one reflecting resource costs.[16] Clark (1970, 112, and *passim*) added (1) the worth of foreign obligations, $7.5 billion, on the grounds that these represented output transferred during the war (and unlikely to be returned later), (2) an adjustment to bring the wages of persons in government service into line with what they could have earned in the civilian sector of $.2 billion, and (3) miscellaneous additions of another $.2 billion. Clark then subtracted (1) interest on war debt of $2.7 billion on the grounds that it was a transfer rather than a use of resources, and (2) part of the deficits of the Federal Railroad Administration of $1.2 billion on the grounds that these were a transfer from taxpayers to shippers. The net result was $31.2 billion. Additions of expenditures made by state governments and private organizations brought the total to a round figure of about $32 billion. (Clark 1970 [1931], 121, and *passim*).

The upper panel of Table 8, due to Edelstein (2000), shows this amount in dollars and as a share of GNP. World War II, and the wars in Korea and Vietnam are shown by way of comparison. Clark (1970 [1931], 121) also broke his estimates down by calendar year. These amounts in dollars and as shares of GNP are shown in the lower panel. Overall, the impression that emerges is that the war was well within the capacity of the American economy. The mobilization obviously went much further in World War II. Only in 1918 does the share of military spending in GNP exceed the share regularly maintained during the Cold War.

6.2 The Role of the United States in International Capital Markets

When World War I began the United States, as shown in Table 9, was a net debtor on international capital markets. Throughout the nineteenth century the United States had received large amounts of foreign capital. The money went into canals, railroads, mines, banks, and other private investments, and into government securities. The war forced Britain and her Allies to liquidate much of this patiently accumulated investment. Between 1914 and 1919 foreign investments in the United States, as shown in Table 9, fell from $7.2 billion to $3.3 billion. After the war, the flow of funds from Europe resumed. In the late 1920s foreign investors, like American investors, found the U.S. stock

market attractive, and by 1930 the level of foreign investment in the United States exceeded the level of 1914. But the United States did not return to its position as net debtor because Americans began investing large amounts abroad, especially in Latin America, taking on the role traditionally played by Britain and other European capital exporters. (Bordo, Edelstein, Rockoff, 1999). New York's investment bankers were probably not as sophisticated as London's, and there is some evidence that the quality of U.S. placements declined in the late 1920s. But there is no gainsaying that New York could justly claim to have emerged from the War as London's equal if not her superior in the contest to be the world's leading financial center. Britain's economic weakness, a direct result of the war, and the difficulties surrounding her return to the gold standard naturally meant that entrepreneurs and governments would look to the one industrial nation that had remained largely unscathed by the war.

6.3 The Ideological Legacies

One might have expected that a war in which the central government took such an active role would produce a substantial upward ratchet in the role of government in the peacetime economy. Judged against this standard, the impact of World War I appears to have been relatively limited. Federal government expenditures were higher after the war than before. But the additional spending was for things that most people would view as the immediate and inevitable costs of the war – mainly additional military expenditures, veterans' benefits, and interest on the debt. (Clark 1931, 105; Rockoff 1998). Although there are sectors, for example agriculture, where one can draw a connection between government policies during the war and increased post war spending, for the most part there was little in the way of additional civilian spending that can be said to have "piggy backed" on the war effort.

The institutional legacies were also limited, although again some exceptions can be found. Most of the wartime regulatory control agencies were terminated as soon as the war ended. The War Industries Board was shut down so abruptly that Baruch had to pay the costs of returning home for some of his employees out of his own pocket. Some attempts were made to keep some of the regulatory experiments going, but these efforts petered out in the 1920s. The railroads, the boldest experiment in nationalization, were returned to private ownership. The Shipping Board hung on longer, and spawned a program to loan money for domestic shipbuilding.

Perhaps the most important domestic institutional legacy of the war was prohibition. Prohibition of alcohol had been pushed by reformers for decades prior to the war, and had been adopted in a number of states on a local or statewide basis. But the war changed the balance of power between the "wets" and the "dries." The wets could now

argue that prohibition was important to make workers more productive and to conserve valuable resources. Antagonism toward German-Americans, who were prominent in the brewing industry, may also have played a role. The Lever Act Food and Fuel Act, adopted in August 1917, banned the importation of distilled spirits and their production from domestic foodstuffs. In December 1917 Congress passed the Prohibition (eighteenth) Amendment to the constitution prohibiting the manufacture, sale, or transportation of drinkable alcohol in the United States. Prohibition would hang on until 1933. By that time most Americans had become convinced that the "noble experiment," as Herbert Hoover termed it, had failed because widespread lawless evasion.

