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The COVID-19 Pandemic and Inflation: Lessons from Major US Wars

Kevin L. Kliesen and David C. Wheelock

Abstract

US fiscal and monetary policies implemented during the COVID-19 pandemic have been likened to those often adopted during wars. This article compares macroeconomic policies of the pandemic period with those of major US wars since the Civil War. Inflation often surges during wars, as it did in the second year of the pandemic, and the wartime experiences can provide insights about the relative scale and persistence of inflation associated with sudden, large increases in government expenditures, such as the fiscal response to the COVID-19 pandemic. The article describes fiscal and monetary policies in each war and postwar period and traces differences in the relationships between the growth in government debt, the money stock, and inflation across the episodes to differences in the prevailing monetary regime and other institutional arrangements. The evidence from US wars suggests that the extent of government spending and the means used to finance that spending can have a significant impact on inflation outcomes. Substantial monetary financing of large increases in government spending was a characteristic of most major wars and a key driver of inflation. Further, the historical record reveals that postwar periods can be disruptive, with sharp fluctuations in economic activity and inflation, and that quick restoration of price stability requires recalibration of fiscal and monetary policy that often has been politically and technically challenging.

JEL codes: E31, E42, E51, E52, E58, E62, E64, N11, N12

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> "A simple way to think about what's happened is the pandemic was like a war, and you had war financing—lots of spending, not just in the U.S. but around the world. If we were going to err, we were going to err on the side of doing too much."
>
> —James Bullard[1]

1. Federal Reserve Bank of St. Louis president James Bullard, quoted in Timiraos (2022).

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The substantial increase in inflation that the United States experienced in 2021-22 was a sharp break from the previous decade. Although this higher inflation is often attributed to supply disruptions, it followed large increases in federal government spending and debt and money stock growth that reflected the fiscal and monetary responses to the COVID-19 pandemic. These responses resembled in several respects the economic policy actions taken during major wars. Parallels between the 2020-21 episode and previous war-time periods are striking: Sharp increases in government spending and inflation have broadly characterized major wars and immediate postwar periods throughout US history. However, differences in how wartime spending was financed, existing monetary regimes, and the use of wage and price controls affected the timing and extent to which inflation followed from sudden large increases in government spending. Similarly, how fast inflation retreated when wars ended, if it did at all, reflected both institutional arrangements and economic policy choices.

This article compares and contrasts economic outcomes associated with the war on COVID-19 with major US wars since the Civil War: World Wars I and II, the Korean War, and the Vietnam War. Specifically, our intent is to glean insights about the relative scale and persistence of inflation associated with, and resulting from, wartime financing—that is, sudden, large increases in fiscal expenditures. Section 1 discusses key aspects of the pandemic and its effect on the US economy. Section 2 discusses the financing of wars historically and summarizes the findings of other recent studies of US war financing. Section 3 presents evidence on inflation and the growth of government debt and the money stock across major US wars from the Civil War to the "war" on COVID-19. We highlight similarities and differences in fiscal and monetary policies associated with each war and postwar periods. Although each episode involved a substantial increase in government spending and debt, differences in the prevailing monetary regimes and other institutional arrangements contributed to differences in the relationships between the growth in government debt, the money stock, and inflation across the wartime periods, details of which we present in an appendix. This review illustrates that the US government used a considerable variety of methods to finance war expenditures while simultaneously attempting to contain inflation. Monetary financing in support of financing wars since the founding of the Federal Reserve in 1913 has been important. Section 4 concludes.

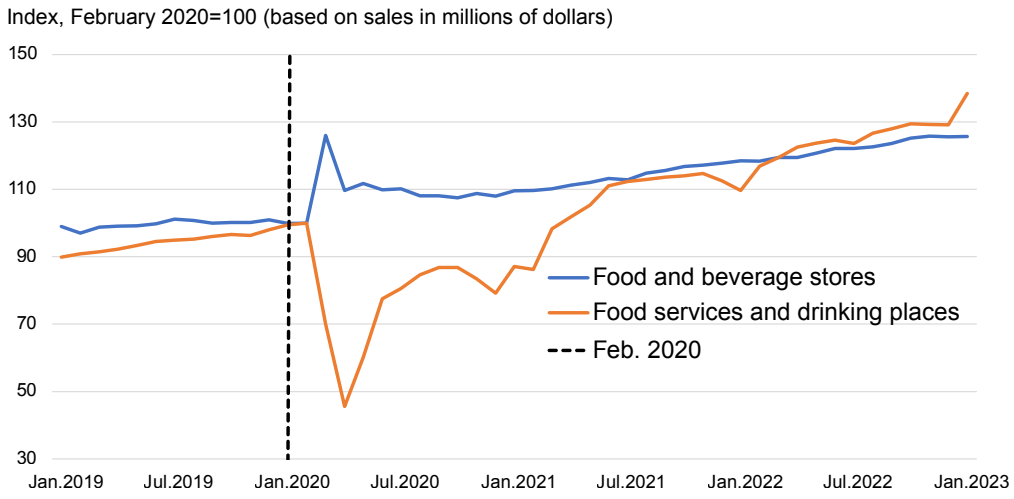
1 THE COVID-19 PANDEMIC AND THE US ECONOMY

The novel coronavirus that became known as COVID-19 emerged in Wuhan, China, in late 2019 and began to overwhelm most countries of the world in early 2020. When COVID-19 began to spread in the United States in early 2020, the federal government and the Federal Reserve responded swiftly to the emerging economic and health care crisis.[2] The Secretary of Health and Human Services declared a public health emergency on January 31, 2020. On March 13, President Trump declared a national emergency; and on March 16, the Administration issued coronavirus guidelines that encouraged the public to limit the size of gatherings and avoid restaurants and bars. Although the guidelines were intended for two weeks, the pandemic worsened dramatically, and most states enacted stay-at-home orders in March. In response, many businesses directed their employees to work remotely while other firms closed and furloughed their employees. Even in locations where businesses remained open, many individuals chose to avoid restaurants, travel, and other forms of social and economic interaction. Figure 1 illustrates this pattern: Early in the pandemic, retail sales at food and beverage stores (food consumed at home) increased sharply while sales from food services and drinking places (food consumed away from home) plunged.

2. The major actions and events are summarized on the *Timeline of Events related to the COVID-19 Pandemic* hosted on the Federal Reserve Bank of St. Louis' FRASER website (https://fraser.stlouisfed.org/timeline/covid-19-pandemic#7).

Figure 1

Retail Sales at Food and Beverage Stores and Food Services and Drinking Places, 2019-Present



SOURCE: Bureau of Economic Analysis and Haver Analytics.

Besides being a public health emergency, the pandemic was a significant economic shock, triggering a record decline in real GDP in the second quarter of 2020—29.9 percent at an annual rate. Nonfarm payrolls plunged by a seasonally adjusted 1.4 million jobs in March 2020 and then fell by an astounding 20.5 million the following month. The civilian unemployment rate surged from a 50-year low of 3.5 percent in January and February 2020, to a more than 80-year high of 14.7 percent in April 2020.[3] The inflation rate (measured as 12-month percent changes) fell from 1.8 percent in January 2020 to 0.4 percent in May 2020. In the Federal Open Market Committee's June 2020 Summary of Economic Projections (SEP), the median FOMC participant projected that both headline and core PCE price inflation would remain under the Committee's 2 percent target through the end of 2022.

In relatively short order, the National Bureau of Economic Research (NBER) declared that a recession had begun in February 2020. The recession was short-lived, however, as real GDP growth rebounded at a 35.3 percent annual rate in the third quarter of 2020 and the unemployment rate dropped by more than half to 6.7 percent by year end. By early 2021, aggregate real personal income exceeded what it would have been if income had simply grown at its pre-pandemic trend rate (Bullard 2021). The NBER subsequently determined that the recession had ended in April 2020. The pandemic-spawned recession was the shortest, but deepest, US recession on record.[4]

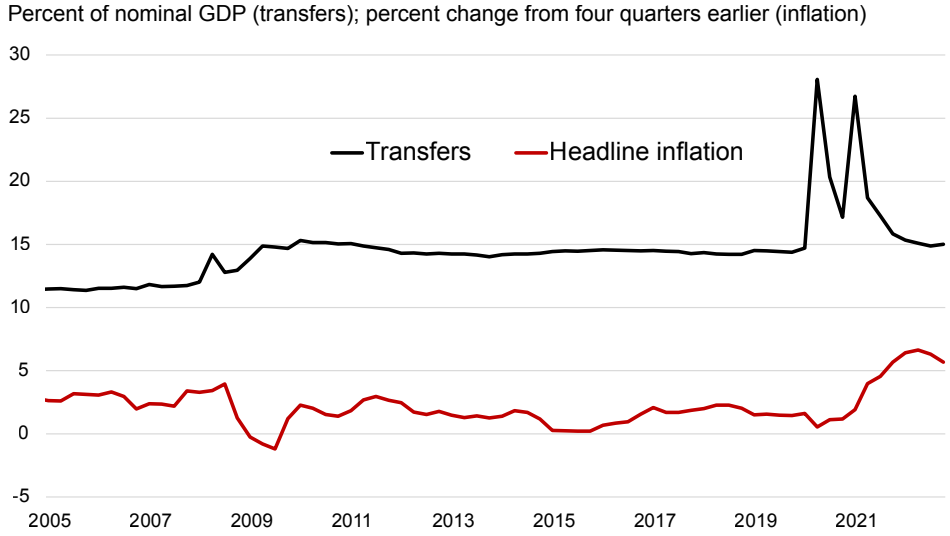
In response to the evolving economic and health care crisis, four pandemic-specific pieces of legislation were signed into law during the spring of 2020. The total amount allocated by Congress at the time exceeded $2.7 trillion, with the CARES Act alone accounting for $2.2 trillion of the total spending. The CARES Act included approximately $450 billion to fund five special Federal Reserve (Fed) lending facilities that were established to support the financial system. Subsequently, in early 2021, Congress enacted two additional pieces of legislation, including the American Rescue Plan Act (ARPA), a $1.9 trillion spending package intended to further encourage recovery from the economic and public health

3. According to the Bureau of Labor Statistics, the actual unemployment rate would have exceeded 19 percent if respondents had correctly reported their pandemic-related employment status. See https://www.bls.gov/news.release/archives/empsit_05082020.pdf.

4. The annual report of the Federal Reserve Bank of St. Louis for 2020 describes some economic effects of the pandemic on the U.S. economy (https://www.stlouisfed.org/annual-report/2020).

Figure 2

Federal Government Transfer Payments and PCEPI Inflation, 2005-22



NOTE: Data through 2022:Q4.

SOURCE: BEA and Haver Analytics.

impacts of the pandemic. In all, the six major pieces of federal legislation enacted in 2020 and 2021 resulted in a more than $5 trillion increase in the nominal federal budget deficit over 10 years.[5]

The Fed's monetary policy response to the pandemic was similarly aggressive. On February 28, 2020, Federal Reserve Chair Jerome Powell issued a statement declaring that "the coronavirus poses evolving risks to economic activity."[6] Two weeks later, on March 15, the FOMC held an unscheduled meeting and voted to lower the federal funds target rate by 100 basis points to 0 to 0.25 percent. In addition to lowering its federal funds rate target effectively to zero, the Fed's Open Market Committee (FOMC) initiated purchases of Treasury and mortgage-backed securities totaling $120 billion per month. From the fourth quarter of 2019 to the fourth quarter of 2021, the value of assets on the Fed's balance sheet increased from $4.17 trillion (19.2 percent of GDP) to $8.76 trillion (36 percent of GDP).

