War, Pandemic, and Household Saving: the COVID-19 Pandemic through the Lens of WWII

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Abstract

Household saving rates were extraordinarily high during WWII and have again increased during the COVID-19 pandemic. In this paper I quantify excess household saving during WWII and the COVID-19 pandemic and compare the contributions of various drivers of increased saving. Excess saving totaled 16.8% of personal disposable income during WWII (1941 to 1945) and 9.1% of personal disposable income during COVID-19 (2020). WWII savings incentives, expansionary fiscal policy, and consumption restrictions explain about 60% of excess saving in WWII. Expansionary fiscal policy and consumption restrictions also explain about 73% of excess saving during the COVID-19 pandemic. Comparing saving behavior and examining the WWII fiscal multiplier shows that the WWII fiscal multiplier can be interpreted as a lower bound for the pandemic fiscal multiplier. Stronger assumptions suggest that the fiscal multiplier during the COVID-19 pandemic is likely at least 0.8 to 1.0. WWII saving played a significant role in fueling the post-WWII boom, suggesting that cautious optimism about the post-pandemic economy is appropriate.

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1 Introduction

One of the difficulties in understanding the economics of the COVID-19 pandemic is the lack of clear precedents. A number of papers, such as Barro et al. (2020), Barro (2020), and Beach et al. (2020), have used the 1918 flu pandemic to understand the likely effects of non-pharmaceutical interventions such as school closures and lockdowns. Policymakers have largely drawn inferences about fiscal policy from studies of the Great Recession and accompanying fiscal interventions—an episode that has been studied extensively and is recent enough to be widely known.

In this paper, I argue that World War II provides invaluable insights for understanding household economic behavior during the COVID-19 pandemic. Obviously a pandemic is not a world war and vice versa, but there are important similarities between the pandemic experiences of 2020-2021 and the US economy during World War II. Both all-out wars and global pandemics are extreme crises that originate outside of the economy but have enormous economic consequences. Both led to dramatic changes in household spending patterns with potentially far-reaching effects.

I examine the five major drivers of increased saving during WWII: savings incentives, expansionary fiscal policy, government debt increases (Ricardian motive), consumption restrictions, and uncertainty. All but the first of these have clear parallels in the COVID-19 pandemic. This paper provides ballpark estimates of each factor's contribution to excess saving during WWII and COVID-19. WWII savings incentives, expansionary fiscal policy, and consumption restrictions explain about 55% of excess saving in WWII. Expansionary fiscal policy and consumption restrictions also explain about 73% of excess saving during the COVID-19 pandemic. Comparing saving behavior and examining the WWII fiscal multiplier shows that the WWII fiscal multiplier can be interpreted as a lower bound for the pandemic fiscal multiplier. Stronger assumptions suggest that the fiscal multiplier during the COVID-19 pandemic is likely at least 0.8 to 1.0. WWII saving played a significant role in fueling the post-WWII boom, suggesting that cautious optimism for the post-pandemic economy is

appropriate.

Economists usually think about economic policies in terms of intertemporal optimization, assuming that economic agents are forward-looking and can mitigate costs by spreading them over time. Both World War II and the COVID-19 pandemic defy these (often implicit) assumptions. Neither event was unforseeable, and in fact federal government agencies were responsible for drafting plans before each crisis emerged. Before World War II, the Office of the Undersecretary of War was responsible for creating and maintaining war mobilization plans, as detailed by Smith (1959). In 2016, President Obama established a Directorate of Global Health Security within the National Security Council. For several decades now the Centers for Disease Control and Prevention (CDC) has regularly monitored potential emerging pandemics and engaged in pandemic planning exercises. Experts were well aware of possibility of both crises before they emerged, even if the American public was not.[1] In both instances, however, plans were inadequate to the scale and speed of the crisis as it emerged.

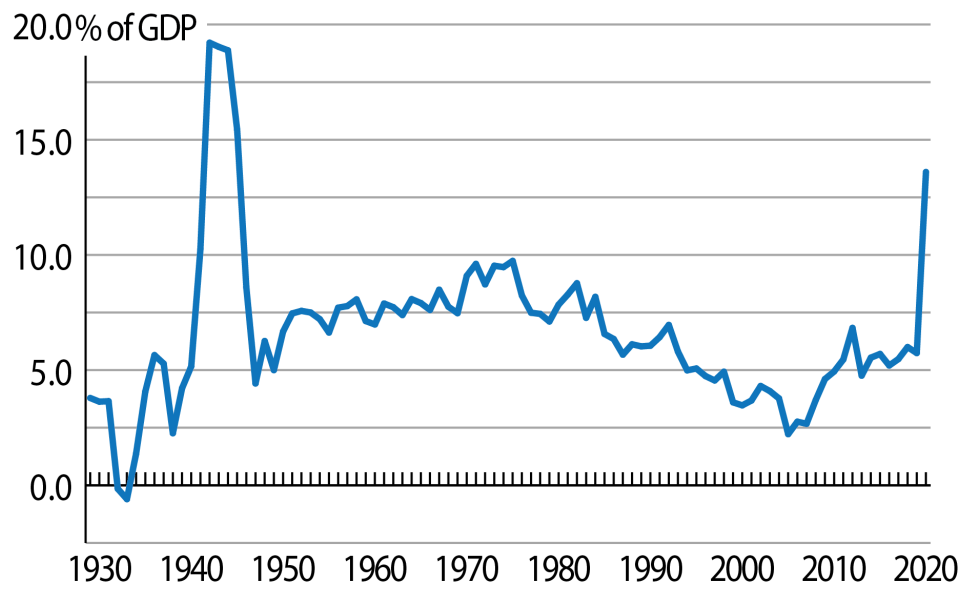
The scale and speed of crisis posed unique challenges for policymakers in December 1941 and again in March 2020. The speed of adjustment took primacy over other considerations as everyone—households, firms, and policymakers—scrambled to implement unprecedented changes that wrenched the economy out of its prior structure. These crises upended normal intertemporal optimization processes practiced by households, firms, and government.

As can be seen in Figure 1, households responded to both the crises themselves and the government's interventions in response to the crises by dramatically increasing their savings rates.

In this paper I quantify household saving behavior during WWII and the COVID-19 pandemic and compare the contributions of various drivers of increased saving. I find that excess saving in WWII was almost twice as large as excess saving during the COVID-19 pandemic. Excess saving totaled 16.8% of personal disposable income during WWII (1941 to 1945) and 9.1% of personal disposable income during 2020. Saving behavior during the first

[1]While WWII began in Europe in 1939 with the German invasion of Poland, isolationist sentiment was strong in the United States. Even as late as fall 1941, WWII was commonly dismissed by most Americans as a "phoney war." It is hard to understate how dramatically Pearl Harbor altered Americans' outlook.

Figure 1: Net Private Saving of Households and Institutions
Soared During WWII and COVID-19



Source: FRED/Bureau of Economic Analysis

half of 2021 appears very similar to saving behavior during 2020: excess saving totaled 8.5% of personal income over over the first two quarters of 2021.

After quantifying excess saving, I then discuss the five main drivers of excess saving during WWII: savings incentives, expansionary fiscal policy, government debt increases (Ricardian motive), consumption restrictions, and uncertainty. Four of these five factors (all but savings incentives) have clear parallels in the COVID-19 pandemic. I estimate that factor's contribution to excess saving during each crisis.