The relatively small increases in spending resulting from the war, and few institutional legacies (with the exception of the shipping administration and prohibition) were the result of determined efforts by conservative Republican administrations in the 1920s to scale back taxes and spending, and to end regulatory experiments. The Republican era was inaugurated with the election of Warren G. Harding in 1920. During the campaign Harding offered what he claimed the public wanted most: "a return to normalcy." Harding won by a landslide. Evidently, the war economy had, at least in the short-run, soured the public on the Democrats.

Despite the immediate conservative ascendancy there was, however, as Robert Higgs argues persuasively in *Crisis and Leviathan* (1987, 150-56), an important ideological legacy from the war. The perceived success of government intervention in the economy during the war, whether real, or simply the halo effect of victory around a brief and confused experiment, increased the confidence on the left that central planning was the best way to meet a national crisis, certainly in wartime, and possibly in peacetime as well. Many people who had been skeptical about the advantages of Big Government – free-market progressive and populist politicians, many labor leaders (particularly in the craft unions), and some business leaders – were persuaded that centralized regulation and control of the economy would be in their interest. This view was far from being dominant during the 1920s but it made itself felt when the Great Depression brought the Democrats back to power in the 1930s.

One of the lessons progressives drew from the war was in macroeconomics. There was no gainsaying that there had been a mighty expansion between 1914 and 1918, and that it had been accompanied by huge government debts and, in the last years of the boom, by controls on wages and prices. Here was medicine for a depressed economy. Determining the active ingredient – monetary expansion, government deficits, price and wage controls, etc. – was difficult. David Friday, a prominent American economist, for example (1921), argued that the lesson of the war was that production had been maximized because the government was insuring private enterprise against the

risk of loss. He proposed that government insurance of private losses be made a permanent feature of the economy. Others saw the balance between prices in the farm and nonfarm sectors maintained by the Food Administration as the key. Indeed, it was not until Keynes that economists reached a consensus that it was increased spending in the foreign trade and government sectors that had produced the boom, and that deficit-financed federal spending would always work. But the war experience, nevertheless, increased the confidence of liberals (in the American sense) in the 1930s that they had a medicine that would restore full employment.

Progressive also drew micro-economic lessons from the war. The government ought to intervene, at least at times, because markets simply didn't work very well. Frank W. Taussig (1919, 1921), another prominent economist of the day, argued that supply and demand were simply general tendencies, useful as a simplification for teaching to the young, but not something to be relied upon to allocate resources. Taussig had been an advocate of regulation before the war; he was not a born again regulator. But the war did increase his confidence that government regulation of private markets could work, and arm him with examples. John Maurice Clark in an essay entitled "The Basis of War-Time Collectivism" (1917, 779) reacted to the announcement that the government would begin producing the Liberty Engine for aircraft by declaring that "It proves that there are great unused possibilities for immediate advancement in private industries where patents or secret processes are held …" and that "It gives one a sense of the sudden liberation of pent-up forces …"[17] Clark was not ready to abandon capitalism in its entirety, but he was ready to continue the successes of wartime collectivism in peacetime.

To be sure, Woodrow Wilson and his fellow Progressives had been more than willing to expand the role of the central government without the benefit of a previous experiment in government intervention on the scale of World War I.[18] And it is more than likely that Franklin Roosevelt and his advisors would have proposed numerous extensions of Federal authority to meet the Great Depression, even if World War I had never occurred. Many of the reforms advocated by the Roosevelt administration had long been advocated in academia, and it only required the emergency of the Great Depression to bring them into being. Abundant and detailed support for New Deal style reforms, as I have argued elsewhere (Rockoff, 1998b), was to be found from the turn of the century through 1929 even in the writings of professional economists, a group now sometimes thought of as relatively pro-market.

Yet it is also true, that almost every government program undertaken in the 1930s reflected a World War I precedent and that many of the people brought in to manage New Deal agencies had learned their craft in Word War I. (Leuchtenburg, 1964). The Reconstruction Finance Corporation (actually set up under Hoover although continued

under Roosevelt) was a reincarnation of the War Finance Committee; the Security and Exchange Commission had much in common with the War Issues Committee; and the Civilian Conservation Corps attempted to create the benefits of military service in peacetime. It seems likely therefore that the speed and scope of the Federal government's expansion in the 1930s were greater than they otherwise would have been because of the impact of World War I on the ideology of the nation's economic and political leaders. And it was the reforming liberalism of the 1930s that inspired future generations of would be reformers. For America, to sum up, the most important long-run impact of the war may have been in the realm of ideas.