At a high level, the fiscal and monetary response to the COVID-19 pandemic resembled in several respects the economic policy actions taken during previous major wars reviewed in this article. However, unlike most wars, when governments spend large amounts on armaments and mobilizing troops, the appearance of an enemy in late 2019 (the virus) triggered a massive increase in federal spending in 2020-21 that consisted largely of transfer payments to households and firms most directly impacted by business shutdowns and other measures taken to slow the spread of the virus. Figure 2 shows that federal transfer payments averaged 14.5 percent of GDP from the first quarter of 2019 to the first quarter of 2020. From the second quarter of 2020 through the second quarter of 2021, when transfer payments peaked at 28.1 percent of GDP, they averaged 22.2 percent.

5. The four pieces of legislation enacted in 2020 were (1) the *Coronavirus Preparedness and Response Supplemental Appropriations Act*; (2) the Families First Coronavirus Response Act; (3) the *Coronavirus Aid, Relief, and Economic Security (or CARES) Act*; and (4) the Paycheck Protection Program and Health Care Enhancement Act. In 2022, the following two pieces of legislation were enacted: (1) the *Consolidated Appropriations Act* and (2) the *American Rescue Plan, or ARPA*. These are listed and discussed in Congressional Research Service (2021). Per convention, the budgetary impacts are reported over a 10-year period (see Congressional Research Service, 2021, Table 2) for budgetary impact details.

6. Statement from Federal Reserve Chair Jerome H. Powell, February 28, 2020 (Federal Reserve Board – Statement from Federal Reserve Chair Jerome H. Powell).

The increased spending was financed primarily by borrowing. The federal budget deficit rose from $984 billion (4.6 percent of GDP) in fiscal year 2019 to $3.1 trillion (15 percent of GDP) in 2020. Helped by a sharp acceleration in real GDP growth in 2021, the budget deficit declined modestly in fiscal year 2021 to $2.8 trillion (12.3 percent of GDP).

The massive monetary and fiscal response triggered an acceleration in the aggregate demand for goods and services that, combined with temporary supply-side disruptions that lowered potential real GDP, provided a powerful inflation impulse.

Initially, few forecasters and economists drew parallels between the fiscal and monetary actions in response to the economic fallout of COVID-19 and those of past wars. This may have been because inflation, as measured by the personal consumption expenditures price index (PCEPI), remained tame through early 2021. The headline (all items) PCEPI increased by just 1.3 percent in 2020 (December to December), well below the Fed's 2 percent target. Measured on a 12-month basis, PCEPI inflation (both headline and core) remained below 2 percent in January and February 2021. Nonetheless, FOMC members expected a small, temporary increase in the rate of inflation in 2021. In the FOMC's March 2021 Summary of Economic Projections, the median participant projected that PCEPI inflation would be 2.4 percent in 2021, 2 percent in 2022, and 2.1 percent in 2023.

Contrary to most predictions, inflation began to rise sharply beginning in March 2021 and continued to increase until the middle of 2022. Some economists, such as Summers (2022), began to warn of the inflationary impact of the COVID fiscal programs. However, the magnitude and duration of the inflation surge of 2021 and 2022 was a surprise to many policymakers and economists (Waller, 2022). Higher inflation was widely expected to be short-lived, reflecting supply-side disturbances, higher energy shocks, and a temporary increase in aggregate demand spurred importantly by record-high saving balances that had accumulated during the pandemic.[7] In short, most policymakers and forecasters expected inflation to return to its pre-pandemic pattern once the shocks dissipated. For example, the Council of Economic Advisers (2021) likened the increase in inflation to the temporary burst of inflation that followed the removal of price controls at the end of World War II.[8] Many Fed officials agreed.

With inflation beginning to trend higher in the spring of 2021, the median FOMC participant in the June 2021 Summary of Economic Projections projected that PCEPI inflation would only rise to 3.4 percent in 2021 and then slow to 2.1 percent in 2022. Speaking at Jackson Hole, Wyoming, in August 2021, Chair Powell claimed that high inflation was unlikely to persist and that the FOMC's near-term focus would be on achieving maximum employment.[9] Inflation continued to increase through the remainder of 2021, however, and by December 2021 the 12-month percent change in the PCEPI inflation rate had reached a 40-year high of 6.0 percent; the CPI inflation rate was even higher at 7 percent, and thus inflation was triple the Fed's 2 percent inflation target.

When the FOMC announced a decision to taper asset purchases on May 4, 2022, CPI inflation had surpassed 8 percent and the PCE price inflation rate exceeded 6 percent (both measured on a 12-month basis). Inflation peaked in June 2022 at 9.1 percent measured by the CPI and at 7 percent measured by the PCEPI. By the end of 2022, measures of headline inflation had retreated—largely reflecting lower energy prices. At that time, the key question for FOMC policymakers was how much additional policy

7. Recent research from New York and San Francisco Fed economists offers divergent evidence on the relative contributions of supply and demand to inflation. Giovanni (2022) finds that 60 percent of the inflation over the 2019-2021 period stemmed from increased demand for goods and services, with the remaining 40 percent due to supply-side issues. Using a shorter time span, Shapiro (2022), by contrast, finds that supply factors explained about half of the increase in inflation over the 12 months ending in April 2022, with demand factors explaining about a third of the increase. Using a fiscal theory of the price level, model-based approach, Bianchi and Melosi (2022) argue that ARPA accounted for 3.5 percentage points of the recent increase in inflation, with supply-side (cost-push) factors accounting for a similar percentage increase.

8. The Council of Economic Advisors report, "Historical Parallels to Today's Inflationary Episode," is dated July 6, 2021 (https://www.whitehouse.gov/cea/written-materials/2021/07/06/historical-parallels-to-todays-inflationary-episode/).

9. See https://www.federalreserve.gov/newsevents/speech/powell20210827a.htm.

tightening would be required to return inflation to the Committee's 2 percent target. High inflation remained a threat to macroeconomic stability and to the FOMC's credibility in 2023. Accordingly, as indicated by the minutes of the January 31–February 1, 2023, FOMC meeting, monetary policymakers remained firmly focused on returning inflation to the 2 percent target.

The linkages between sudden large increases in government spending and high inflation are not new and were a feature of major US wars of the past. The next section discusses some historical comparisons. The post-COVID inflation dynamics studied in this article suggest that an end to wartime financing eventually results in lower rates of inflation, but the transition has not always been smooth.

2 FINANCING WARS: AN HISTORICAL PERSPECTIVE

Historically, wars have been characterized by heavy government spending and debt issuance, highly accommodative monetary policy, and often inflation (e.g., Rockoff 2015). Tightening monetary policy to control inflation during wartime could be viewed as inconsistent with the aim of winning the war, especially if doing so would entail higher interest rates and thus higher government borrowing costs. Consequently, governments have often accepted inflation (or imposed controls to limit price increases) with or without the acquiescence of their central banks to ensure sufficient low-cost funding of war expenditures. Situations in which monetary policy becomes subservient to fiscal policy, referred to as "fiscal dominance," seem more likely during wars or other emergencies that cause governments to borrow heavily to finance large increases in spending. "Fiscal dominance" may be defined as "the imposition of the fiscal authority's preferences despite disagreement from the central bank." In a fiscal dominance regime, "the preferences of the central bank, and thus its independence, [is] irrelevant" (Martin 2021, p. 3). In this article, we use a less strict definition of fiscal dominance as shorthand to refer to situations in which monetary policy is determined primarily by the fiscal authority regardless of agreement by the monetary authority.

Whether fiscal dominance persists after the emergency passes could depend on a variety of conditions, including the level of outstanding government debt and degree of central bank independence.[10] Our review of wartime episodes indicates that higher inflation has been a characteristic of most major US wars and was associated with monetary accommodation of sudden, large increases in government expenditures. Further, we find that the restoration of price stability after wars has always involved a tightening of both fiscal and monetary policy but that features unique to each episode influenced the timing and extent of economic disruption associated with each disinflation. For interested readers, the appendix provides more detailed discussions of fiscal and monetary actions, and the behavior of inflation, during each major war reviewed in this article.

Governments can finance expenditures for wars and other projects by raising revenues (e.g., taxes) or by issuing debt. Debt sold to the public can be either interest-bearing or non-interest-bearing and may have qualities that enable it to function as money. Economists have long argued about the optimal financing of wars and other emergency expenditures. Adam Smith, for example, asserted that borrowing by issuing long-term bonds hides the true funding cost of wars and thereby provides an incentive for political leaders to wage war. By contrast, John Stuart Mill contended that borrowing is acceptable so long as it does not cause interest rates to rise. The modern view of optimal war finance stems from Barro (1979), who argues that governments should borrow to finance temporary increases in government expenditures to minimize disincentive effects associated with higher taxes.[11]

10. According to Schnabel (2020), "At the time of the Maastricht Treaty, high government debt was seen as a major threat to central bank independence, and it was feared that *fiscal dominance* could induce a central bank to deviate from its monetary policy objectives, endangering price stability" (emphasis in original).

11. However, Lucas and Stokey (1983) argue that in an economy with state-contingent policies, "the efficient policy is to tax capital heavily or adjust returns on government debt immediately upon the outbreak of war" (Ohanian 1997, p. 23). Hall and Sargent (2021) elaborate on the differences between the Barro (1979) and Lucas and Stokey (1983) frameworks and conclusions.

Before the development of modern capital markets, governments sought to finance military expenditures by levying taxes (broadly defined to include impressment of property and soldiers). As noted by Keen and Slemrod (2021), examples from several centuries of world history include the "Saladin tithe" to finance a 12th century crusade and the "fifteenth and tenth" tax on the value of movable goods, such as corn or farm animals, in fourteenth century England. Later, in the 16th century, Henry VIII levied a class-based tax whereby dukes paid a larger tax than barons, who in turn paid more than peasants. However, governments resorted to borrowing when fully financing expenditures through taxes proved impossible or undesirable, and they used various mechanisms to increase the public's willingness to accept the government's debt. Some of those mechanisms included issuing debt that either directly or indirectly augmented the supply of money, for example by declaring the debt securities to be legal tender. Other funding mechanisms involved borrowing from banks, sometimes in exchange for special privileges that gave rise to the first central banks. The Bank of England, for example, was founded in 1694 during a war with France. Kindleberger (1984, p. 5) writes that "It is no accident, for example, that the Bank of England was established in the midst of the Nine Years' War, … or that the Bank of France was established by Napoleon in 1800 to help finance his wars."[12] The founders of the Bank of England agreed to lend £1.2 million to the English government in exchange for a £100,000 annual payment and a monopoly right to issue bank notes in London. The Bank's note issues, according to Kindleberger (1984, p. 53), had the effect of exacerbating wartime inflation.[13]

In his review of the financial histories of US military conflicts, Rockoff (2015) finds that money creation was a significant component of financing "major" US wars but not of "minor" wars, such as the Mexican-American War of the 1840s and Gulf War of 1991. Not surprisingly, therefore, inflation was a characteristic of major wars but not of minor conflicts. However, funding mechanisms and inflation outcomes differed somewhat across even the major wars, depending on the prevailing monetary regime, as well as on the timing and extent of price controls and other institutional arrangements.