The goal of this paper is to provide ballpark estimates of each factor's contribution to excess saving during WWII and COVID-19, providing a framework for understanding pandemic saving and its effects on the broader macroeconomy. While some effects can be identified precisely, data limitations and the sheer scope of both crises make precise identification of every effect impossible.

WWII savings incentives, expansionary fiscal policy, and consumption restrictions explain about 60% of excess saving in WWII. Expansionary fiscal policy and consumption restrictions

also explain about 73% of excess saving during the COVID-19 pandemic. About a fifth of excess saving in each crisis can be explained by expansionary fiscal policy, implying that fiscal policy had about twice as large an effect on saving during WWII since excess saving was almost twice as large during WWII. Consumption restrictions explain similar increases in saving during both WWII and the COVID-19 pandemic, implying that they explain about half of excess saving during the pandemic and one quarter of excess saving during WWII.

I then turn to implications for fiscal policy. The WWII fiscal multiplier can be interpreted as a lower bound for the pandemic fiscal multiplier. With stronger assumptions, comparisons between WWII and the pandemic suggest a cross-sectional pandemic multiplier of roughly 0.8 to 1.0.

Finally I examine the influence of WWII saving on the post-WWII economy and its implications for the post-pandemic economy. WWII saving fueled post-WWII consumption of housing and cars—categories of consumption restricted during the war. These findings suggest that excess saving during the COVID-19 pandemic may help boost the post-pandemic economy. However, optimism should be cautious. Pandemic consumption restrictions have been concentrated in services, not durables, and services consumption may be more difficult to shift intertemporally than durables consumption.

Apart from household saving behavior, other aspects of the macroeconomic environments during WWII and COVID-19 differ dramatically. These differences necessitate caution when comparing the two periods. During WWII, the US economy was at full employment. Real disposable personal income increased by 37.6% from 1940 to 1943 in spite of large tax increases, though growth stalled between 1943 and 1945. In contrast, the COVID-19 pandemic led to widespread unemployment. Real disposable personal income grew 7.5% from 2019 to 2020, but increases in disposable income were directly attributable to government transfer payments. WWII occurred during the "Great Compression" of wages in the mid-20th century (and may have caused wage compression), a period when wages grew quickly for most workers. In contrast, the COVID-19 pandemic occurred during a long period of wage divergence, in which only the highest earners saw large wage growth. Because of these and other differences in the

underlying macroeconomic environments, there is probably more heterogeneity in the effects of the COVID-19 pandemic on households than in the effects of WWII.

The remainder of the paper is structured as follows. Section 2 quantifies excess saving during WWII and during the COVID-19 pandemic. In Section 3 I examine drivers of excess saving in WWII and their present-day analogs. Section 4 addresses the implications of the household saving results for the size of the fiscal multiplier. Section 5 discusses the influence of wartime saving on the post-WWII US economy and implications for the post-pandemic economy. Section 6 concludes.

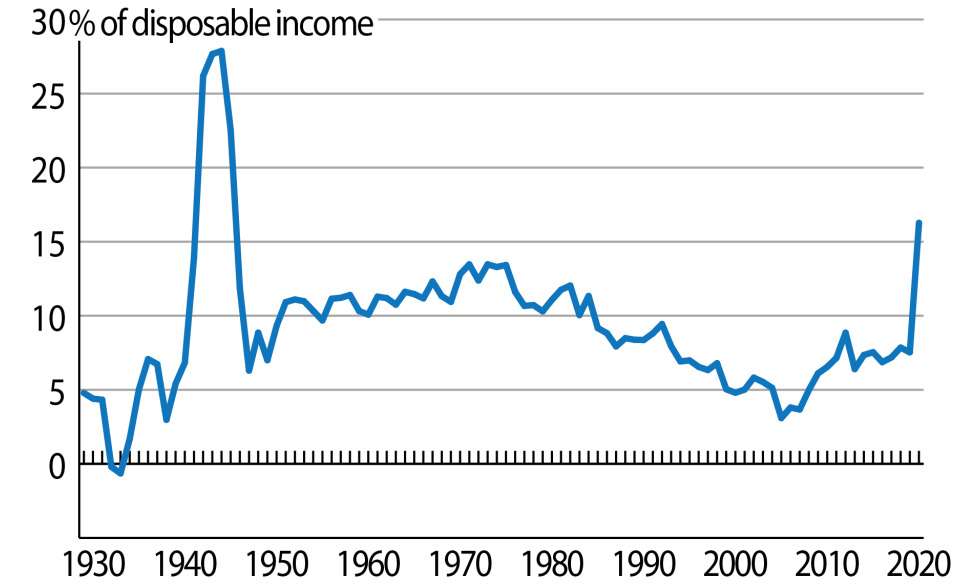
2 Quantifying Excess Saving

The unusually high rates of household saving during both World War II and the COVID-19 pandemic are clearly visible no matter how household saving is measured. For this paper, I measure saving as a fraction of disposable personal income. This measure is shown in Figure 2.

I choose to measure saving as a fraction of disposable personal income for several reasons. First, I want a measure that relates closely to the household's consumption-saving decision, since WWII and the COVID-19 pandemic both influence that decision in similar ways. Second, I do not want measurement to be influenced by the different treatment of government purchases versus transfer payments in GDP. I am interested in households' response to the combination of the crisis itself and the government's response to the crisis. Both WWII and COVID-19 prompted expansionary fiscal policy on a massive scale, but the composition of fiscal packages was substantially different. WWII spending was almost entirely government purchases while transfer payments played a much larger role during COVID-19. Because government purchases are directly included in GDP while transfer payments are not, measuring saving relative to GDP would distort comparisons. Measuring saving relative to personal income avoids this problem. Finally, I measure saving relative to *disposable* personal income because I don't want measurement influenced by differences in tax regimes.

I define *excess saving* during World War II and COVID-19 as all saving above 7.5% of

Figure 2: Personal Saving as a Share of Disposable Personal Income



Source: Bureau of Economic Analysis

disposable income. This benchmark seems reasonable given savings rates before (and in the case of WWII, after) each crisis. In aggregate, households saved 6.8% of disposable personal income in 1940 and 7.6% of disposable personal income in 2019. Over the five years each preceding and following WWII (1936–1940 and 1946–1950) personal saving averaged 7.2% of disposable personal income, and over the five years preceding COVID-19 (2015-2019) it averaged 7.4%. In this context, 7.5% of disposable personal income is a reasonable threshold for the "normal" personal saving rate for purposes of comparison. Small changes in this threshold do not significantly alter any of the results.

In principle one might take a more sophisticated approach and estimate the "normal" rate of saving as a function of the nominal interest rate using data from non-crisis periods. However, interest rates were quite low during both WWII and COVID-19, so this exercise seems likely to add more noise than meaning.

Using these definitions, how much excess saving occurred during WWII and COVID-19? Excess saving totaled $111.5 billion (in nominal dollars) over 1941–1945, or 16.8% of disposable personal income. In 2020, Excess saving totaled $1.6 trillion, or 9.1% of disposable personal income. In the first half of 2021, excess saving totaled $804 billion, or 8.5% of

disposable personal income. Thus on an annual basis, excess household saving during the COVID-19 pandemic is about half its WWII level.