Figure 1
Currency and Payrolls

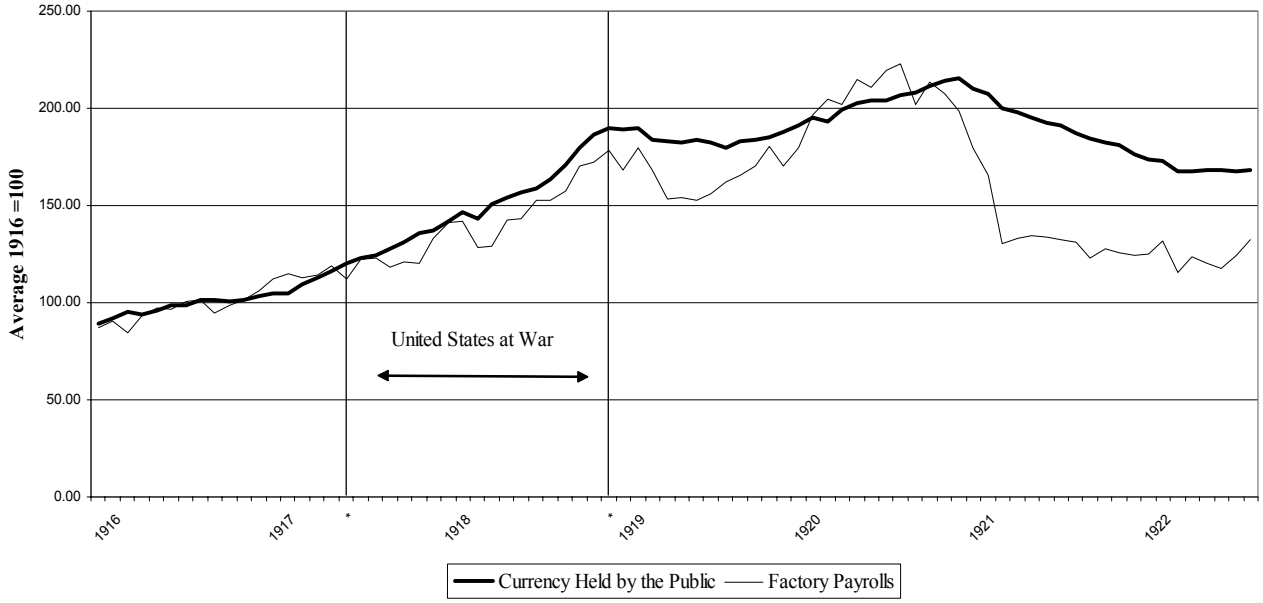

Figure 2

Coupons on the Liberty Loans

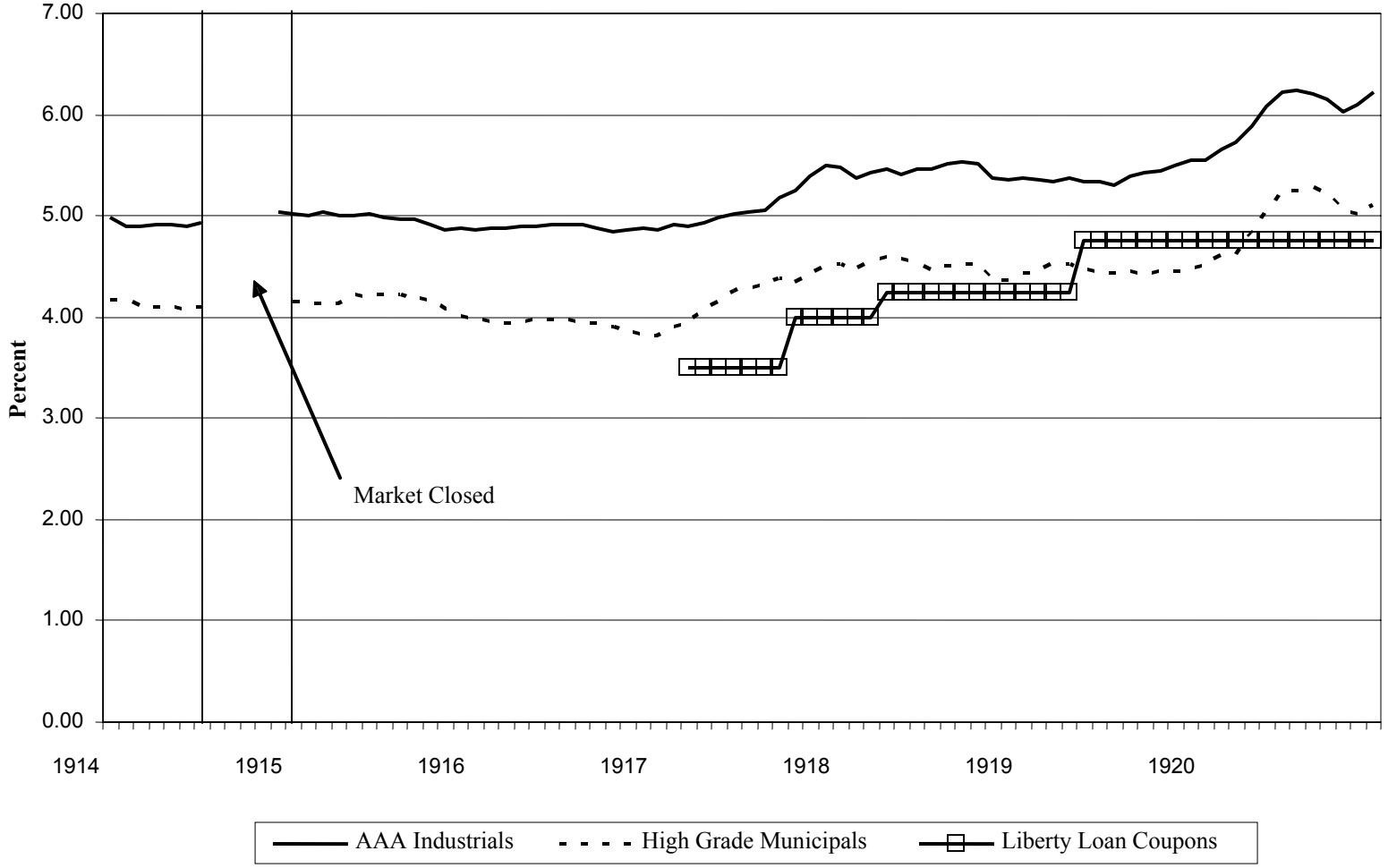

Figure 3
Yields on the Liberty Loans, 1917-1925

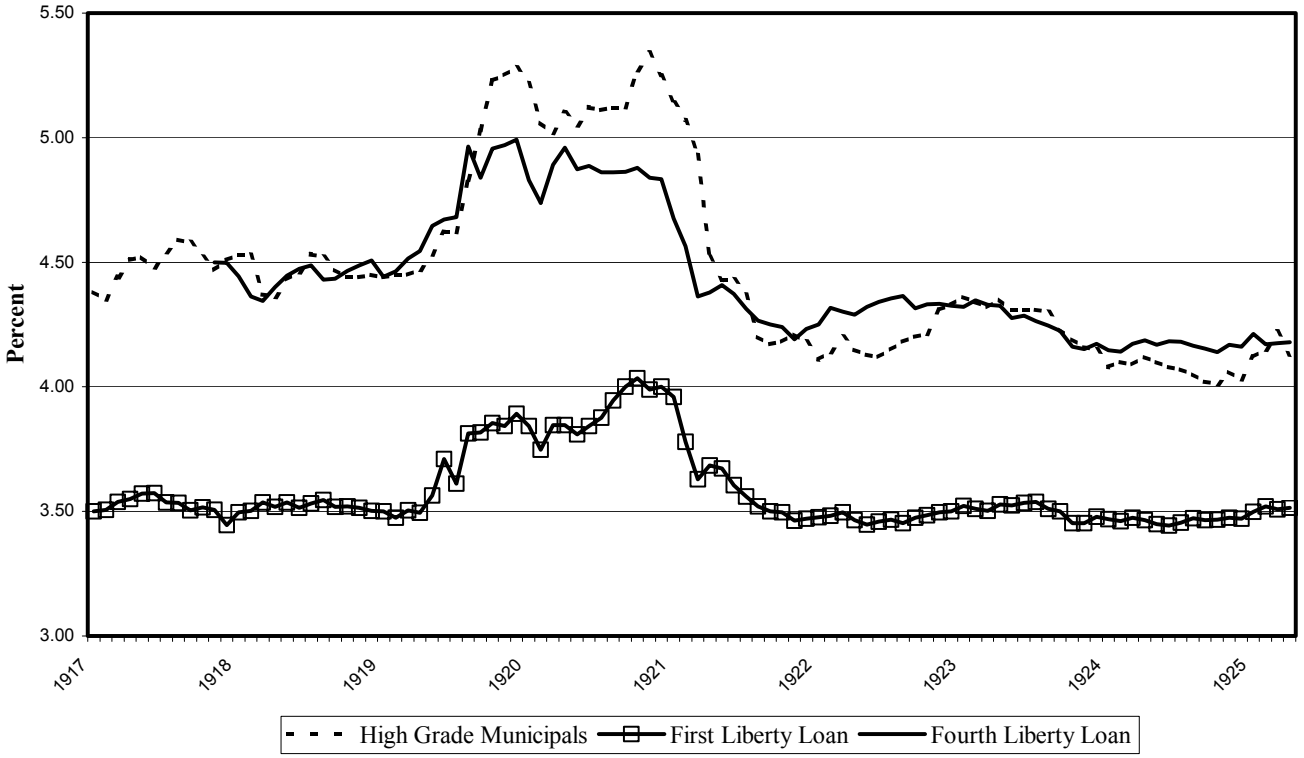

Figure 4
Steel and Total Industrial Production, 1914-20

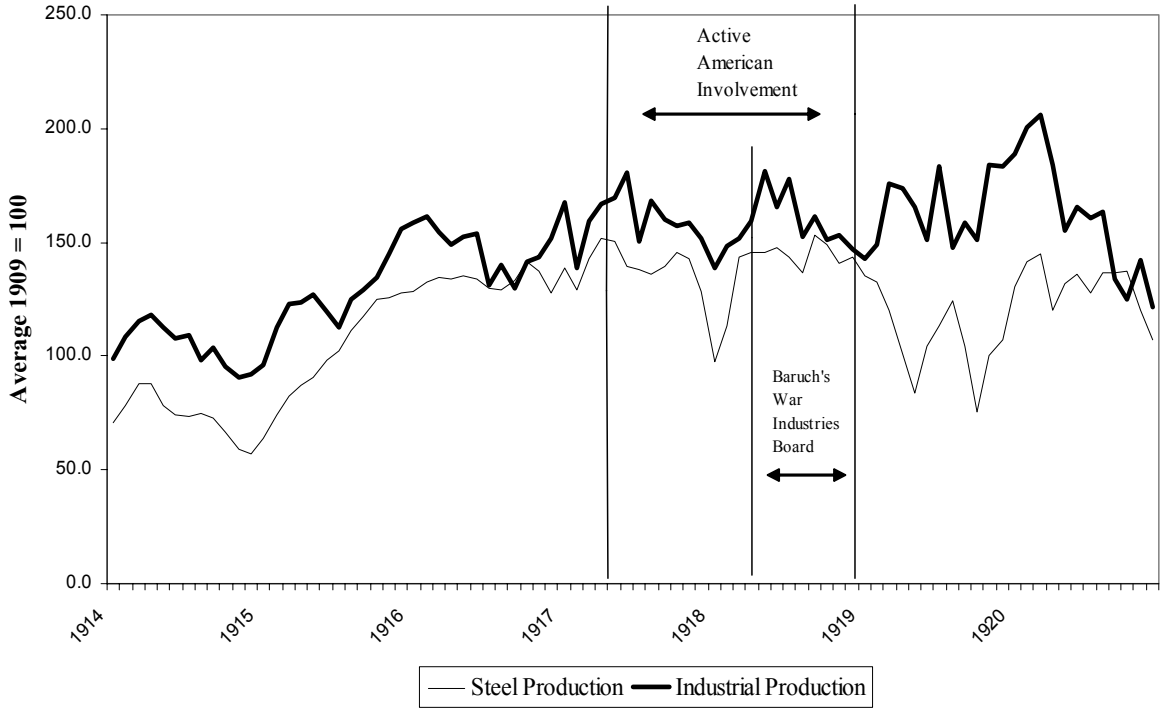

Table 1. Three Long Economic Expansions.

	1848-1853	1861-1865	1914-1918
	The California Gold Rush	The American Civil War	World War I
(1) Percentage increase in Money	66.8	95.9	48.6
(2) Percentage increase in Real GNP	25 .6 [37.6]	20.2?	26.1 [18.4]
(3) Percentage increase in the GNP deflator	9.8	57.1	45 [51.3]

Sources. Money. 1848-1853, Friedman and Schwartz (1970, table 14, column 3, p. 232). 1861-1865, my estimates, based mainly on Mitchell (1903, table V, p. 179). 