The extent to which governments borrow to finance wartime expenditures can depend at least in part on their ability to raise revenues by other means. Borrowing by issuing debt that serves as a means of payment, either directly or via the banking system, is often termed "printing money" or use of the "inflation tax" because of the association between increases in the supply of money and inflation. An extreme example of "printing money" to finance a war was by the Confederate States of America during the American Civil War. The Confederacy financed approximately 60 percent of its spending by printing money and incurred an inflation rate that exceeded 100 percent per year from mid-1862 through the end of the war in 1865.[14]

Whereas some governments have little choice but to attempt to finance war expenditures by printing money, the funding method chosen can also reflect the preferences of those in charge. The United States financed its Korean War expenditures mainly by raising taxes, for example, reflecting President Harry Truman's aversion to deficit spending and high interest rates (Ohanian 1997). Hall and Sargent (2021) study the financing of World Wars I and II and the "War on COVID-19." They distinguish between the issuance of interest-bearing debt (i.e., Treasury securities) and non-interest-bearing debt (i.e., base money).[15] Hall and Sargent find that borrowing was the preferred method in all three wars; taxes were raised to some extent in WWI and WWII, but hardly at all in the COVID-19 episode. A key feature of the COVID-19 period was that the monetary base rose sharply alongside the increase in

12. Based on nearly a century of data from the London bond market, Poast (2015) finds that having a central bank lowered a sovereign's borrowing costs—particularly during wartime.

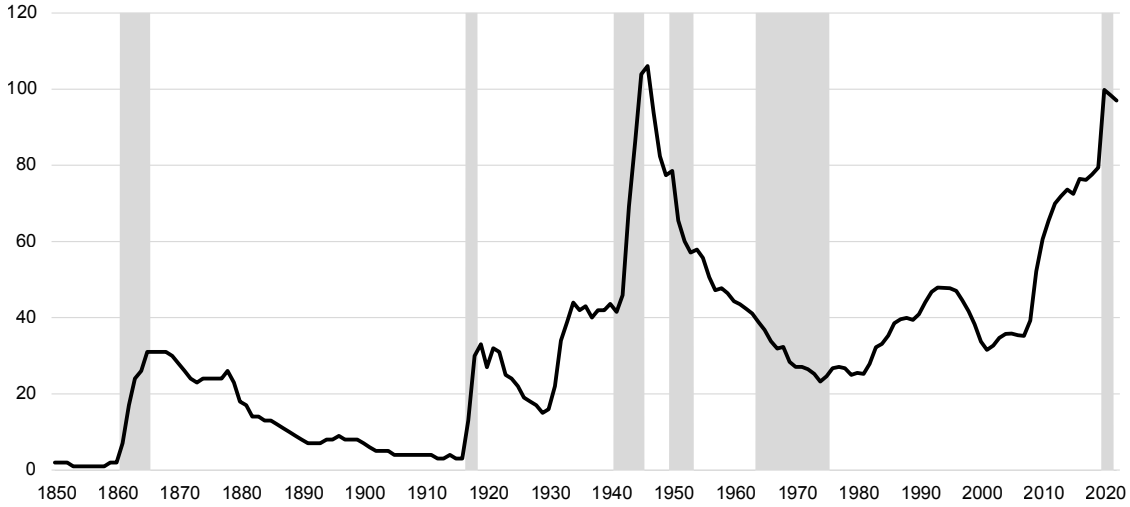
13. See also https://www.bankofengland.co.uk/about/history.

14. For additional information about Confederate war finance and inflation, see Weidenmier (https://eh.net/encyclopedia/money-and-finance-in-the-confederate-states-of-america/) or *Tax History Project -- The Civil War* (www.taxhistory.org).

15. The monetary base reflects the monetary liabilities of the central bank, i.e., currency outstanding and the reserve deposits of banks and other depository institutions.

Figure 3

US Federal Debt Held by the Public as a Percent of GDP During Major US Wars, 1850-2022



NOTE: Shaded areas are the war years studied in this paper.

SOURCE: Congressional Budget Office.

government expenditures as the Federal Reserve purchased Treasury securities in the open market equal to about half of the increase in gross federal debt.[16]

3 MAJOR US WARS, GOVERNMENT DEBT, AND INFLATION

Inflation has occurred during nearly every major US war, typically the result of monetary accommodation of wartime government spending. But history also shows that monetary accommodation can take different forms. These have included simply issuing new currency to pay for government purchases, using financial incentives to encourage the public to purchase government debt, and outright purchases of substantial amounts of government debt by the central bank. The different mechanisms can make it difficult to discern the extent of central bank financing from basic data on the size of the Fed's balance sheet, for example. And, similarly, price controls can obscure relationships between money growth and inflation. This variation can be explained to a great extent by differences in institutional features affecting the relationships between government debt, money, and inflation during the wars and early postwar periods, which we discuss in this section and the appendix.

Figures 3 and 4 provide historical data on US federal debt held by the public from 1850 to 2022 (as a percent of nominal GDP) and inflation. Inflation is measured as the annual percentage change in the consumer price index (CPI).[17] The shaded areas are the years of the major wars discussed in this article and the COVID-19 period, which we date as the years 2020 and 2021. Although COVID-19 deaths and hospitalizations persist today, the main elements of the fiscal and monetary response to the pandemic occurred in 2020 and 2021.[18]

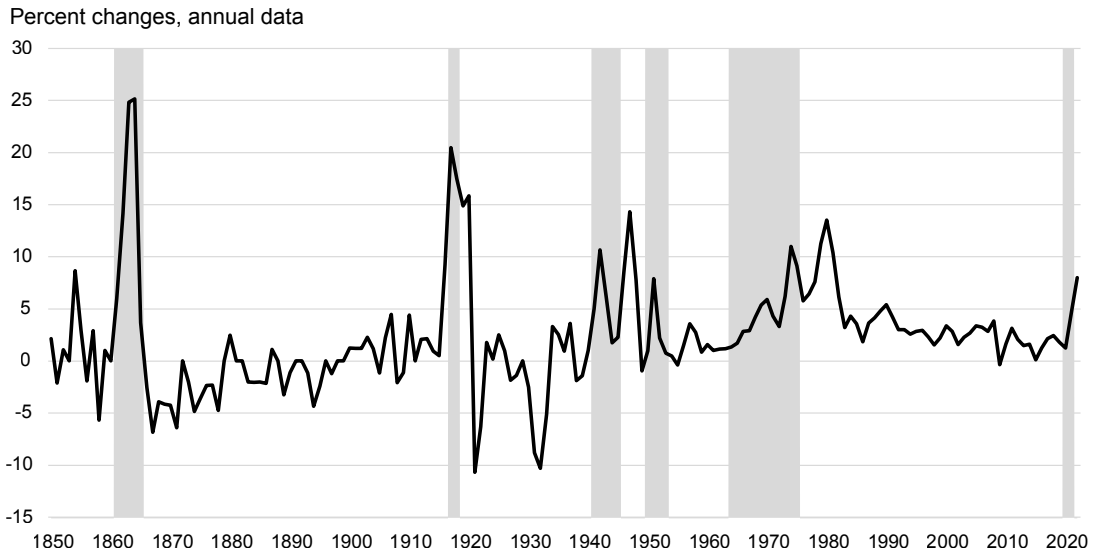
16. Gross federal debt includes debt held by the public and debt held by government trust funds (e.g., Social Security and Medicare) and other government accounts. Debt held by the public includes debt on the Federal Reserve's balance sheet. Federal debt held by the public increased by $4.2 trillion from 2019 to 2021, and the Federal Reserve's holdings of Treasury securities increased by $3.3 trillion. Hence, the Fed purchased 78.8 percent of the increase in federal debt held by the public (data are calendar year averages).

17. See the Data Appendix for source information.

18. We do not claim that any structural effects on the economy from the COVID-19 pandemic ended after 2021. There is a growing literature on the economic effects of COVID-19, particularly on the supply and demand for labor and global supply chains.

Figure 4

CPI Inflation During Six Major US Wars, 1850-2022



NOTE: Inflation rates are calculated from annual average data. Shaded areas are the war years studied in this paper.

SOURCE: www.measuringworth.com and the Department of Veterans' Affairs.

Several patterns are evident in Figures 3 and 4. First, relative to GDP, federal debt held by the public increased sharply in the first three wars, but then fell when the wars ended. This pattern did not hold for the Korean and Vietnam wars, however, as debt was falling relative to GDP before those wars and continued to fall during them. Second, as Figure 3 shows, there were two non-war periods when federal debt rose sharply relative to GDP. The first occurred during the 1930s when GDP dropped sharply during the first years of the Great Depression, causing the debt-to-GDP ratio to rise despite little change in debt outstanding. The second occurred during the financial crisis in 2008 and subsequent recession. Figure 3 shows that the debt-to-GDP ratio rose sharply after the financial crisis and that, when the pandemic hit, debt as a percent of GDP was already at its highest level since just after World War II. Debt as a percent of GDP then rose sharply during the pandemic. Thus, the COVID-19 era most closely resembles the first three wars (Civil War, World War I, and World War II).

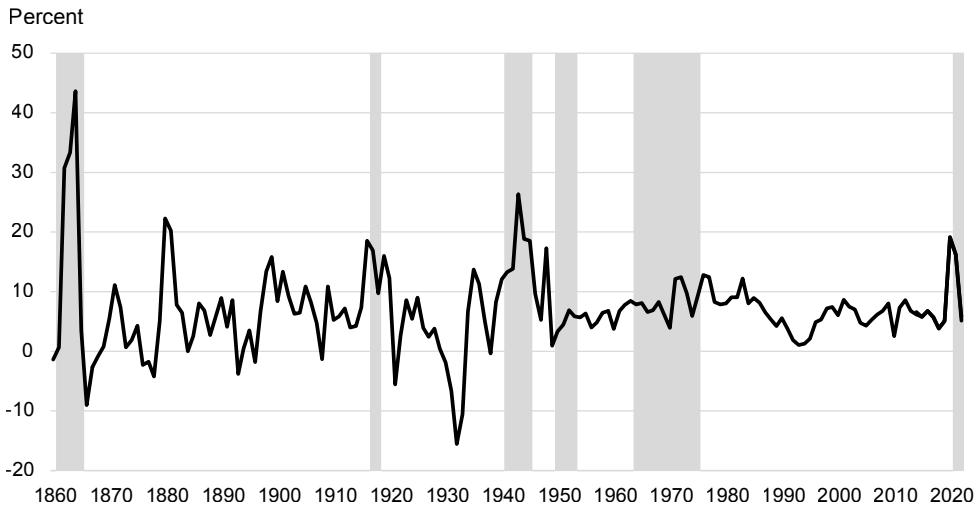
The CBO estimates that the six legislative actions signed into law in 2020-21 increased the federal budget deficit by $5.04 trillion over a 10-year period (Congressional Research Service, 2021). As shown in Figure 3, federal debt held by the public as a percent of nominal GDP increased from 79.4 percent in 2019 to 99.8 percent in 2020. Thereafter, the debt-to-GDP ratio fell to 98.4 percent in 2021 and then slightly more to 97 percent in 2022.[19]

There is a long literature on the connection between expansionary fiscal policy and inflation (e.g., Bordo and Levy, 2020). Figure 4 plots CPI inflation since the Civil War. Inflation rose sharply during the major wars, but then decelerated quickly after the wars ended (with the exception of the Vietnam War). The ends of the Civil War and World War I were also followed by periods of significant deflation, but that was not true of later wars. Finally, as with the previous five wars, CPI inflation spiked during the COVID-19 pandemic and remained at its highest levels since the early 1980s in 2021 (6.7 percent) and 2022 (7.1 percent). According to the median FOMC participant in the March 2023 Summary of Economic Projections (SEP), inflation is not expected to return to the Committee's 2 percent inflation target until sometime after 2025.