3 Drivers of Excess Saving During Crisis

Given estimates of excess saving during both WWII and the COVID-19 pandemic, the next step is to consider the drivers of increased saving during both crises. While not every driver of WWII saving has modern analogs, many causes of increased saving are common to both crises: large expansions in fiscal policy, Ricardian motives for saving, consumption restrictions, and uncertainty. In this section I examine each major driver of saving in WWII and estimate its contribution to excess saving. For the savings motives with modern parallels in the COVID-19 pandemic, I also assess their contributions to saving in 2020 and then compare the relative contributions of each motive in both episodes.

Some effects can be precisely identified and compared using available data. For other effects, data limitations make estimates imprecise. However, the scale of shocks involved is so large that even imprecise estimates are useful.

3.1 Savings Incentives Unique to WWII

During WWII policymakers intentionally incentivized saving in the hope of reducing inflation. This policy goal has no analog in the COVID-19 pandemic, but can explain some excess saving during WWII.

To encourage saving during WWII, policymakers enacted a payroll deduction program that allowed workers at participating firms to purchase war bonds through payroll deductions. Participation in the payroll deduction program peaked at 27.6 million workers in June 1944, at which point over half of all members of the military and civilian non-farm employees in the US were participating.[2] Payroll deductions for war bond purchases totaled $15

[2]The 27.6 million total includes soldiers in the Armed Forces as well as civilian employees in the US. Civilian non-farm payrolls totaled 41.9 million in June 1944 and another 11 million Americans served in the Armed Forces in 1944.

billion over December 1941 through April 1945.[3] At peak, 11% of total participant pay was deducted for war bond purchases. Annual reports from large firms such as General Motors and International Harvester report within-firm employee participation rates above 90%.

Unfortunately, I am not aware of disaggregated historical data that could be used to directly estimate the effect of the WWII payroll deduction program on households saving rates. Conceptually, this question is fairly close to the public finance literature on how retirement savings plans—which are also implemented through payroll deductions—influence total household saving. This literature unfortunately lacks consensus. At one extreme, a set of papers (Gale and Scholz, 1994; Engen et al., 1996) argue that savings incentive plans such as 401(K)s have no net effect on savings. Another set of papers (Venti and Wise, 1990; Poterba et al., 1995, 1996) argue that savings incentives have significant effects on household behavior. In more recent papers, Gelber (2011) finds significant effects of 401(K) eligibility on both 401(K) holdings and other retirement assets, but also increases in net debt. Card and Ransom (2011) find that a 10% increase in pension contributions translates to a 3-7% increases in total saving (retirement plus supplemental saving) among university employees. The range of estimates in the literature is quite large in part because of differences in data—specifically in how different papers measure total household saving. Yet this literature also suggests a large role for behavioral and framing effects on saving behavior.

Due to the lack of consensus in this literature and the indications that findings may be quite sensitive to behavioral and framing effects, a wide range of estimates are plausible. Specifically, the increase in net savings may plausibly be anywhere from 0% to 150% of total payroll deductions for war bond purchases. At the lower bound of the plausible range, the WWII payroll deduction program would not explain any excess saving in WWII. At the upper bound of the plausible range, the WWII payroll deduction program would explain $22.5 billion in excess saving (150% of $15 billion), or roughly 20% of excess saving in WWII. Taking the midpoint of the plausible range, the WWII payroll deduction program accounts for 10% of

[3]This figure is computed from data published in the *Monthly Treasury Bulletins*. The payroll deduction program for war bond purchases began in December 1941; payroll deductions for war bond purchases are not reported after April 1945.

excess saving in WWII.

3.2 Expansionary Fiscal Policy

WWII and the COVID-19 pandemic both prompted immense fiscal responses from the federal government. These fiscal policy responses increased household incomes during both periods. In WWII, war production indirectly raised household incomes. During COVID-19, household incomes rose via direct checks to households and expanded unemployment benefits. Transfer payments played a much larger role in the latter episode while government purchases dominated the former. In both cases, however, households' disposable incomes increased significantly due to the government's response to the crisis.

If the marginal savings rate during the crisis exceeds the average savings rate from before the crisis, household saving will increase (as a share of disposable income). The question, then, is how much excess saving is explained by expansionary fiscal policy during each crisis?

3.2.1 Fiscal Policy and Saving in WWII

For WWII, this question translates into the effect of war production on household saving. The geography of WWII spending is fairly exogenous once we control for key pre-WWII location characteristics. WWII contract placements were controlled by the military, which ignored economic considerations when placing contracts. The reasons for the military's attitude and evidence from the historical narrative are detailed in Brunet (2021). Rhode et al. (2017) examine the political economy of WWII contract placement and find no evidence of political biases in the locations of WWII contracts. It is important to control for pre-WWII manufacturing employment rates (positively correlated with war production) and agricultural exposure (negatively correlated with war production but positively correlated with income due to the wartime farm boom). Once these features are accounted for, however, the military's utter disregard for local labor market conditions and similar economic considerations makes estimating the effects of WWII production on household savings rates a straightforward exercise.

I use two different empirical approaches to estimate the influence of WWII production on household saving, which produce similar results. Each approach has different advantages and disadvantages, and leverages different identifying variation. First, I use state-level panel data. Second, I use a cross-section of county-level data.

For both approaches, I measure war production using micro data on individual WWII contracts. The contract data covers all war production contracts with private companies.[4] The contract data covers $180.6 billion in contracts over 1940 to 1946. The contract data does not include direct personnel costs (i.e. wages) for the armed forces, food purchases by the military, or facilities construction (either military bases or factories). Total US military spending for 1940 to 1946 was $305 billion, so the contract data represents 59% of all WWII spending. This data is discussed at length in Brunet (2021).

To measure saving during WWII I focus on two measures: Series E war bonds and changes in bank deposit holdings. Series E war bond purchases and increases in deposit holdings account for 59% of net private saving over 1941 to 1945; Series F and G bond sales account for another 8%.[5] So together E-bonds and increases in deposit holdings account for the majority of wartime saving. At the state level, data on both E-bond purchases and bank deposits is available annually. At the county level, data E-bond purchases and bank deposits are available for selected years only. These differences in data availability are the reason why I use both approaches.

3.2.2 Fiscal Policy and Saving in WWII: State-Level Panel

For the state-level panel, I estimate:

[4]The contract data includes contracts from government-owned, company-operated facilities, the "GOCO" model stressed by historian Mark Wilson (2016) as central to WWII production.

[5]Series F and G bonds could be purchased by individuals, but also by corporations, trusts, and other non-financial institutional investors. F- and G-bonds had a slightly longer maturity than E-bonds (12 years instead of 10) and a lower rate of return (2.5% annually instead of 2.9% annually). Individuals were limited to $5,000 per year (maturity value, $3,750 purchase value) in E-bond purchases but could buy up to $100,000 per year in F and G bonds (combined maturity value). Because E bonds were available in smaller denominations and had higher rates of return, they were the primary savings vehicle for households; individual investors would have maximized their returns by buying F- and G-bonds only after reaching the annual purchase limit on E-bonds.