1914-1918: Friedman and Schwartz (1970, table 1, column 9, pp. 14-16). Real GNP and GNP deflator, 1848-1853, 1861-1865: Berry (1988, Table 3, p. 19; table 5, p. 21). [Real GDP, 1848-1853]: Rhode [Gallman] (2002, table 1, p. 28). The increase shown for the Civil War years is highly controversial. It probably applies, if at all, to those regions that avoided actual fighting. 1914-1918: Balke and Gordon (1989, Table 10, p.84). [1914-1918]: (Romer 1989, table 2, pp. 22-23).

Table 2. The Labor Force by Sector, 1914-1920

A. Persons engaged (thousands)					
	Total	Public Sector		Private Sector	
		Military	Civilian	Farm	Nonfarm
1914	37,475	161	1,527	10,456	25,331
1915	37,669	169	1,584	10,466	25,450
1916	40,126	174	1,620	10,497	27,835
1917	41,531	835	1,692	10,447	28,557
1918	43,998	2,968	2,092	10,311	28,627
1919	42,313	1,266	2,057	10,197	28,793
1920	41,497	353	1,961	10,343	28,840
change 1914-16	2,651	13	93	41	2,504
change 1916-18	3,872	2,794	472	-186	792
change 1914-18	6,523	2,807	565	-145	3,296
Percent Change 1914-1918	16.05	291.42	31.48	-1.40	12.23
B. Annual Hours per Person Engaged					
1914	2,688	2,043	2,034	2,496	2,811
1915	2,654	2,036	2,027	2,443	2,784
1916	2,668	2,034	2,033	2,421	2,802
1917	2,665	2,032	2,014	2,501	2,782
1918	2,611	2,009	1,984	2,568	2,735
1919	2,551	2,009	1,931	2,549	2,619
1920	2,584	2,003	1,932	2,552	2,647
change 1914-16	-20	-9	-1	-75	-9
change 1916-18	-57	-25	-49	147	-68
change 1914-18	-77	-34	-50	72	-77
Percent Change 1914-1918	-3.98	-1.33	-4.84	4.25	-6.10
Source: Kendrick (1961, Table A-VI, p. 306; Table A-X, p. 312).					