19. See https://fred.stlouisfed.org/series/FYGFGDQ188S.

Figure 5

Growth of the M2 Money Stock and Major Wars, 1860-2022

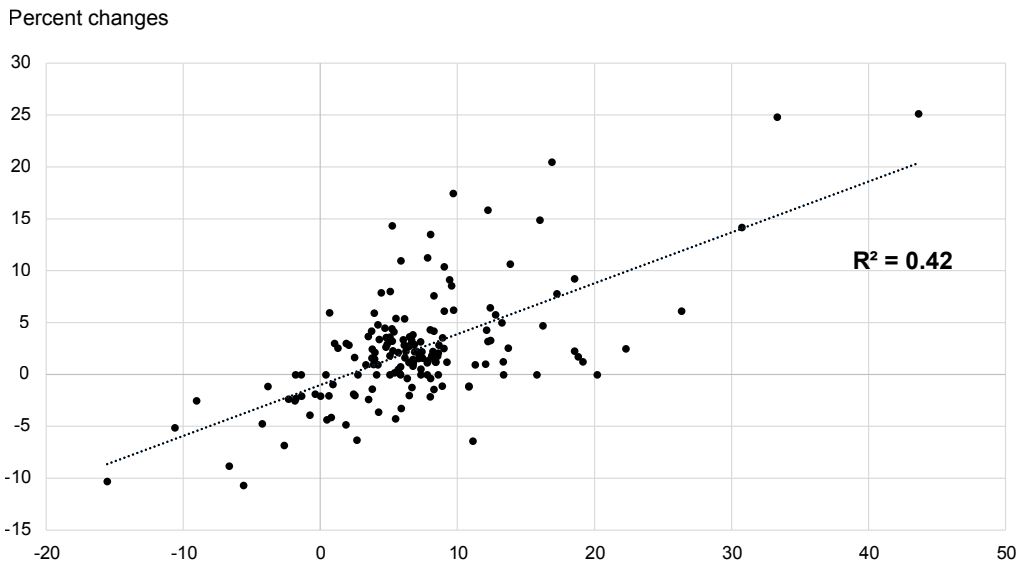


NOTE: Shaded areas are the war years studied in this paper.

SOURCE: Various (see text for data sources).

Figure 6

Money Growth and CPI Inflation, 1860-2022



SOURCE: Data from Figures 2 and 5.

History has shown that sustained, high rates of inflation cannot typically occur without excessive money growth. Figure 5 plots the growth rate of the money stock for the wartime periods studied in this article. Except for the Korean War, the major US wars were associated with marked increases in money stock growth for the duration of the war. The COVID-19 era has not been exceptional in that regard. As Figure 5 shows, however, the extent to which the money stock increased varied considerably across the episodes. Further, as with the pattern for inflation, the money stock contracted sharply after the Civil War and World War I, but not after the more recent wars. The differences between the first

Table 1

Major US Wars Since the Civil War: Key Facts

War	Period of hostilities	Debt/GDP avg prior four years	Debt/GDP avg during war	Years of fiscal dominance	Average inflation rate	Years of price controls***	Fed share of marketable Treasury debt (beginning)	Fed share of marketable Treasury debt (end)	Fed share of marketable Treasury debt (peak)
Civil War	1861-65	1.5	21.0	1861-65	14.8	N/A	N/A	N/A	N/A
WWI	1917-18	3.3	21.5	1917-19	19.0	1917-18	4.9	0.67	9.51
WWII	1941-45	41.9	60.8	1941-51*	5.9	1942-46	5.49	9.42	9.51
Korean	1950-53	90.0	65.3	1950-51*	3.0	1951-53	11.22	16.24	16.93
Vietnam	1964-75	42.8	29.6	N/A	4.9	1971-74	16.93	26.63	29.93
COVID-19**	2020-21	77.4	100.0	N/A	3.0	N/A	14.26	24.38	24.71

NOTE: *Fiscal dominance period ended with the Fed-Treasury Accord in March 1951. **For the COVID-19 period, we use annual data for debt/GDP and CPI inflation from the CBO and BLS. The Fed share of marketable debt is annual averages from monthly data from Hall and Sargent (2022). ***Price controls were in place Aug. 1917–Nov. 1918; April 1942–June 1946; Jan. 1951–Feb. 1953; Aug. 1971–April 1974 (Rockoff, 1981).

SOURCE: Bureau of Economic Analysis, Bureau of Labor Statistics, Congressional Budget Office, MeasuringWealth.com, and Hall and Sargent (2022).

two wars and the subsequent wars likely reflect the different monetary regimes of the eras. Under the gold standard that prevailed in the 19th and early 20th centuries, the price level was volatile in the short run but mean-reverting over time (Bordo 1981). Under the monetary regimes that have prevailed since World War II, however, the price level has exhibited less volatility but has not been mean-reverting. This suggests that the long-run price level has been less predictable since World War II.

Similar to the earlier wars, money stock growth began to slow in 2022. Although M2 rose by 5 percent in 2022, the money stock peaked in March 2022 and declined over the final nine months of the year. The decline after March 2022 coincided with the FOMC's tightening of monetary policy, as reflected in a 4.25-percentage-point increase in the federal funds rate target between March and December 2022. Borio et al. (2022) present a cross-country regime-based model and show that periods of high inflation correspond to periods of excess money growth (the difference between money growth and real GDP growth). This finding correlates well with the surge in money growth during the COVID-19 period. As Figure 6 shows, even over longer periods of time, the correlation between the annual money growth rates and annual CPI inflation rates (plotted in Figures 2 and 5) is relatively strong.[20]

Table 1 provides data on the increases in government debt (relative to nominal GDP), changes in the share of Treasury debt held by the Federal Reserve, and inflation during the five major wars examined here and the COVID-19 period. During the first three wars, the debt-to-GDP ratio rose sharply relative to the average over the previous four years. That ratio rose sharply during World War II, although, as Figure 3 shows, the average of 60.8 percent belies the eventual peak of more than 100 percent. Federal debt outstanding more than quintupled, rising from $51 billion in 1940 to $260 billion in 1945 (Carter et al., 2006, series ea682). Public debt outstanding eventually peaked a year after the war ended, in 1946, at $271 billion (106.1 percent of GDP). Through 2022, the debt-to-GDP ratio never surpassed the record debt level of 1946; but the debt level of 100.3 percent in 2020 did come close (see Figure 1). Debt that was accumulated during the post-World War II years was subsequently reduced by fiscal tightening, economic growth, and inflation, as reflected in the declining debt-to-GDP ratio throughout the pre-war and wartime years of the Korean and Vietnam periods.

Table 1 shows that inflation was a characteristic of each wartime episode, as were price controls, though the experiences varied. As noted above, wartime inflation was highest during the Civil War

20. The linear regression line shown in Figure 6 is based on a least-squares regression between the two variables, plus a constant term.

and World War I eras, but much lower in later wars. As discussed in detail in the Appendix, temporary wage and price controls were implemented during the 20th century wars. Wage and price controls appeared to have been much more effective in keeping inflation low during the second World War and the Korean War than in World War I. However, inflation accelerated after the price controls were lifted in all three episodes. For example, after price controls were lifted in 1946, the CPI inflation rate approached 20 percent during the first half of 1947 and averaged 14.5 percent between July 1946 and December 1947. Inflation then fell sharply and between January 1949 and June 1950, the CPI inflation rate averaged -1.0 percent, i.e., a *deflation* rate of 1.0 percent. Wage and price controls were also implemented in August 1971 as part of the Nixon Administration's strategy to contain inflation (see Table 1). But unlike prior wartime experiences, inflation rose while the controls were in place and rose still higher after controls were lifted.[21] In the latter part of the Vietnam War (August 1971 to April 1974), the CPI annualized inflation rate was 4.6 percent in the six months before controls were implemented; inflation rose to 6.2 percent during the control period, and then to 12.1 percent six months after the controls were lifted (Rockoff, 1981, Table 1).

Eras of Fiscal Dominance

As noted above, fiscal dominance occurs when the monetary authority no longer exercises full control over its balance sheet. This occurred in World War II when the Fed acquiesced to the Treasury by pegging the value of short- and long-term interest rates to reduce the government's interest cost (see the Appendix for details). Fiscal dominance can lead to higher inflation as the central bank's liabilities expand to accommodate increased government spending (see Sargent, 1982; Cochrane, 2022b). For example, central bank purchases of government securities typically increase the reserves of the banking system and, hence, the monetary base. During World War II, the Fed purchased a large share of the increase in Treasury debt. However, in World War I, the Fed financed wartime expenditures mainly by lending on favorable terms to banks against their holdings of government securities. In that instance, reserves and the monetary base rose sharply even though the Fed did not directly purchase large amounts of government securities.

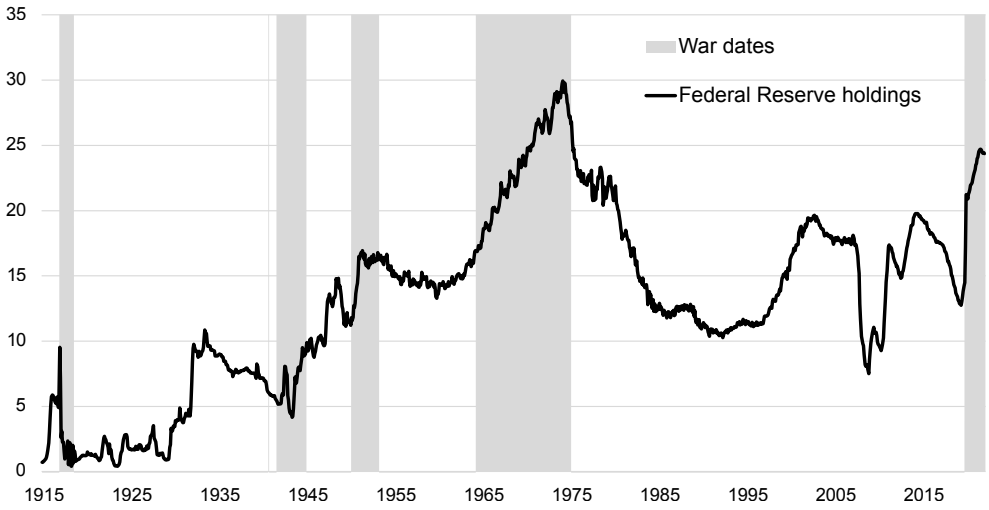
Figure 7 shows the Fed's holdings of marketable interest-bearing Treasury debt as a percent of total marketable interest-bearing Treasury debt. All else equal, an increasing share of Treasury debt held by the Fed will tend to increase the money supply and thus contribute to inflation. From 1913 to 1974, the Fed's share of marketable interest-bearing debt steadily increased, from near zero to roughly 30 percent. Thereafter, the share fell until the pandemic, but on a volatile path that exhibited no discernible trend. The figure shows, however, that the Fed's holdings of Treasury debt usually increased during wartime periods and that the Fed's holdings of interest-bearing Treasury debt rose sharply during the COVID-19 period. As noted previously, Hall and Sargent (2022) find that the Fed financed roughly half of the increase in federal debt during the war on COVID-19.