Table 1: Savings Responses to War Spending: State Panel Approach

	Disposable Personal Income	Savings	
		Change in Deposits	E-Bond Purchases
β	0.219***	0.122***	0.0275***
	(0.0546)	(0.0331)	(0.00903)
Observations	196	196	196
Within R-squared	0.764	0.521	0.941

Standard errors clustered by state. Regressions weighted by states' 1939 populations. State and time fixed effects and separate time fixed effects for farm states estimated but not shown.
*** p<0.01, ** p<0.05, * p<0.1

$$\frac{X_{it} - X_{i,t-2}}{Y_{i,t-2}} = \beta \frac{G_{it} - G_{i,t-2}}{Y_{i,t-2}} + \alpha_i + \gamma_t + F_i * \gamma_t + \epsilon_{it} \tag{1}$$

where X is the outcome of interest (measured in per capita in 1942 \$), whether disposable personal income, change in bank deposits, or E-bond purchases. Y is real personal disposable income per capita and G is real war production spending per capita (both also measured in 1942 \$).

$F_i = \mathbb{1}(\textit{farm state}) = 1$ if at least 9% of the state's population was employed in agriculture in 1939.[6] Interacting this term with the time fixed effect essentially allows separate underlying time trends for agricultural and non-agricultural areas, which is important because agricultural areas did very little war production but saw dramatic income increases due to the wartime agricultural boom.[7] Scaling both war production spending and the outcome of interest by personal income makes β easier to interpret.

The major advantage of state-level panel data is that identification comes from differential

[6]Including the fraction of each state's population employed in agriculture in 1939 instead of an indicator for agriculture-intensive states does not meaningfully alter the results, but is not used to avoid statistical leverage on outliers. Small changes to the cut-off threshold to define which states are agriculture-intensive do not change the results either so long as the agricultural and non-agricultural groups do not become too unbalanced; the threshold of 9% is used because it is close to the median.

[7]World wars dramatically increase global crop prices because warfare precludes agriculture in locations where fighting occurs, causing large negative supply shocks.

timing, i.e. which areas were more intensively involved in war production in different years. With both time and state fixed effects, location-specific characteristics and aggregate time effects are differenced out. The disadvantage of the panel data approach is that the data is only available at the state level, and so may miss some geographic variation.

Estimates using the state-level panel data are shown in Table 1. The outcome variable in the first column is personal income, the closest thing to state-level GDP available for WWII. The β for this column can be interpreted as the WWII fiscal multiplier, and is discussed at length in Brunet (2021). The outcome variables for the second and third columns respectively are the change in bank deposit holdings (versus the prior year) and Series E bond purchases (also measured as an annual flow). Table 1 shows that when per capita war production increased by 10% in a given state and year, personal disposable income increased by 2.1%, deposit holdings in that state and year grew by 1.2%, and E-bond purchases increased by another .028%. Because Series E war bonds could only be purchased by individuals and not by institutions, the βs for bank deposits and bond purchases are additive, implying a total increase in saving of 1.5% in response to a 10% increase in per capita war production.

3.2.3 Fiscal Policy and Saving in WWII: County-Level Cross Section

Another way to estimate the influence of WWII production on saving is to analyze cross-sections of county-level data. County-level outcome data (whether income or saving) was not collected annually at the time, so panel estimation cannot be used at the county level, but this cross-sectional approach allows for finer geographic disaggregation. For the county-level cross-section I estimate:

$$s_i = \alpha + \beta g_i + \gamma' X_i + \epsilon_i \tag{2}$$

where s_i is total wartime saving in county i, g_i is war spending—this time including facilities construction as well war production—and X_i is a vector of controls, including county i's 1939 manufacturing employment rate, the fraction of county i's population living on rural

Table 2: Savings Responses to War Spending: County Cross-Section Approach

	E-Bonds 1944	Bank Deposits 1944
War spending	0.0528***	0.0342***
	(0.00652)	(0.00693)
1939 mfg employment	-0.0883**	-0.274***
	(0.0411)	(0.0991)
% pop rural farm 1940	-0.0450*	-0.169
	(0.0264)	(0.115)
Population change '30–'40	-0.00034**	-0.00092
	(0.00014)	(0.00057)
1941 deposits		0.901***
		(0.192)
Observations	3,093	3,081
R-squared	0.359	0.755

Data come from the decennial censuses and the County Data Books, except war production data (reconstructed from contract micro data). 1941 bank deposits were provided by Paul Rhode. Population, employment, and savings variables are measured as fractions of the adult population in the nearest decennial census year. The inverse hyperbolic sine transformation is used for all dollar amounts. State fixed effects estimated but not shown. Standard errors are clustered by state.
*** p<0.01, ** p<0.05, * p<0.1

farms in 1940, the county's change in population over 1930 to 1940, and state fixed effects (since county fixed effects are not feasible when the units of observation are county aggregates). All of these variables are measured per capita, defined by 1940 adult population (using 21+ as the definition of adult because it is the most consistent cutoff in age bins across censuses in the early-mid 20th century).

E-bond sales at the county level appear to have been collected for 1944 only, so E-bond sales in 1944 are the outcome variable for the county-level analysis. County-level data on bank deposits have been digitized for 1944 and for 1941, so I use 1944 deposits as the outcome while including 1941 deposit holdings as a control variable. Deposits are measured at the end of each calendar year (December 31), so this comparison captures the change in deposit holdings over the three years in which the vast majority of war production occurred: US war spending. Of the $263 billion spent on national defense over 1940 to 1945, $172 billion was spent over 1942, 1943, and 1944. US military spending over 1940 and 1941 was only $8 billion, 80%

of which was in 1941; while it would be ideal to use 1940 deposits as a control if they had been digitized, using 1941 deposits is the next-best option for capturing the influence of war production on saving.

The county-level analysis is shown in Table 2. A 10% increase in per (adult) capita WWII production is associated with a 5.3% increase in E-bond purchases in 1944 and with a 3.4% increase in bank deposit holdings relative to 1941.

3.2.4 How Much of WWII Excess Saving is Explained by Fiscal Policy?

The magnitude of the saving response to WWII production is modest whichever methodology is used. However, these modest responses imply significant aggregate saving given the scale of WWII production. Adding together $\beta_{war\ bonds} + \beta_{deposits}$ indicates that the increase in saving in response to war production was between 8.7% of war production (using the county-level cross-section) and 15.0% (using the state-level panel). Over 1941–1945, US war production totaled $175.5 billion (in 1940s dollars). Thus the savings response to WWII production accounts for $15-$26 billion in saving, or 14-24% of the $111.5 billion in excess saving during WWII described in Section 2.

An alternative is to take a more structural approach to estimating the influence of expansionary fiscal policy in WWII on the WWII saving rate. Specifically, I estimate the change in the savings rate as:

$$\Delta s = \frac{mps \times \Delta y_d + s_{pre-crisis} \times y_{d,pre-crisis}}{y_{d,pre-crisis} + \Delta y_d} - s_{pre-crisis} \tag{3}$$

where s is savings rate, y_d is personal disposable income per capita, mps is the estimated marginal propensity to save, and Δy_d is the predicted change in personal disposable income per capita due to war production. The marginal propensity to save can be calculated using the parameters estimated in Table 1: $mps = \beta_{saving}/\beta_{personal\ income} = .1495/.219 = .68$. The predicted change in personal disposable income per capita due to war production, Δy_d, can also be computed using parameters from Table 1: $\Delta y_d = \beta_y \times \Delta G = .219 \times \Delta G$. The $175.5

billion total war production over 1941-1945 is divided by 5 since all other figures are annual. Thus the structural approach yields

$$\Delta s = \frac{.68 \times \$56.21 + .068 \times \$588}{\$588 + \$56.21} - 6.8\% = 12.2\% - 6.8\% = 5.4\%. \tag{4}$$

This implies that war production explains a 5.4% increase in the saving rate (computed as a share of disposable personal income). Since excess saving averaged 16.8% per year during WWII, this approach suggests that WWII production explains about 32% of excess saving in WWII. Depending on the chosen methodology, WWII production explains 14-32% of excess saving during WWII.