Table 3. Financing World War I, March 1917-May 1919

Source of Finance	Billions of Dollars	Percent
Taxation and Nontax receipts	7.3	22
Borrowing from the Public	24	58
Direct Money Creation	1.6	5
Indirect Money Creation	4.8	15
Total Cost of the War	33	100

Note: Direct and indirect money creation is defined in the text. The estimate of indirect money creation is based on the assumption that the total increase in deposits and circulation (notes) of commercial banks were backed directly or indirectly by government securities. This is partly conjectural because some of the items that appeared on bank balance sheets such as "loans to customers" may or may not have been secured by government bonds. The amount shown may be regarded as an upper bound. The figure is based on the increase in M2, which includes time and demand deposits of commercial banks but excludes deposits in mutual savings banks. If the latter are included (they are included in M3) the maximum percentage financed by money creation rises to 21 percent. Including savings and loan shares, the distinguishing feature of M4, would change the results only slightly, and would add a more problematic element because it is doubtful that the increase in savings and loan shares were matched completely, directly or indirectly by government bond holdings.

Source: Friedman and Schwartz (1963, p. 221)

Table 4. Money, Real GNP, and Prices, 1914-1920.

	High-powered Money	Money Supply (M2)	Money Supply (M4)	GNP	Money per Unit of Output	GNP deflator	Cost of Living
	Billions of Dollars	Billions of Dollars	Billions of Dollars	Billions of 1982 Dollars		1982 = 100	1890-99 = 100
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
1914	3.48	16.67	21.15	402.4	0.041	8.51	139
1915	3.66	17.40	24.02	417.3	0.042	8.71	136
1916	4.13	20.66	27.93	485.0	0.043	9.49	149
1917	5.09	24.30	31.40	484.9	0.050	11.36	179
1918	5.89	26.20	34.87	522.2	0.050	13.35	218
1919	6.52	30.68	40.00	507.1	0.061	15.23	247
1920	7.21	35.06	41.72	496.3	0.071	17.58	286
			Index numbers 1914 = 100				
1914	100	100	100	100	100	100	100
1915	105	104	114	104	101	102	98
1916	119	124	132	121	103	112	107
1917	146	146	148	121	121	133	129
1918	169	157	165	130	121	157	157
1919	187	184	189	126	146	179	178
1920	207	210	197	123	171	207	206

Sources: [1]: Friedman and Schwartz (1963, 801-02). [2]: Friedman and Schwartz (1970, 15-19). M2 is the sum of currency held by the public and all deposits, both time and demand deposits, in commercial banks. Values at June dates are shown here. Monthly estimates are available in the source. This is Friedman and Schwartz's preferred monetary aggregate. [3]: Friedman and Schwartz (1970, 15-19). M4 is M2 plus deposits in mutual savings banks, deposits in the postal savings system, and savings and loan shares. December estimates, the only ones available, are shown here. [4]: Balke and Gordon (1989, 84-85). [5]: column [2] divided by column [4]. [6]: Balke and Gordon (1989, 84-85). [7]: U.S. Bureau of the Census (1960, 127, series 159.

Table 5. Changes in Federal Individual Income Tax Rates, 1913-1929

Years	Income Class		
	$50,000	$100,000	$1,000,000
1913-1915	1.5%	2.5%	6.0%
1916	2.6	3.9	10.3
1917	10.3	16.2	47.5
1918	22.0	35.0	70.3
1919-1920	18.3	31.2	66.3
1929	8.3	14.8	23.1

Note: These are the effective tax rates (percent of income) with 4 exemptions. Income subject to tax excludes certain expenses and interest on tax-exempt bonds.