Table 1 provides a more granular analysis of debt/GDP, wartime inflation, and fiscal dominance. Fiscal dominance clearly prevailed at times in the first four wars, but not in the Vietnam War. Unlike World War I and II, the Fed did not explicitly agree to support government spending during the Vietnam War. However, Fed Chair William McChesney Martin faced considerable political pressure to adapt monetary policy to the Administration's policy objectives. He was protective of the Fed's independence and was famously taken to task by President Johnson for raising the Fed's discount rate in 1965 (Bremner 2004, pp. 208-10). However, Martin also believed in consensus and accepted limits on the Fed's independence. According to Meltzer (2009, pp. 48-49), Martin's view of Fed independence

21. George Shultz, who administered price controls in the Nixon Administration, argued that the price controls encouraged easier monetary policy, which might explain why inflation continued to rise. See Meltzer (2009, p. 761).

Figure 7

Federal Reserve Holdings of Marketable Interest-Bearing Federal Debt as a Percent of Total Marketable Interest-Bearing Debt (Par Value), 1915-2021



SOURCE: Hall and Sargent (2022).

was that of "independence within the government, not independent of the government." Further, Martin "made it clear that to him independence did not permit the Federal Reserve to prevent inflation if the administration and Congress ran large budget deficits" (Meltzer 2009, p. 85).[22] A charitable reading of the Martin tenure is that, while the Treasury never demanded that the Fed buy securities issued for wartime finance purposes, as in World Wars I and II, the seeds of the Great Inflation were sown during his tenure.

Similarly, during the COVID-19 period, the Fed did not explicitly align its monetary policies with the government's fiscal policy. Nonetheless, monetary policy in 2020-21 was aggressive and has been likened to a fiscal "helicopter drop" (see Cochrane, 2022a). However, the war on COVID-19 was not a period of fiscal dominance in the sense that the Fed opposed (overtly) the government's spending plans but was powerless to resist. Still, the pandemic was a period like other major wars since 1913 when a vigorously expansionary monetary policy coincided with a sudden, large increase in government spending. In that sense, monetary and fiscal policy acted in tandem—and maybe that is a distinction without a difference.

4 CONCLUSION

The major US wars since the Civil War were all characterized by sharp increases in government spending, rising federal debt levels, significant monetary accommodation, and inflation. We find that fiscal dominance, which can be thought of as monetary support of government spending, was a feature of most of the major wars reviewed here. The "war" on COVID-19 was also characterized by exceptional monetary accommodation, and it is perhaps surprising that more economists and policymakers were not attuned to the possibility that inflation could move sharply higher. Of course, the response to the economic impact of COVID-19 was also different from the war experiences in various ways. For example,

22. Gardner Ackley, who chaired the Council of Economic Advisors under President Johnson, reported that "on several occasions … Martin has persuaded the Open Market Committee to go along with something 'because the President wanted it.'" (Quoted by Woolley 1984, p. 116).

government spending during the pandemic consisted largely of transfer payments to households and firms to help them weather unemployment and income loss, rather than of purchases of war material and payments to service members. And, unlike most wars, which cease with an armistice, the pandemic has not had a clear end. Still, the tempering of the pandemic, the economic recovery, and rising inflation in 2021 refocused the Fed's attention on restoring price stability. It remains to be seen whether inflation will continue to decline toward a level consistent with price stability as it did after the major wars other than the Vietnam War.

Although the economic contours of the major US wars reviewed in this article had features in common, they had differences as well—for example, in the extent to which government spending was financed by "printing money," a form of fiscal dominance. Inflation outcomes differed, too, in part because of differences in the use of price controls, but also because of institutional features and changes that affected inflation expectations, especially in postwar periods, such as the Fed-Treasury Accord of March 1951. Although the inflation of the 1970s raised doubts about the ability of independent central banks to contain inflation and revived interest in restoring the gold standard, the disinflation of the 1980s and subsequent "Great Moderation" that followed provided strong evidence that a politically independent central bank can contain inflation.

The inflation of the Vietnam War era, which moved even higher after the war, is perhaps the most puzzling of all the major US war periods reviewed in this article. The Great Inflation is almost universally blamed on the Fed's monetary policy.[23] Explanations for why the Fed failed to contain inflation include the failure of policymakers to understand the fundamental cause of inflation and their unwillingness to tighten policy if that meant higher unemployment. However, the Fed was also subject to political pressure during the Johnson and Nixon Administrations. Although political pressure was less overt under the Ford and Carter Administrations, federal budget deficits increased in the second half of the 1970s and the Fed was criticized for raising interest rates while also not reducing inflation. Only when inflation became intolerable and President Carter appointed Paul Volcker as Fed chair was monetary policy used to bring inflation under control. Thus, unlike the prior war eras, the end of the Vietnam war brought neither a significant reduction in fiscal deficits nor an end to pressure on the Fed to keep interest rates from rising.

The fiscal and monetary policies adopted in the "war" on COVID-19 were indeed like past wars. Sharp increases in government spending with substantial monetary accommodation promoted a rapid recovery from the severe, but brief, recession in the second and third quarters of 2020. However, as in past wars, those fiscal and monetary policies also contributed to a significant increase in inflation. Whether price stability will be restored quickly (as it was after the Civil War and World War I or soon after the removal of price controls at the end of World War II) or persist for several years (as it did after the Vietnam War) remains to be seen. The era of modern central banking shows that central banks are capable of achieving low inflation, though the evidence from US wars suggests that the extent of government spending and the means used to finance that spending (e.g., monetizing the debt) can have a significant impact on inflation outcomes. Further, the historical record reveals that postwar periods can be disruptive, with sharp fluctuations in economic activity and inflation, and that a quick restoration of price stability requires a recalibration of monetary policy that cannot always be taken for granted.

23. The United States was not alone in having high inflation in the 1970s, but inflation experiences differed across countries. See, for example, Beyer et al. (2013), Ito (2013), or DiCecio and Nelson (2013).

DATA APPENDIX

The historical data used in Table 1 and Figures 1 and 2 are from www.measuringworth.com. These data have been used in many academic studies, some of which are cited in this article (e.g., Hall and Sargent 2021, 2022; and Rockoff, 2015).

The measures of the growth of the M2 money stock plotted in Figure 3 are derived from many sources. The source of pre-1959 money stock data is Carter et al. (2006, series cj28 for 1859-66; series cj45 for 1867-1947; series cj52 for 1947-59). For later years, the money stock is measured as M2 and sourced from the Board of Governors of the Federal Reserve System.

Data on the Fed's holdings of Treasury securities were graciously provided by George Hall. These data are monthly and measured in terms of market values. See George Hall, Jonathan Payne, Thomas J. Sargent, "US Federal Debt 1776-1960: Quantities and Prices," Working Papers 18-25, New York University, Leonard N. Stern School of Business, Department of Economics, 2018.

Data for Figures 5 through 8 are from the Bureau of Economic Analysis, the Federal Reserve System, and Haver Analytics. These are publicly available data that can be found in the St. Louis Fed's FRED® database.

APPENDIX: US WARTIME EXPERIENCES

The data indicate considerable variation in the extent and timing of money growth and inflation during major US wars and their postwar periods. This appendix provides a more detailed summary of the major wars from the Civil War to the Vietnam War for insights about the relationships between wartime government expenditures, inflation, and the monetary regime.

The Civil War

Civil War hostilities began with the Confederate attack on Fort Sumter in April 1861. Major hostilities ended on April 12, 1865, when General Robert E. Lee of the Confederate Army of Northern Virginia formally surrendered to US General Ulysses S. Grant; the war officially ended on June 2, 1865, when final terms of surrender were signed with the Confederate Army of the Trans-Mississippi.

Federal debt outstanding (excluding debt issued by the Confederacy) increased 15-fold during the Civil War, from about 2 percent of GDP in 1860 to 31 percent in 1865, where it remained until 1869. Over the same period, the money stock nearly tripled, from $554 million in 1860 to $1,445 million in 1865 (the peak estimate is $1,506 reached in November 1864) (Carter et al., 2006, series cj28). The consumer price index level rose from 8.1 to 15.8 (1982-84 = 100) and the GDP deflator rose from 4.7 to 8.4 (2012=100). Thus, while federal debt-to-GDP ratio increased by a factor of 15 during the war years, the money stock tripled and the price level roughly doubled. Although federal debt remained at about 31 percent of GDP in the immediate postwar years, the money stock and price level began to fall after the war ended.

The federal (Union) government was relatively successful in financing its war effort, such that the price level *only* doubled during the war, with an average annual inflation rate during 1861-65 of about 12 percent; but the Confederate government was much less successful in avoiding inflation. While tax revenue covered some 21 percent of federal expenditures, taxes paid for just 5 percent of spending by the Confederate government.[24] The Confederate government borrowed heavily to finance its expenditures and issued currency that could be used to purchase Confederate debt. Thus, in essence, the South financed much of its war effort by printing money. The result was an inflation rate that topped 9,000 percent by war's end.

24. See: http://www.taxhistory.org/www/website.nsf/Web/THM1861?OpenDocument.

The federal government had more ability to raise revenues through various forms of taxation. Tariff rates were increased on imported goods and new taxes imposed on incomes and a variety of domestic goods. The Internal Revenue Act of 1862 created the Bureau of Internal Revenue and provided for new excise taxes on goods and a variety of other taxes; a subsequent revenue act in 1864 raised tax rates and penalties for noncompliance (Studenski and Krooss 1952, pp. 137-60; Fox, 1986).

Although taxes covered a nontrivial portion of federal government wartime spending, a larger share was debt financed, including through noninterest-bearing debt issued in small denominations that was commonly referred to as "greenbacks." Greenbacks could be used to pay taxes, settle private debts, and purchase interest-bearing bonds authorized by the same legislation, but were not redeemable in gold or silver. A funding bill enacted in February 1862 authorized a $150 million greenback issue. Subsequent legislation in July 1862 and July 1863 authorized another $300 million of greenbacks. In total, the government issued $430 million of greenbacks, comprising approximately a third of the total money stock (Rockoff, 2015).