3.2.5 Fiscal Policy and Saving During COVID-19

Economists have produced a flurry of papers examining the economic effects of COVID-19 Relief Spending. The largest elements of the three pandemic stimulus bills (March 2020, December 2020, and March 2021) have been $859 billion in household rebates (stimulus checks) and $593 billion in expanded unemployment assistance.

Coibion et al. (2020) examines how Americans used the first round of stimulus checks, sent out in May 2020. They examine both qualitative responses (self-reporting of how households planned to use their stimulus payments) and quantitative responses (self-reporting of how households' actual use of stimulus). Qualitatively, 32.8% of households who had received a stimulus check reported using this income mostly to increase saving. Quantitatively, households reported saving 27% of their stimulus checks on average. These averages do mask considerable heterogeneity: approximately 30% of survey respondents had an *mpc* of 1, while almost 40% had an *mpc* of 0 (which can reflect either saving or debt reduction). Still, it seems safe to conclude that households saved around 30% of their first-round rebates.

If households used the later rounds of stimulus checks in similar ways, the $859 billion in household rebates across the March 2020 CARES Act, December 2020 Consolidated Appropriations Act, and March 2021 American Rescue Plan would translate into roughly $258

billion in household saving explained by the rebates. This estimate may overstate the effect of household rebates on saving since the later rounds of rebates were more targeted than the initial round studied by Coibion et al. (2020).

What proportion of excess saving does the $258 billion from household rebates account for? Excess saving was just under $1.6 trillion in 2020 and another $804 billion over the first two quarters of 2021, for a total of $2.4 billion through the end of June 2021. The household rebates enacted in March 2020, December 2020, and March 2021 thus account for 11% of excess saving during the COVID-19 pandemic.

The second and third largest components of COVID-19 relief spending was $593 billion for unemployment assistance and $333 billion for aid to state, local, and tribal governments. Endogeneity makes it difficult to precisely identify the effects of expanded unemployment assistance. However, unemployment assistance is much more targeted than stimulus checks sent to households. All else equal, more targeted fiscal policies should result in a higher marginal propensity to consume (*mpc*) and a larger overall stimulus effect. This can be seen in Coibion et al. (2020)'s findings: unemployed respondents were 4.6 times less likely to have mostly saved their first-round stimulus checks compared to respondents not experiencing unemployment. The decrease in marginal savings stemming from the higher *mpc* likely outweighs the increase in saving due to increased income. Thus the per-dollar influence of unemployment assistance on saving is very likely to be smaller than the savings effect attributable to household rebates, but still positive. Past research (Chodorow-Reich et al., 2012) has shown aid to state and local governments to have macroeconomic effects similar to unemployment assistance: this type of spending is particularly well targeted, with high fiscal multipliers and high *mpc*s. Aid to state, local, and tribal governments is thus also likely to induce a smaller (but still positive) savings response than household rebates. Together, household rebates, expanded unemployment assistance and aid to state, local, and tribal governments account for 11-22% of excess saving during the COVID-19 pandemic, depending on the responsiveness of saving to unemployment assistance and aid to state, local, and tribal governments.

3.3 Ricardian Motive

As a result of the fiscal policy actions discussed in Section 3.2, federal government debt expanded quickly during both WWII and COVID-19. In WWII, federal debt held by the public grew from 43.6% of GDP in December 1940 to 103.9% of GDP in December 1945. Federal debt held by the public was 79.2% of GDP in December 2019 and is projected to hit 107.6% of GDP in December 2021.[8]

To the extent that household saving is influenced by a Ricardian motive, the strength of the Ricardian motive should be proportional to the increase in government debt. The pandemic increase in federal debt due to the COVID-19 pandemic is 47% of the federal debt increase from WWII. Economists' views on Ricardian equivalence differ substantially. But to the extent that increased saving is driven by a Ricardian motive, the increases in government debt are roughly proportional to the increases in excess saving.

3.4 Consumption Restrictions

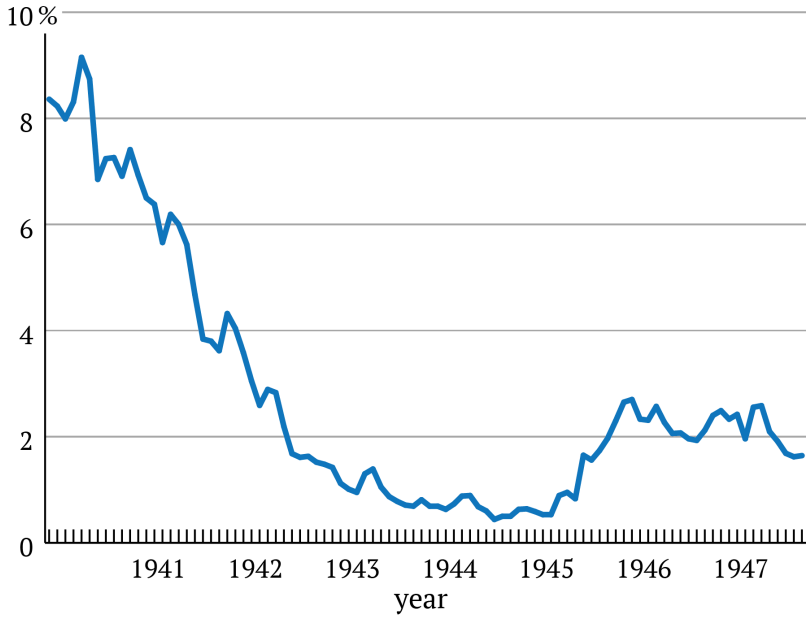
A feature of the American economy unique to WWII and the COVID-19 pandemic is significant restrictions on household consumption. In some respects, war and pandemic restrictions were quite different: they affected different spectrums of consumption and were implemented in utterly different ways. Yet in both episodes, a broad spectrum of consumption was essentially unavailable to a significant number of consumers.

Unsurprisingly, personal consumption fell as a share of personal disposable income both during WWII and the COVID-19 pandemic. Over 1941–45, personal consumption averaged 75% of personal disposable income, a drop of 16.8% versus 1940. In 2020, personal consumption was 81% of personal disposable income, a drop of 8.4% versus 2020.

The similarities should not be overstated. During WWII, consumption restrictions came through rationing and government control of strategic materials (including virtually all metals). As a result, the drop in consumption during WWII was heavily concentrated in durable

[8]March 2021 CBO projection, adjusted to add the American Rescue Plan Act of of 2021.

Figure 3: US Unemployment During WWII



Source: NBER Macrohistory Database series m08084b

goods plus gasoline (a complement to a durable good—automobiles). During COVID-19, consumption restrictions came through lockdowns and other non-pharmaceutical interventions—as well as through people's fear of the virus itself. The drop in consumption during COVID-19 was heavily concentrated in services (except housing, which boomed as people spent more time at home and preferences shifted accordingly).