Source: U.S. Bureau of the Census (1975, series Y437, Y438, and Y439, p. 1112)

Table 6. The Liberty Loans

	First Liberty Loan	Second Liberty Loan	Third Liberty Loan	Fourth Liberty Loan	Fifth Liberty (Victory) Loan, taxable	Fifth Liberty (Victory) Loan, not taxable
Issued on	June 15 1917	November 15 1917	May 9 1918	October 24 1918	April-May 1919	April – May 1919
Coupon	3.50	4.00	4.25	4.25	4.75	3.75
Callable in (years)	15	10	__	15	3	3
Maturity (years)	30	25	10	20	4	4
Offered (billion $s)	2.000	3.000	3.000	6.000	4.500	
Subscribed (billion $s)	3.035	4.618	4.177	6.989	5.250	
Rate of Over-subscription (percent)	52	54	40	17	17	
Subscriptions accepted (billion $s)	2.000	3.808	4.177	6.989	4.5	
Exemption from Federal Income taxes[a]	All interest exempt	Interest on the first $30,000 at face value was exempt from personal income and excess profits tax until two years after the close of the war.[b]	Interest on the first $30,000 at face value was exempt from personal income and excess profits tax until two years after the close of the war.[b]	Interest on the first $30,000 at face value was exempt from personal income and excess profits tax until two years after the close of the war.	All interest subject to surtax and excess profits tax	All interest exempt

[a]The bonds were subject to Federal estate and inheritance taxes.

[b] Extended from the Fourth Liberty Loan.

Sources: Schultz and Caine (1937, pp. 533-41); Dewey (1931, pp. 502-510).

Table 7. U.S. Production of Selected Munitions in World War I

Munition	Total Production to the end of the war[a]	Peak monthly rate of production[b]	Production in the Peak Month at an Annual Rate
Rifles	3,550,000	271,000	3,252,000
Machine Guns	226,557	35,000	420,000
Artillery Units	3,077	410	4,920
Smokeless Powder (pounds)	632,504,000	n.a.	n.a.
High Explosives (pounds)	375,566,000	n.a.	n.a.
Rounds of Artillery Ammunition	20,326,000	3,072,000	31,104,000
Toxic Gas (tons)	10,817	2,726	32,712
Tanks	799	n.a.	n.a.
Training Planes	9,503	n.a	n.a
Training Engines	17,073	n.a.	n.a.
De Havilland-4 Bombers (shipped)	3,227 (1,885)	1,100	13,200
Liberty Airplane Engines (shipped)	13,574 (4,435)	3,850	46,200

[a]Typically, this is the period from April 1917 to March or April 1919. Production after the armistice was usually limited, reflecting the completion of units in the pipeline.

[b]Generally, October 1919.

Source: Ayres (1919, *passim*)

Table 8. The Costs of World War I

A. Cost of World War I in Comparative Perspective

	Total Cost (Billions of Current Dollars)	Total Cost (Billions of 1982 Dollars)	As a Percentage of GNP
WWI (1917-1918)	32.4	377.9	52.2
WWII (1941-1945)	306.7	2,459.7	175.4
Korea (1950-1953)	49.9	206.3	14.8
Vietnam (1964-1973)	108.3-136.3	313.2-392.5	10.6-13.3

B. Cost of World War I by Year

Year	Billions of Dollars	As a Percentage of GDP
1917	6	10.9 (9.7) [5.0]
1918	16	23.0 (21.1) [17.4]
1919	9	11.7 (11.5) [9.7]
1920	1	1.1 (1.1) [2.4]
Total	32	46.6 (43.4) [34.5]

Sources and Notes: A. Costs: Edelstein (2000, p. 342). For Vietnam the larger amount is the total spent on the military, the smaller amount excludes the normal peacetime costs of maintaining the armed forces. GDP was the average of GDP in the first year of the war and the last year from Johnston and Williamson (2002). (B) Expenditures: Clark (1970 [1931], 121). GNP: Balke and Gordon (1989) and Romer (1989). The calculation using Balke and Gordon's estimates of GNP are shown first, mainly because Robert Gordon was on my dissertation committee, and the calculation using Romer's estimates follow in parentheses. The third estimate, in brackets, is from Kendrick (1961, table A1, columns 5 and 6, p. 291). These estimates are somewhat lower during the war years primarily because the loans to the Allies are excluded.

Table 9. The International Investment Position of the United States, 1914-1929, selected years.

Year	U.S. Investments Abroad	Foreign Investments in the U.S.	U.S. Net Indebtedness
	(Billions of dollars)	(Billions of dollars)	(Billions of dollars)
1914 (June)	5.0	7.2	-2.2
1919	9.7	3.3	6.4
1924	15.1	3.9	11.2
1927	17.9	6.6	11.3
1929	21.5	8.4	13.1

Source: U.S. Bureau of the Census (1975, series U26, U33, p. 869)