In addition to greenbacks, the federal government issued large amounts of interest- bearing debt. Congress helped spur demand for this debt by creating a new federal banking system and tying the currency issued by the banks in that system to the amount of government bonds they purchased. Before the Civil War, US currency comprised notes issued by state-chartered commercial banks. Although such notes were generally accepted in their local communities, notes of distant banks tended to circulate at discounts if they were accepted at all, reflecting uncertainty about whether the issuing bank would stand behind its promise to redeem them in gold or silver at par, as well as the cost of collecting from distant banks. The National Banking Acts of the 1860s standardized the currency by creating a new federal banking charter, requiring that banks chartered by the federal government ("national banks") hold government bonds to back their note issues and taxing notes issued by state-chartered banks out of existence (Studenski and Krooss, 1952, pp. 154-55). Along with greenbacks, national bank notes were the main form of currency in circulation in the United States before the founding of the Federal Reserve in 1914.

The Civil War era was one of fiscal dominance in the sense that the large expansion of the money stock was a direct result of the government's financing of its wartime expenditures. The money stock ceased to expand when the war ended and government spending fell. The United States did not have a central bank at the time to be dominated, however, and the money stock was determined largely by federal banking laws and the actions of the Treasury.[25] The bimetallic (gold and silver) standard was suspended during the war, which enabled the government to expand the money supply without the constraint of metallic backing for its note issues. There was little debate about returning to a metallic standard when the war ended; the only questions were about how and when to do so (Friedman and Schwartz, 1963, pp. 44). Although a subsequent period of slow economic growth and deflation led some to question resumption, the Resumption Act of 1875 mandated a return to a gold standard in 1879 at the pre-Civil War dollar-parity rate.[26] The United States remained on the gold standard until World War I, and growth of the money stock during 1879-1914 was determined largely by international gold flows and supply. The federal government typically ran budget surpluses in this era and fiscal policy had only limited impact on the monetary base (Friedman and Schwartz, 1963, Chapter 3). Figures 2 and 3 show that periods of monetary contraction and deflation were not uncommon.

25. The federal government chartered two proto-central banks (the first and second Bank of the United States) in the pre-Civil War era. The federal government owned 20 percent of the stock of each bank and they acted as fiscal agents for the government. However, their charters were not renewed; and, by the 1860s, the only banks operating in the United States were chartered by state governments. The United States had no official central banks until the Federal Reserve was founded in 1914.

26. Friedman and Schwartz (1963, pp. 44-50) describe the politics of returning to a metallic standard after the Civil War.

World War I

World War I broke out in Europe following the assassination of Austria's Archduke Franz Ferdinand on June 28, 1914. The United States initially adopted a policy of neutrality but German submarine aggression against neutral ships and ocean liners, such as the Lusitania, eventually pulled the United States into the conflict in early 1917. After some 18 more months of fighting, an armistice ending the conflict was signed on November 11, 1918.

Federal government expenditures increased sharply after the United States entered the war, from $713 million in 1916 to $1.95 billion in 1917, $12.7 billion in 1918, and $18.49 billion in 1919 (Carter et al., 2006, series ea585). Higher taxes covered a portion of the increase in spending. The outbreak of hostilities in 1914 reduced international trade and tariff revenue, which Congress attempted to offset with new excise taxes via the War Revenue Act of 1914. The Revenue Act of 1916 subsequently levied additional excise taxes, increased income taxes on households and corporations, and imposed an estate tax.[27] Additional legislation in 1917 levied a tax on excess corporate profits, raised personal income tax rates again, and added a surtax on household incomes above $6,000 (roughly $137,000 in 2022 dollars). Finally, the Revenue Act of 1918 (which was enacted in early 1919) raised tax rates on income, profits, and estates. The various changes to the federal tax system increased the share of federal revenues derived from income taxes from 16 percent in 1916 to as high as 58 percent during the years 1917-20.[28]

Despite substantial tax increases, the federal government also borrowed heavily to finance wartime spending. When the United States entered the war, the amount of federal government debt outstanding ($1.2 billion in 1916) was less than 5 percent of GDP. By 1918 it had risen to 30 percent and the amount of debt outstanding had ballooned to $12.5 billion. Total federal debt outstanding peaked in 1919 at $25.5 billion (Carter et al., 2006, series ea587).

Inflation began to rise before the United States entered the war. It peaked at over 20 percent and averaged above 10 percent per year from 1917 through 1920, despite government controls on the prices of various commodities (Stewart, 1941; Rockoff, 1984). In all, the price level more than doubled between 1914 and 1920, as did the stock of money.

The Federal Reserve System had been in operation less than three years when the United States entered World War I. The outbreak of war in 1914 precipitated a brief financial panic and a gold outflow from the United States. US exports began to increase within a few months, however, and gold poured into US banks, causing the money stock to rise.

Although the Fed played a major role in helping to finance the war effort, it purchased a relatively small portion of the government's debt. Figure 4 plots Federal Reserve holdings of marketable interest-bearing federal debt as a percentage of total federal interest-bearing debt outstanding from 1915 to 2021. Before the United States entered the war, the Fed held about 5 percent of outstanding Treasury debt. The percentage jumped to nearly 10 percent when the war began but quickly fell back to around 2 percent. While the United States was directly engaged in the war, the Fed's holdings of US government securities fluctuated around an average of $134 million. The Fed was actively engaged in both marketing and financing Treasury debt, however. The Reserve Banks were enlisted to assist in selling government securities to banks and the public and they encouraged their member banks to purchase Treasury securities by establishing preferential discount rates on loans secured by government notes and bonds (Meltzer, 2003, pp. 85-86; Studenski and Krooss, 1952, pp. 293-94). The Fed's loans to member banks increased from about $200 million in June 1917 to nearly $1.8 billion in November 1918 (Board of Governors, 1943, p. 373), and the vast majority were collateralized by US government securities (Board of Governors, 1943, p. 340). As of December 1918, the sum of the Fed's holdings of Treasury securities

27. The 16th Amendment to the U.S. Constitution, which permitted a federal income tax, was adopted in 1913 and Congress passed legislation authorizing an income tax that year.

28. See Studenski and Krooss (1952, pp. 280-301) for details on the financing of World War I.

and loans collateralized by Treasuries represented about 9 percent of total marketable Treasury debt outstanding.

The Fed's commitment to assisting the government's financing of wartime expenditures included support for debt issued after the war, such as the Victory Loan of 1919. Meltzer (2003, p. 90) argues that "by promising not to raise interest rates during the last wartime bond drive, the System relinquished a chance to moderate the postwar inflation." He also reports, however, that after the war, Fed officials were increasingly concerned about rising prices and began to press for higher interest rates, a proposal that the Treasury rejected. Thus, at least for a time, a strict regime of fiscal dominance prevailed in that monetary policy was dictated by the Treasury over the objections of Fed officials.

The period of fiscal dominance began to crack in 1919. Inflation continued to increase sharply, especially after the last of wartime price controls expired in mid-1919, and Reserve Bank officials renewed their calls for higher interest rates. In November, the Federal Reserve Board approved requests from several Reserve Banks to raise their discount rates. Continued inflation and a desire to protect the Reserve Banks' gold reserves motivated further rate hikes over the next six months (Meltzer 2003). The Treasury dropped its opposition to rate increases as government spending and the need to issue debt declined. By 1920, the federal budget was in surplus (Carter et al., 2006, series ea586) and the era of fiscal dominance ended.

Inflation fell sharply in the second half of 1920 and the economy entered a relatively protracted recession.[29] The GDP deflator fell 15 percent from 1920 to 1921, and consumer prices dropped 11 percent. Wartime budget deficits evaporated after the war, and the federal government ran modest annual surpluses throughout the 1920s. The money stock fell 5.6 percent on an annual average basis between 1920 and 1921, while monthly estimates show a drop of 9.4 percent from September 1920, when the money stock peaked, to January 1922.[30]

Thus, as in the Civil War era, World War I brought a large increase in federal spending, much of which was debt financed and supported by the Federal Reserve, resulting in a large increase in the money stock and inflation. The government budget deficit evaporated in 1920, which eliminated political pressure on the Fed to maintain low interest rates: Monetary policy tightened sharply, the price level fell, and the economy endured a moderately severe recession.

World War II

The inflation/deflation cycle that occurred after World War I was followed by nearly a decade of price stability. Then, significant deflation occurred during the first years of the Great Depression, 1929-33, when the price level fell some 30 percent. Federal debt increased relative to GDP: first because of a large decline in GDP from 1929 to 1933 and then from rising federal expenditures under the Roosevelt Administration's New Deal programs and increased defense spending in the second half of the decade.

Federal debt outstanding rose from 15 percent of GDP in 1929 to 42 percent in 1941. Annual federal government expenditures rose tenfold during World War II, from $9.5 billion in 1940 to $93 billion in 1945 (Carter et al., 2006, series ea680). A series of laws were passed that increased various excise taxes, raised tax rates, and broadened tax bases on corporate and personal incomes and inheritances. Notably, the Revenue Act of 1943 introduced withholding for the collection of personal income taxes.[31] Federal

29. The NBER dates the business cycle peak in January 1920 and the trough in July 1921.

30. The monthly money stock series referred to here is the sum of currency held by the public and commercial bank demand and time deposits, seasonally adjusted, as estimated by Friedman and Schwartz (1970) (NBER Macrohistory database series M14144: https://www.nber.org/research/data/nber-macrohistory-xiv-money-and-banking).

31. See Studenski and Krooss (1952, pp. 436-51) for information on federal government revenues and expenditures during World War II.

government revenues rose from $6.5 billion in 1940 to $45 billion in 1945 (Carter et al., 2006, series ea679). According to Hall and Sargent (2022), taxes financed 30.2 percent of war-related spending in World War II, interest-bearing debt financed 46 percent of the spending, and money growth financed 10.1 percent. The comparable numbers for World War I were 20.8 percent, 74.3 percent, and 6.9 percent, respectively.[32]

As it had during the first world war, the Federal Reserve played a major role in assisting the federal government in financing its debt in World War II. In World War I, the Fed's assistance took the form mainly of encouraging banks to purchase government bonds by providing them with preferential discount rates. By contrast, during World War II, the Fed purchased large amounts of government securities outright. Shortly after Pearl Harbor, the Fed announced that it would engage in open market operations to maintain specific yields on short- and intermediate-term Treasury securities and enforce a maximum market yield on long-term Treasury bonds. The Fed set the rate on 13-week Treasury bills at 3/8 percent, set the rate somewhat higher rates for longer-term securities, and enforced a maximum yield of 2.5 percent on long-term Treasury bonds. The policy required the Fed to purchase whatever securities the public did not want to hold at the specified yields. The result was an increase in the Fed's holdings of Treasury securities from $2.25 billion in December 1941 to $24.26 billion at the end of 1945 (Board of Governors of the Federal Reserve System, 1971, p. 468).