The differences in the underlying economic environments also make the two crises quite different. During WWII, US labor markets were extremely tight. This can be seen in Figure 3, which shows the extremely low unemployment rates during WWII. Real disposable personal income grew by 37.6% from 1940 to 1943 before stagnating over 1943 to 1945, likely driven by the expansion of the labor force during 1940–43. In contrast, the COVID-19 pandemic led to increased unemployment and falling labor force participation. While personal disposable income did grow 7.5% from 2019 to 2020, the growth in disposable income was directly attributable to government transfer payments. Unsurprisingly, the changes in overall consumption look quite different during the two crises. Over 1940 to 1943 (the years in which incomes grew rapidly), real consumption grew by 7%, as increased consumption of services

outweighed the steep decline in durables consumption. From 2019 to 2020, real consumption fell by 3.8%, with declining consumption of services outweighing increased consumption of housing and durable goods.

In spite of these significant differences, both WWII and COVID-19 saw divergent consumption behavior, with some types of consumption growing quickly while other types of consumption shrank. In both cases, the categories of consumption that shrank were exactly those categories of consumption most affected by restrictions imposed by some combination of the crisis itself and the government's policy response to the crisis.

To influence household saving behavior, consumption restrictions must be broad enough that consumers engage in intertemporal substitution (or permanent changes in consumption behavior) rather than substituting between goods. Ideally, consumption restrictions would be cleanly identified using margins of substitution—indeed, I hope researchers will develop such estimates in future. Since disposable incomes grew during both crises and that every category of consumption which experienced declines was affected by consumption restrictions, observed reductions in consumption serve as a rough proxy for the effects of consumption restrictions.

3.4.1 Consumption Restrictions in WWII

As explained above, consumption restrictions affect the consumption-saving decision only when consumers do not directly substitute other products, but instead engage in intertemporal consumption shifting or alter total consumption over time. For this reason, consumption restrictions that influence saving are conceptually distinct from rationing.

During WWII, a large array of goods was subject to rationing, from sugar and canned food to typewriters, tires, and automobiles. Some rationing was imposed directly via prohibitions on production and sale of specific goods for civilian use, starting with tires and automobiles in early 1942. Other rationing was imposed indirectly via the government's control of strategic materials, which included rubber and virtually all metals. Scooters were rather famously left out of the rationing orders limiting production of cars and bicycles, prompting political cartoons showing government officials riding scooters, but that didn't make scooters more

available for consumption. It wasn't necessary to formally restrict production of every good containing metal when firms could only buy metal if the production order had a sufficiently high priority rating (granted for military goods, farm equipment, and replacement parts to keep old cars and appliances functioning).

WWII rationing was not intended to restrict aggregate consumption. Instead, rationing served two purposes. One was to allocate scarce strategic materials: at some points raw materials shortages for metal and rubber were so extreme that supplies were insufficient to meet war production requirements even with 100% of materials allocated to war projects.[9] The second purpose of WWII rationing was to address distributional equity for popular consumption goods that were unavoidably in short supply due to the war. As John Maynard Keynes wrote in 1940:

> [The purpose of a] well-conceived policy of rationing ... is not to control aggregate consumption but to divert consumption in as fair a way as possible from an article, the supply of which has to be restricted for special reasons. For example, interruption of trade with Denmark and the Baltic necessarily restricts the supply of bacon below normal, and replacement is only possible by purchases in U.S.A. which would compete with more important claims on our dollar resources; or it is impossible to allot enough shipping tonnage to satisfy the current demand for sugar. It is necessary, therefore, to to force people to consume less bacon or less sugar and buy something else instead;—quite a different problem from reducing their aggregate expenditure. If the article is not a conventional necessary or one of general consumption, the end is reached most easily by allowing a rise in the price of the article, the consumption of which we wish to restrict, relatively to other articles. But if this article is a necessary, an exceptional rise in the price of which is undesirable, so that the natural method of restriction is ruled out, then

[9]This prompted the "great feasibility debate" between civilian planners—led by economists Robert Nathan and Simon Kuznets—and the military. These strategic materials constraints and the debates over them are covered extensively in Bureau of the Budget (1946), Lacey (2011), Nelson (1946), and Smith (1959), among many others.

there is a sound case for rationing.[10]

During WWII, many individual goods were rationed in categories that did not see consumption declines: items like butter, sugar, canned food, cotton and wool cloth. When rationing was applied to narrow categories of goods, consumers clearly substituted other goods that were not rationed. During WWII Americans learned to substitute honey, fruit, and beet sugar for cane sugar, and to make clothes from rayon and acetate instead of cotton and wool. Real consumption of both food and clothing grew during WWII, in spite of rationing, because households could find substitutes that were not rationed.

In contrast, when rationing applied to broad categories of goods, the best substitute was saving in the present and waiting to buy the good in the future. For example, the best substitute for buying a car now is buying a car in the future. Because these restrictions applied to broad categories of goods, it was impossible to find satisfactory substitutes.

The broad categories of consumption that saw significant declines during WWII are listed in Table 3, which also shows each category's share of pre-war consumption in 1940 and the total decline in consumption for each category between 1940 (the last "normal" year before the war became a significant factor influencing the US economy) and 1943 (the year in which consumption restrictions were most binding). The largest effect is a 71% drop in consumption of motor vehicles and parts, which was in turn driven by a 95% reduction in purchases of new motor vehicles (as the only cars sold between February 1942 and August 1945 were inventories from February 1942). Household appliance purchases also fell by 63%, while other effects were less extreme.

WWII consumption restrictions were narrow but deep. Only 10.5% of 1940 consumption was in the affected categories—all durable goods except for gasoline, a complement to durable goods. In real terms, real consumption in these affected categories was 63.4% lower in 1943 than in 1940. Over the period from 1941 to 1945, real consumption in these affected categories was 40% lower than in 1940.

[10]Keynes (1940), pp. 53-54.

Table 3: Consumption Restrictions During WWII

Consumption Category	% of Total 1940 Consumption	% Δ 1940–1943
Motor vehicles & parts	3.9%	-71%
Household appliances	1.1%	-63%
Video, audio, photographic, & information processing equipment	0.7%	-20%
Gasoline (vehicle fuels and fluids)	3.2%	-43%

Source: BEA Table 2.4.5, nominal dollars

3.4.2 Consumption Restrictions During COVID-19

The COVID-19 pandemic has not included the rationing of goods[11] Instead, consumption of services has been restricted due to non-pharmaceutical interventions (NPIs), which have included closures of bars, restaurants, and public venues as well as travel restrictions. Consumption of these services has also fallen due to fears of the Coronavirus—and likely would have fallen even in the absence of lockdowns and closures. However, if we understand a restaurant meal or trip to the movie theater as different goods depending on whether or not they carry a significant risk of exposure to COVID-19, the pandemic itself has in some sense imposed consumption restrictions.

Consumption restrictions during COVID-19 have been dominated by services—again with the exception of gasoline. (Gasoline is a complement to the consumption of restricted services, much like it is also a complement to automobiles.) The broad categories of consumption that saw significant declines during the COVID-19 pandemic are listed in Table 4. The later columns of Table 4 show each category's share of pre-pandemic consumption in 2019 and the total decline in consumption for each category from 2019 to 2020.

Unlike the rationing used in WWII, the extent of consumption restrictions during the COVID-19 pandemic clearly depends on individual perceptions of risk (both from the virus and from consumption of various services).[12] This implies more heterogeneity in consumption

[11]During the COVID-19 pandemic consumers have encountered purchase limits on products such as hand sanitizer, toilet paper, and cleaning products imposed by individual stores. These have never been universal, and have been enacted for short periods due to shortages stemming from supply chain disruptions. While consumers have certainly experienced unprecedented shortages during the pandemic, rationing has never been fully implemented.