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1914	
August	Beginning of World War I.
December	Trough of U.S. Business Cycle.
1915	
May	A German submarine sinks the Lusitania; 124 Americans are killed and public opinion shifts away from neutrality.
1916	
June	The National Defense Act provides for expansion of the Army.
August	Council of National Defense established to plan and coordinate defense efforts.
September	U.S. Shipping Board created to build, lease, and requisition ships.
November	Woodrow Wilson is elected President.
1917	
April	The United States enters World War I.
June	First Liberty Loan.
July	The War Industries Board succeeds the General Munitions Board, and is given the task of increasing production and coordinating the mobilization.
August	The Lever Food and Fuel Control Act empowers the President to fix the price and regulate the distribution of food and fuel. Herbert Hoover is appointed Food Administrator and Harry Garfield, Fuel Administrator. The Act also prohibits the importation of distilled liquors or their manufacture from foodstuffs.
October	The War Revenue Act authorizes a graduated income tax, corporate profits tax, and sharp increases in postal rates and excise taxes.
November	Second Liberty Loan
December	The railroads are placed under Federal administration. Williams Gibbs McAdoo is in charge.
"	The Prohibition Amendment to the Constitution (the eighteenth amendment) prohibiting the manufacture, sale, or transportation of drinkable alcohol.
1918	
January	An official schedule of maximum prices for steel is established.
March	The War Industries Board is reorganized and Bernard M. Baruch is placed in charge.

April	The War Finance Corporation is created to make loans to financial institutions that had extended credits to war industries.
"	National War Labor Board is created to act as a court of last resort in labor disputes.
May	Third Liberty Loan
June	New system for allocating steel is introduced concentrating authority in the hands of the War Industries Board.
"	The National War Labor Board is established to standardize labor conditions. Felix Frankfurter is placed in charge.
August	Peak of U.S. Business Cycle
October	Fourth Liberty Loan
November	Armistice
1919	
January	The Prohibition Amendment is declared ratified. It will become effective in January 1920. It will be repealed in 1933.
February	The War Revenue Act of 1918 takes effect.
April	Victory Loan
October	The Volstead Act, which provides a mechanism for enforcing prohibition, is adopted.
December	President Wilson announces that the railroads will be returned to private ownership in March 1920.

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Endnotes

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[2]The Aldrich-Vreeland Act was intended to be a stopgap measure that would protect against panics until the Federal Reserve System could be established. It permitted groups of banks to issue currency in an emergency based on the general assets of the banks.

[3] The war began in April 1861 with the Confederate attack on Fort Sumter and ended in April 1865 with Lee's surrender to Grant.

[4] Prior to December 1854, only annual cycle dates are available from the NBER.

[5] The increase in real income for the Civil War shown in the table is an old estimate and is now considered doubtful. But the estimate shown may represent something closer to how the Civil War was perceived at the time of World War I – as a war that was highly destructive for the South, but highly profitable for the loyal states -- than would a smaller estimate.

[6] Over 1.2 million immigrants arrived in 1914, which fell to 326 thousand in 1915, and trended lower until the end of the war. (U.S. Bureau of the Census, 1975, 105).

[7] Detailed comparisons of the Civil War, World War I, and World War II are provided in Friedman (May 1952).

[8] John Whitclay Chambers II (1987) tells the story of the World War I draft.

[9] This is the difference between the actual amount of currency circulating in May 1919 and the amount of deposits in May 1919 divided by 8.34.

[10] World War I, however, was no exception to the rule that wars produce profiteering scandals. See Stuart Brandes (1997, chapter 7) for a thorough account of war profiteering during World War I.

[11] Municipal bonds were presumed to be exempt from Federal taxes including the income tax under an 1895 Supreme Court ruling. However, the recent passage of the constitutional amendment authorizing the income tax meant that the question of tax exemption might be revisited. (Bogart, et al, 1919, 86-87).

[12] Prices are end-of-month prices from the *Commercial and Financial Chronicle*, *passim*.

[13] These rates were computed simply by dividing coupons by market prices. I also tried calculating yields to maturity. This does not noticeably affect the First Liberty Bond because it had a long maturity and was close to par. A yield-to-maturity calculation does raise, slightly, the return on the Fourth Liberty Loan.

[14] This exemption was then extended to the second and third liberty loans.

[15] Kerr (1967) shows that nationalization also reflected the ideological predisposition of Wilson and his progressive advisors. Many private interests, moreover, also favored nationalization. Shippers of agricultural products and coal favored nationalization because they thought it would prevent increases in freight rates, and the railroad labor unions favored nationalization because they thought the government would be more sympathetic to their demands. Some of the railroads favored nationalization because they saw it as a way out of the predicament created by rising costs and fixed freight rates. Cunningham (1921) provides a detailed and balanced evaluation of the effects of nationalization. He concludes that both the decision to nationalize in 1918 and the decision to return the railroads to private ownership in 1920 were correct.

[16] For a more detailed exposition and evaluation of Clark's methods see Edelstein (2000).

[17] On the history of the Liberty engine see Marcosson's (1948) detailed although hagiographic biography of Colonel Edward A. Deeds who headed the program.

[18] Wilson could and did look to Europe for examples of wartime economies. And the Progressives looked to Europe, Canada, Australia, and a number of progressive U.S. states for examples of what they regarded as successful social welfare and regulatory programs.