Given the pattern of rates set by the Fed and the public's expectation that the Fed would maintain the pattern at least for the duration of the war, the public preferred to invest in longer-term Treasuries rather than bills; and, by the end of 1945, the Fed held 75 percent of outstanding bills (Garbade, 2020). However, the Fed's holdings of Treasury bonds declined during the war to under $1 billion in August 1945 (Chaurushiya and Kuttner, 2003). As Table 1 shows, the Fed's holdings of Treasury debt ranged from about 5 percent of the total outstanding at the beginning of the war to 10 percent in 1945. The credibility of the Fed's commitment to the pegged yield levels likely encouraged the public to hold more Treasury debt than it would have otherwise. In addition, a scarcity of consumer goods and wartime rationing led households to save a higher percentage of their incomes than normal, and much of that savings was invested in government securities.

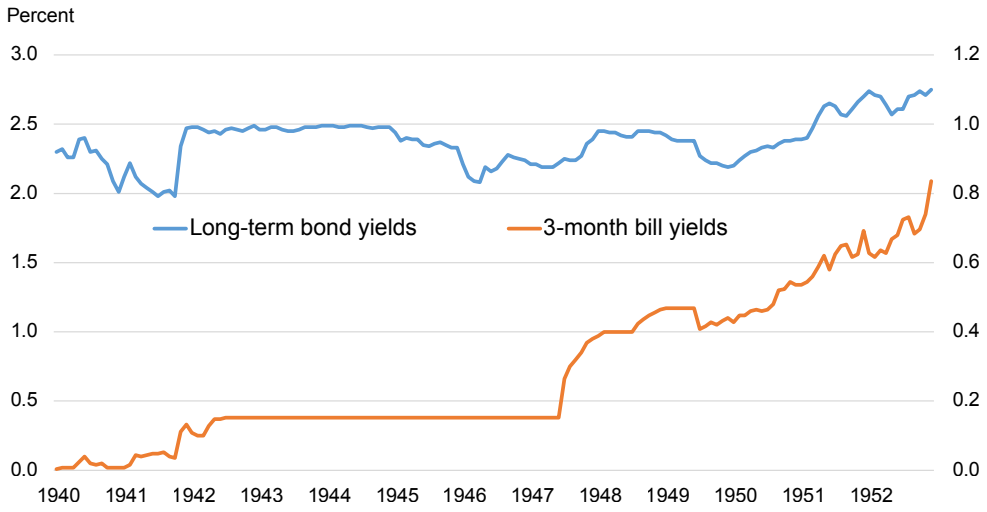
The 10-fold increase in the size of the Fed's Treasury portfolio during the war drove a large increase in the monetary base, which Friedman and Schwartz (1963) estimate rose from $23.7 billion in December 1941 to $43.3 billion in December 1945 (an 83 percent increase). Friedman and Schwartz (1970) estimate that the M2 money stock approximately doubled over the same period, from $64.1 billion to $132.7 billion.

The tremendous growth in federal expenditures and the money stock occurred when much of the productive capacity of the United States was devoted to producing war material. This likely would have resulted in significant inflation were it not for the imposition of price controls. The Emergency Price Control Act of January 1942 created the Office of Price Administration, which had the power to impose ceilings on all prices other than agricultural commodities and a system for rationing scare supplies of many goods. The controls imposed during World War II were "the longest and most comprehensive" in US history, according to Rockoff (1984, p. 85). In 1941, the CPI rose 5 percent, followed by a 10.7 percent increase in 1942 and a 6.1 percent increase in 1943. Thereafter inflation slowed sharply (see Figure 2). Controls were especially effective at containing inflation between April 1943 and June 1946, when strict enforcement limited the measured inflation rate to just 2.3 percent per year (Rockoff, 1984, p. 108).

32. Inflation and "other" contributors are the remaining sources of wartime financing. See Hall and Sargent (2022, Table 2).

Figure A1

Yields on Short- and Long-Term Treasury Yields, 1940-52



SOURCE: Federal Reserve and Haver Analytics.

The Postwar Period

Wartime government spending and growth in the money stock caused household demand to rise at a time when consumer goods were in short supply.

An interesting question is how much of the decline in the rate of inflation in 1948-49 was due to the increased supply of consumer goods and services rather than to a slowing of demand or a change in inflation expectations. Output of consumer goods expanded rapidly after the war, but fiscal and monetary policy also tightened. The last major government funding operation occurred in 1945. The fiscal deficit declined sharply in 1946, and the federal budget was in surplus during 1947-49 (Carter et al., 2006, series ea681).

Although the Fed remained committed to controlling yields on Treasury securities, the budget surpluses made that task easier: Yields remained at or below their pegged levels despite an inflation rate approaching 20 percent. At least partly in response to high inflation, the Fed ended its peg of the Treasury bill rate in July 1947. However, the pegs on other short- and intermediate-term securities, and the ceiling of 2.5 percent on the long-term bond, were maintained, and the Fed apparently had little difficulty keeping market yields from rising. Although prevented from making significant adjustments to interest rates by its commitment to keeping Treasury yields low and stable, the Fed increased reserve requirements on banks and reimposed wartime regulations on consumer installment credit in 1948 (Carlson and Wheelock, 2016). The growth rate of the money stock slowed and turned negative in early 1948, some nine months before the price level peaked in August 1948.

Following a mild recession in 1949, both the price level and money stock began to rise in early 1950. Treasury bill yields also began to rise, and the Fed made open market purchases to prevent yields on intermediate- and long-term Treasuries from moving above their pegs. Figure A1 illustrates the evolution of yields on 3-month Treasury bills and long-term government bonds. After the Fed stopped pegging the 3-month bill yield in July 1947, the market yield rose from 3/8 percent to 1 percent in early 1948. Although the long-term bond yield approached the Fed's 2.5 percent ceiling, it remained comfortably below the ceiling throughout most of 1946-49. However, by 1950 it had begun to rise along with the 3-month bill rate, despite increased Fed purchases. The outbreak of the Korean War in June 1950 brought increased defense expenditures and the US government ran a budget deficit in 1950.

Yields on Treasury securities continued to rise, which the Fed resisted with additional purchases. In May 1950, the size of the Fed's portfolio was at a low point. By March 1951, the Fed had added $5.5 billion to its Treasury holdings, a 32 percent increase, and inflation began to increase as well. The Fed found it increasingly difficult to prevent Treasury security yields from rising without greatly increasing its purchases. Facing a situation that it viewed as untenable, and with the support of key members of Congress, the Fed negotiated an "Accord" with the Truman Administration in March 1951 that ended its commitment to the interest rate pegs, thus ending the period of fiscal dominance.[33]

Friedman and Schwartz (1963, pp. 580-85) consider the contrast between 1947 and 1950-51: that is, respectively, between the period when the Fed was able to maintain its pegs on intermediate- and long-term bond yields with limited open market purchases, despite a 20 percent inflation rate and the period when it had more difficulty even though inflation was lower. They argue that inflation expectations were key: In 1946-47, the public expected that high inflation would be short-lived and foresaw an inflation/deflation pattern like that which followed World War I. Moreover, the public was still haunted by the specter of the Great Depression and the deflation of 1929-33 (Friedman and Schwartz, 1963, p. 658). Large federal government budget surpluses in 1947 and 1948 reinforced expectations of deflation and contributed to a slowing of demand pressures while helping the Fed maintain the structure of yields on Treasury securities with relatively little effort. But by July 1948, the Council of Economic Advisers was warning of "developing inflationary conditions which endanger both our domestic strength and our place in world affairs" (Economic Report of the President, p. 1). Conditions continued to deteriorate further. According to Friedman and Schwartz (1963, p. 610), the outbreak of the Korean War in June 1950 "drastically altered public expectations … and unleashed a speculative boom." Government spending and deficits rose sharply, inflation expectations became unanchored, and the Fed had to purchase large quantities of Treasury securities to prevent yields rates from rising above their pegged levels.

Korean War

The United States entered the Korean conflict in June 1950. Fighting continued until July 1953. Defense outlays boosted federal government expenditures and the federal budget swung from a surplus of $580 million in 1949 to a deficit of $3.1 billion in 1950. Legislation enacted in September 1950 raised corporate and personal income taxes, as well as various excise taxes, which put the budget back in surplus in 1951. Deficits returned in 1952 and 1953 with large spending increases, but taxes covered a higher percentage of wartime expenditures than in previous American wars. Although the stock of federal debt rose, GDP increased even more and the ratio of federal debt outstanding to GDP continued to fall (see Figure 1).[34]

As noted previously, beginning in 1950, the Federal Reserve made large purchases of Treasury securities to prevent their yields from rising above the levels agreed upon with the Treasury. Consequently, the money stock growth rate and inflation rose. The money stock had fallen at an average annual rate of 0.46 percent in 1949, but it began to increase in 1950 and averaged 4.1 percent between June 1950 and July 1953.

The decline in consumer prices ended when the United States entered the war. Inflation rose, peaking at 9.4 percent (measured on a year-over-year basis) in February 1951. The inflation rate then gradually declined. Friedman and Schwartz (1963, p. 598) argue that the Fed-Treasury Accord helped control inflation by reducing the liquidity of Treasury securities and inducing the public to hold larger

33. Meltzer (2003, pp. 691-712) describes the events and negotiations that led to the Accord.

34. Hall and Sargent (2021) note that federal debt outstanding had been falling before the war and contend that although the debt/GDP ratio declined during the war, it was higher in 1954 than it would have been had the war not occurred. Taking into account the halt in the paydown of the federal debt, Hall and Sargent estimate that 45.5 percent of Korean War expenditures were debt financed.

money balances and, perhaps more importantly, by limiting expected inflation. However, Rockoff (1984, pp. 185-87) argues that wage and price controls were more important than the Accord for reducing expected inflation, noting that inflation averaged just 2.1 percent while price controls were in place. In his view, (i) the increase in inflation that occurred early in the war was due more to inflationary expectations than to overly loose monetary policy and (ii) that the imposition of price controls in January 1951 lowered expected inflation. At the same time, the tax hikes and somewhat tighter monetary policy that followed the Accord prevented a burst of inflation after controls were lifted in early 1953. Rockoff (1984, p. 187) concludes that, by chance, "controls during the Korean War…were coordinated almost perfectly with monetary policy": The rate of inflation remained low after controls were lifted, averaging a mere 0.8 percent throughout 1953. Inflation remained low for the next dozen years, averaging just 1.4 percent from 1953 to 1965. Although the Fed refrained from making interest rate changes during periods when the Treasury was issuing new debt (a practice referred to as the "even keel" policy), the era of fiscal dominance of monetary policy ended with the Accord, at least for a while, and the percentage of outstanding marketable Treasury debt held by the Fed drifted downward.

Vietnam War

The "Vietnam era" began in February 1961 and ended in May 1975 according to the Congressional Research Service (2018). The US Department of Veterans Affairs, by contrast, dates the Vietnam war from 1964 to 1975. We use the latter dates since most of the casualties occurred from 1964 to 1975.[35]

The "Great Inflation" overlapped with the Vietnam War and occurred from 1965 to 1982 (Bordo and Orphanides, 2013). Over this period, the CPI increased by 74 percent. The start of the Great Inflation is widely attributed to sharply higher government spending, reflecting President Johnson's "guns and butter" policy—simultaneously prosecuting the war in Southeast Asia and the domestic "war on poverty," along with an accommodative monetary policy (e.g., Meltzer, 2005; Bernanke, 2022).