[12]The idea that distinctions between goods may be perceived differently by different consumers is not

Table 4: Consumption Restrictions During COVID-19

Consumption Category	% of Total 2019 Consumption	% Δ 2019–2020
Food Services and Accommodations	6.5%	-21.9%
Recreation Services	3.9%	-30.1%
Transportation Services	3.5%	-25.8%
Health Care	17.1%	-8.4%
Gasoline and other energy goods	3.4%	-13.7%

Source: BEA Table 2.3.6, real dollars

restrictions during the pandemic than during WWII: one segment of the population perceives high risks from COVID-19, and consequently perceives significant restrictions on consumption of services affected by the pandemic. Another segment of the population perceives negligible risks from COVID-19 and so perceives minimal consumption restrictions (apart from those imposed by law, which have varied dramatically across locations). The remainder of the population is on a spectrum between the two extremes, and analogously perceives consumption restrictions along a spectrum. Heterogenous perceptions of the risk associated with COVID-19 do not influence the virus, but they do influence the macroeconomic response to the virus.

Perhaps unsurprisingly given this heterogeneity of perceptions among consumers, the drops in consumption in categories affected by pandemic restrictions are much shallower than the drops seen during WWII. The largest reduction (as a share of pre-pandemic consumption) was in recreation services, which fell by 30.1% from 2019 to 2020. Compared to the 71% reduction in purchases of motor vehicles and parts during WWII, pandemic consumption reductions are quite shallow. While the reductions are shallower, pandemic consumption restrictions apply to a larger spectrum of consumption than WWII consumption restrictions. 34.3% of 2019 consumption was in categories affected by pandemic consumption restrictions.

3.4.3 Comparing the Effects of Consumption Restrictions

Precisely quantifying the effects of consumption restrictions during WWII and COVID-19 is difficult because consumers may engage in complex substitutions across many margins.

specific to pandemic risk. For example, some consumers are brand conscious while others are not.

Table 5: Comparing Effects of Consumption Restrictions

Pre-Crisis Year	Pre-Crisis η/c	Crisis Period	$\%\Delta\eta$	Estimated Effect of Restrictions
1940	10.5%	1941–45	-40.0%	-4.2%
1940	10.5%	1943	-63.7%	-6.7%
2019	34.3%	2020	-15.7%	-4.8%

However, examining the behavior of consumption in categories affected by consumption restrictions can provide ballpark estimates. I approximate the aggregate effects of consumption restrictions by multiplying the share of pre-crisis consumption affected by consumption restrictions by the average drop in consumption across the affected categories. Mathematically, this can be written

$$= \frac{\eta_{pre-crisis}}{c} \times \%\Delta\eta_{crisis} \tag{5}$$

where c is total consumption (pre-crisis) and η is consumption in restricted categories.

These estimates are shown in Table 5. The effects of WWII consumption restrictions are computed in two different ways. The top row shows the average effect of WWII consumption restrictions over 1941 to 1945. This estimate may in some sense understate the effect of WWII consumption restrictions, since most consumption restrictions did not take effect until 1942 and almost all were removed by the end of 1945. The second row shows the effects of WWII consumption restrictions in 1943, the year in which restrictions were most intense. This estimate can be interpreted as an upper bound for the influence of WWII consumption restrictions. The bottom row of Table 5 shows the effect of COVID-19 consumption restrictions, comparing 2019 to 2020.

The total effects of consumption restrictions during WWII and COVID-19 appear to be roughly comparable, even though WWII restrictions were narrow but deep and COVID-19 restrictions are broad but shallow. In both crises, consumption restrictions appear to reduce consumption by about 5%. This similarity is particularly noteworthy given that aggregate consumption grew by 7% in real terms from 1940 to 1943 but fell by 3.8% from 2019 to

2020: the estimated effects of consumption restrictions are not driven by similar patterns in aggregate consumption. As excess saving during WWII was approximately twice as large as excess saving during COVID-19 (relative to disposable personal incomes), consumption restrictions account for roughly 1/4 of excess saving during WWII and 1/2 of excess saving during COVID-19.

3.5 Uncertainty

High levels of uncertainty are a defining feature of any economic crisis. Economists have long acknowledged that uncertainty can amplify macroeconomic shocks by inducing consumers to save more and consume less.[13]

In the past decade economists have developed quantitative measures of uncertainty, such as Baker et al. (2016) and Hlatshwayo (2016). Unfortunately, underlying differences in news reporting (used to construct modern measures of uncertainty) to use these methods to compare the level of uncertainty during WWII and the COVID-19 pandemic.

We do know that many of the same questions generated uncertainty in both crises: how long will the crisis (and associated restrictions) last? how much will the crisis distort the structure of the economy, and to what extent will distortions become permanent? how many people will die due to the crisis? how many people will face long-term disabilities caused by the crisis? what will the post-crisis economy look like?

WWII also included an additional source of uncertainty: WWII occurred after the Great Depression. The US economy (and indeed the global economy) had not experienced anything that could be described as "normal" since at least 1929. Many Americans—including many American policymakers—feared a return to Depression after WWII. With the benefit of hindsight we know that the US economy boomed after WWII, but this was certainly not the consensus expectation during the war years. The upheaval that preceded WWII may have made it difficult for households to anchor their expectations, increasing the economic influence of uncertainty.

[13]For example, see Romer (1990) on the role of uncertainty in the onset of the Great Depression.

3.6 Contributions to Crisis Saving

Three of the five factors discussed above—expansionary fiscal policy, consumption restrictions, and the WWII payroll deduction program—can be directly measured. A fourth factor, Ricardian motive, cannot be measured directly as an influence on saving but can be measured by relative debt increases: the debt increases associated with each crisis are roughly proportional to excess saving, suggesting that Ricardian motives explain roughly equal shares of excess saving in both crises, whatever those shares may be. The fifth factor, uncertainty, can only be measured as a residual.

The WWII payroll deduction program, intended to promote saving, explains up to 20% of excess saving during WWII, as discussed in Section 3.1. Depending on how one reads the public finance literature on the incentives provided by payroll deductions, payroll deductions for war bond purchases explain anywhere from 0% to 20% of excess saving. I take the midpoint of the range, implying that the payroll deduction program accounts for 10% of excess saving during WWII. This program has no equivalent during the COVID-19 pandemic: increasing saving was an intentional policy goal during WWII, but has not been a goal during the pandemic.

As discussed in Section 3.2, expansionary fiscal policy explains 14-32% of excess saving during WWII and 11-22% of excess saving during the COVID-19 pandemic. In both cases I focus on fiscal policies whose effects are relatively well understood. To the extent that other fiscal policies also increased saving during each crisis, these are likely underestimates.[14] War production spending accounts for 59.3% of all WWII spending over 1941-1945, while household rebates, unemployment assistance, and aid to state, local, and tribal governments account for just 34.8% of COVID-19 relief spending. Since a much larger share of WWII spending is accounted for, it seems likely that the influence of pandemic fiscal policy is underestimated

[14]Other WWII spending is dominated by facilities construction, pay for the Armed Forces, and purchases of food for the military and occupied areas. Other pandemic relief spending encompasses a vast array of government programs, most of them with relatively small amounts of total funding. It would be extremely difficult to construct meaningful and comprehensive estimates of the effects of these residual programs on saving.

by more. Expansionary fiscal policy explains on the order of 20-25% of excess saving during both WWII and the COVID-19 pandemic, and perhaps as much as 30%.