Figure A2 shows the growth in government spending during the Vietnam era measured relative to GDP. Three broad trends are evident. First, federal expenditures on defense rose between 1965 and 1967 but were generally declining over the longer period. Second, federal transfer payments increased sharply, from about 4.5 percent of GDP in the first quarter of 1966 to 10 percent of GDP in the third quarter of 1975.[36] Third, federal expenditures on nondefense goods and services, such as education or infrastructure, were roughly constant relative to GDP (a little more than 3 percent) from 1965 to 1975.

Despite increased government spending, and unlike the experience of prior major wars, the debt-to-GDP ratio declined between 1964 and 1975, from 39 percent to 25 percent, as inflation pushed nominal GDP higher while also eroding the real value of outstanding debt. However, the federal budget swung from a *surplus* equal to 0.3 percent of nominal GDP in fiscal year 1969 to a *deficit* of 4.1 percent of nominal GDP in 1976. Thus, the decline in the nominal value of Treasury debt relative to nominal GDP belied an expansionary fiscal policy.[37]

Total federal government spending continued to increase after 1975 in both nominal and real terms. Real defense spending peaked in 1968 and then fell until 1975 before rising again. However, nondefense spending was the primary driver of the growth in federal spending over the second half of the 1970s. This included the cost of servicing federal debt. Averaging less than 1.5 percent of GDP between 1962 and the mid-1970s, the growing federal debt and rising interest rates caused debt service costs to almost double to 2.6 percent of GDP by 1982.

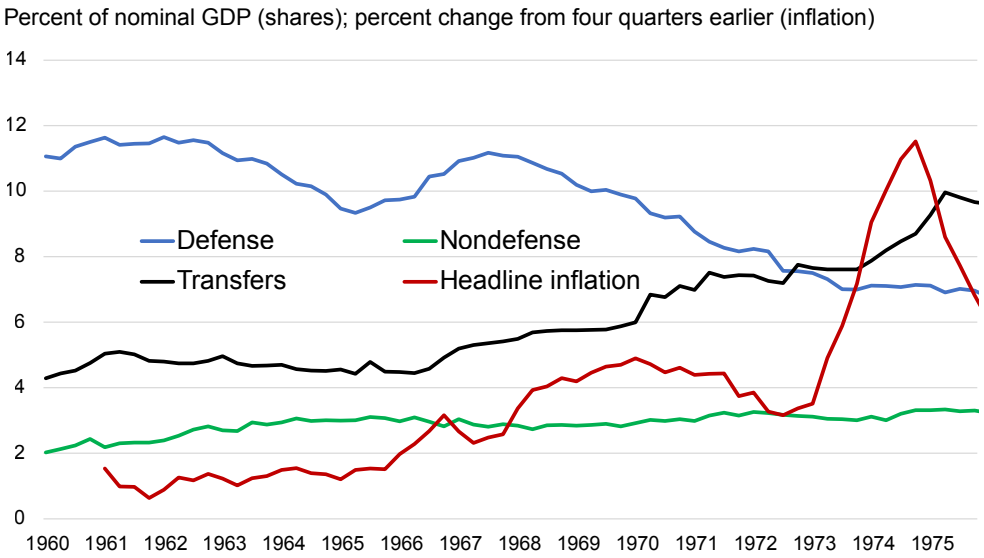
35. According to US government archives, there were 58,220 deaths during the war. There were 200 deaths from 1956 through 1963 (0.3% of the total). See https://www.archives.gov/research/military/vietnam-war/casualty-statistics.

36. Government transfer payments include social security benefits, medical benefits (e.g., from Medicare or Medicaid), veterans' benefits, and unemployment insurance benefits.

37. A falling debt-to-GDP ratio—both in nominal and real terms—largely reflected higher-than-expected inflation, which increased nominal GDP. See Neely (2022) for a discussion of these issues.

Figure A2

Government Expenditure Shares, Transfer Payments, and Inflation, 1960-75



SOURCE: BEA and Haver Analytics.

Unlike prior wars, inflation did not recede after the American withdrawal from Vietnam, but instead continued to rise to more than a 30-year high in 1980. The upward trajectory of inflation from the mid-1960s through the 1970s was punctuated by distinct surges, and when inflation declined following each surge the low point was invariably higher than the low that had followed the previous surge (see Figure 2). These surges and the rising trend rate of inflation have been widely blamed on the Fed's "stop-go" monetary policy (e.g., Meltzer 2009).[38]

Although the Fed would tighten policy when inflation was rising, it reversed course and eased substantially whenever unemployment rose and economic activity faltered. As evidence that monetary policy was to blame for the rising trend rate of inflation, many of the Fed's critics pointed to the rapid expansion of the money stock (see Figure 3), which more than doubled between 1964 and 1975 (rising at an average 8.1 percent annual rate). Money growth continued to accelerate after the Vietnam War, fueling the latter years of the Great Inflation. From 1976 to 1981, annual growth of the M2 money stock averaged 9.7 percent per year. Over this period, the CPI inflation rate averaged 9.2 percent per year, sharply higher than the average inflation rate of 4.9 percent that prevailed from 1964 to 1975.

The reasons for the Fed's failure to contain inflation during the late 1960s and 1970s have been widely studied and debated.[39] Much of the literature has focused on the policy views of the Fed's chairs at the time. The Federal Reserve had four chairs during the Great Inflation era—William McChesney Martin Jr., Arthur Burns, G. William Miller, and Paul Volcker.

Martin had generally orthodox views about the role of monetary policy and the causes of inflation. However, the Fed's monetary policies began to shift as the Kennedy and Johnson administrations appointed new members to the Fed's Board of Governors (and as the Fed hired staff economists with similar views). Policymakers came to accept the idea of a permanent tradeoff between unemployment and inflation, but also that unemployment could fall to very low levels (perhaps 4 percent or even lower)

38. See Blinder and Rudd (2013) for an alternative view that blames the inflation primarily on supply-side disturbances.

39. Among the many studies of Fed policy during the Great Inflation are Romer and Romer (2004), Meltzer (2005), Hetzel (2008) and Goodfriend and King (2013).

without triggering a substantial rise in inflation (Romer and Romer, 2004). As inflation began to accelerate under the Johnson Administration's "guns and butter" policy, Martin pressed President Johnson to enact an income tax surcharge in 1968 to help fight inflation. Then, after the 1968 election, he expressed to president-elect Nixon that "close relations and policy coordination [between the administration and the Fed] are important since monetary policy will need the help of fiscal policy to cope with inflation" (quoted by Bremner, 2004, p. 261).

Arthur Burns succeeded Martin as Fed chair in 1970. Like his predecessor, Burns believed that monetary policy should strive to achieve stable economic growth that was compatible with the aims of fiscal policy (Bremner, 2004, pp. 256-57). Burns also worked closely with the Nixon Administration on economic policy. According to Meltzer (2009, p. 760), Burns "sacrificed Federal Reserve independence and credibility for political reasons to a degree not seen since Marriner Eccles in the 1930s or perhaps never before." Burns strongly advocated the use of wage and price controls to contain inflation, persuaded a reluctant President Nixon to accept controls, and worked with the Administration to devise and administer the controls. Burns chaired the Committee on Interest and Dividends, which was charged with regulating administered interest rates such as the prime rate and dividends. The appointment set up a potential conflict of interest, which, according to Meltzer (2009, p. 767), might explain the Fed's reluctance to raise interest rates to combat inflation in 1972. Meltzer (2009, pp. 791-802) describes President Nixon's repeated efforts in 1971-72 to pressure Burns for a more expansionary monetary policy, reflected in faster growth of the money supply, and Burns' apparent acquiescence. However, Meltzer also notes that most of the other FOMC members and many academic economists supported a looser policy because the economy seemed to be growing at less than potential, as evidenced by an unemployment rate above 5 percent.[40]

Whereas Martin had comparatively orthodox views about the causes of inflation, Burns tended to blame inflation on non-monetary forces, including government budget deficits, oil price shocks and other supply factors, and monopolistic price setting by firms and labor unions. Further, Burns argued that the costs of using monetary policy to reduce inflation could be unacceptably high: "Once an inflation spiral gets underway, I am afraid there isn't a great deal that can be done constructively. A severe recession would bring it to a halt, but no one of us wants that. If we move back toward a policy of severe credit restriction, chances are that we will bring on a recession" (quoted by Bremner, 2004, p. 229).

G. William Miller succeeded Burns as Fed chair in 1978. Meltzer (2009, p. 910) contends that President Carter replaced Burns because he was viewed as "too much an anti-inflationist" and unwilling to cooperate with the Administration on economic policy. Carter's advisors thought that Miller would "work cooperatively with the Administration while preserving the independence of the Fed." (Meltzer, 2009, p. 923) Like Burns, Miller tended to blame inflation on supply-side factors, such as bad harvests and oil price shocks, as well as "excessive" increases in wage rates. Miller argued that monetary policy was not a particularly effective tool for reducing inflation and argued for policies that would increase competition and correct "structural problems" in the economy (Romer and Romer, 2004, pp. 142-43). Miller repeated Burns' mistake of never tightening policy sufficiently to bring inflation under control. Moreover, in Meltzer's (2009) view, the Fed lacked a coherent economic framework: Policymakers were too willing to blame inflation on supply shocks and rising wage rates, especially when the economy appeared to be growing at less than potential and unemployment was higher than what they viewed as consistent with full employment. Thus, unlike the early years of the Great Inflation era, when inflation stemmed at least in part from monetary accommodation of government spending, the continued rise of inflation in the second half of the 1970s seems largely driven by a lack of understanding among Fed

40. See also Woolley (1984, pp. 168-69) who notes that many Democratic members of Congress also favored faster money stock growth at the time.

officials and policymakers generally about the causes of inflation, their misreading of potential growth and employment, and fear that sufficient monetary tightening to control inflation would result in unacceptably high unemployment.

The Fed's monetary policy changed under Paul Volcker, who came into office in 1979 determined to restore price stability. Volcker publicly committed the Fed to controlling the growth of monetary aggregates, which he saw as necessary to establishing the Fed's anti-inflation credibility and the only way to persuade the FOMC to tighten policy sufficiently to break the inflation psychology that had become cemented in financial markets (Hetzel, 2008, pp. 152-53). The end of the Great Inflation thus occurred when Volcker and his colleagues on the FOMC implemented a monetary policy regime designed to slow the growth of money and bring down inflation expectations (Kliesen and Wheelock, 2021).

In the aftermath of the Great Inflation, inflation and macroeconomic volatility declined sharply, and the period from 1984 to 2006 is sometimes referred to as the Great Moderation.[41] Although there were occasional bursts of inflation, annual CPI inflation exceeded 5 percent only once during the period, when oil prices rose sharply following Iraq's invasion of Kuwait in 1990 (see Figure 2). Similarly, until 2020, annual M2 money growth never exceeded 10 percent. It was not until the COVID-19 pandemic that high and rising inflation and rapid money growth reemerged.

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