Consumption restrictions explain savings increases of 4.2% and 4.8% during WWII and the COVID-19 pandemic, respectively. As discussed in Section 3.4, the overall effects of consumption restrictions are remarkably similar even though WWII consumption restrictions were narrow but deep but pandemic consumption restrictions are broader but shallower. Because excess saving was much higher during WWII (16.8% of personal disposable income vs. 9.1%), consumption restrictions explain a larger share of excess saving during the COVID-19 pandemic. They account for just over half (53%) of excess saving in the COVID-19 pandemic but only one quarter (25%) of excess saving during WWII.

Together, then, these three factors account for around 60% of excess saving in WWII. The two factors relevant to the COVID-19 pandemic account for around 73% of excess saving during the pandemic. The Ricardian motive in the two crises is roughly proportional to excess saving, so should explain similar shares of excess saving in both episodes. For back of a better measure, the residual can be interpreted as a loose proxy for the role of uncertainty. The larger share of unexplained excess saving during WWII is consistent with higher uncertainty during WWII, as discussed in Section 3.5.

4 WWII Fiscal Multiplier as a Lower Bound for the Pandemic Fiscal Multiplier

In some respects, the influence of WWII on household saving is approximately double the influence of the COVID-19 pandemic: excess saving in WWII is almost twice as large, as is the increase in the debt/GDP ratio (which can be interpreted as a proxy for Ricardian motives). Fiscal policy explains roughly one fifth of excess saving in both episodes, which corresponds to twice the impact in WWII (since excess saving during WWII was about twice its share of personal disposable income during the pandemic). The effects of consumption restrictions on

saving are about the same in both episodes, implying that consumption restrictions explain about half of excess saving during the COVID-19 pandemic but one quarter of excess saving during WWII.

All else equal, a higher savings rate reduces the fiscal multiplier because it implies a smaller *mpc*. This stylized fact has prompted concern that high savings rates during the COVID-19 pandemic may blunt the stimulative effects of fiscal policy while the pandemic persists. Comparing households savings behavior during WWII and the COVID-19 pandemic can help quantify this concern.

It is important to note that the fiscal multiplier is not a structural parameter, but varies depending on both what the government buys and the state of the underlying economy (Auerbach and Gorodnichenko, 2012, 2013; Ramey and Zubairy, 2018). There is a huge variation in the content of government purchases and transfer payments during both WWII and the COVID-19 pandemic, which surely influences the size of the fiscal multiplier. Comparisons between episodes necessarily compare the effects of savings behavior on a generic fiscal multiplier, implicitly assuming the same type of government spending.

Because excess saving was significantly higher during WWII than during the COVID-19 pandemic, the WWII fiscal multiplier can be interpreted as a lower bound for the pandemic fiscal multiplier. This conclusion is quite robust in the sense that it holds even if some savings channels affect the multiplier process more or less than others: for every driver of saving common to both episodes, its influence during WWII ranges from roughly on par with its influence during COVID-19 to roughly twice as large during WWII. With stronger assumptions (i.e. focusing on total excess saving, ignoring potential heterogeneity between channels), the data suggest that the influence of saving on the fiscal multiplier during WWII is roughly twice the influence of saving on the fiscal multiplier during the COVID-19 pandemic.

Other features of the WWII economy apart from saving also reduced the WWII fiscal multiplier, as shown in Brunet (2021). Conversion of manufacturing capacity from civilian production to war production reduced the WWII fiscal multiplier by about 0.3. While some conversion has occurred during the COVID-19 pandemic—distilleries producing hand sani-

tizer, Ford and General motors producing ventilators during the spring and summer of 2020, repurposing of parking lots at large venues for testing vaccination sites—the scale of conversion has been far smaller than during WWII, when one-third of civilian manufacturing was displaced by war production.

Price controls in WWII placed downward pressure on the markup because consumer prices were more heavily constrained than producer prices (Rockoff, 2012). As discussed by Hall (2009), the procyclicality of the markup process is an important mechanism underlying the fiscal multiplier in New Keynesian models; WWII interrupted this mechanism. Since price controls have not been implemented during the COVID-19 pandemic, the pandemic economy is not subject to this distortion.

Finally, the Frisch elasticity of labor supply—another key influence on the multiplier in New Keynesian models—was quite low during the period of WWII when most war production occurred. While women did enter the workforce in large numbers during WWII, they roughly offset men leaving the civilian labor force as they joined the Armed Forces. While high unemployment contributed to a high Frisch elasticity in 1940 and 1941 (see Figure 3), the US unemployment rate stayed below 2% from September 1942 to 1946. The overwhelming majority of government purchases for WWII—93% of WWII spending authorizations and 97% of WWII spending over 1940 to 1945—took place over 1942 to 1945, so the high elasticity of labor supply during 1940 and 1941 is overwhelmed by the low elasticity of labor supply over the later years of the war. Even if expanded unemployment assistance and fear of COVID-19 have reduced the elasticity of labor supply during pandemic, the unemployment rate has remained well above unemployment rates from 1942–1945 throughout the pandemic. This implies that Frisch elasticities have also remained higher during the pandemic.

It is safe to interpret the fiscal multiplier in WWII as a lower bound for the COVID-19 fiscal multiplier. The pandemic fiscal multiplier is likely to be smaller than usual for a period with high unemployment because of unusually high savings rates. Even so, the cumulative influence of factors reducing the fiscal multiplier was larger during WWII: excess saving during WWII was almost twice as high as during the pandemic, the labor market was far tighter

during the period of WWII when most war production occurred, and conversion has been much more limited during the pandemic.

With stronger assumptions—namely that the various channels influencing excess saving have approximately proportional estimates on the fiscal multiplier—it is possible to get more precise. The cross-sectional fiscal multiplier for WWII production was around 0.25 (Brunet, 2021). For comparison, Nakamura and Steinsson (2014) estimate a local multiplier of 1.4 on defense spending for 1969–2006 using similar methodology. Chodorow-Reich (2019) surveys the literature on local fiscal multipliers and finds a "usual" local multiplier of 1.8, largely but not exclusively supported by studies of the 2009 fiscal stimulus. Since excess saving during the COVID-19 pandemic has been at roughly half the rate of excess saving during WWII, one can reasonably conclude that the pandemic fiscal multiplier is likely about halfway between the WWII multiplier and the "normal" multiplier, suggesting a cross-sectional pandemic multiplier of roughly 0.8 to 1.0.

5 Longer-Term Effects of Crisis Saving

An advantage of comparing WWII and the COVID-19 pandemic is that we know quite a lot about what happened to the US economy after WWII, while as yet we do not know how the economy will respond after the COVID-19 pandemic (or indeed, when the pandemic will end). It is particularly useful to consider how WWII saving influenced the post-WWII economy in light of the clear parallels in household saving behavior.

5.1 The Post-WWII Transition

Economists and policymakers expected a severe recession after WWII and were surprised when the post-war recession proved remarkably mild. To some extent this was achieved by sleight of hand and artifacts of the data: the stated policy goal after WWII was to ensure employment for returning veterans. Workers who had been brought into the labor force or transitioned to high-paying manufacturing jobs during the war—women, African Americans,

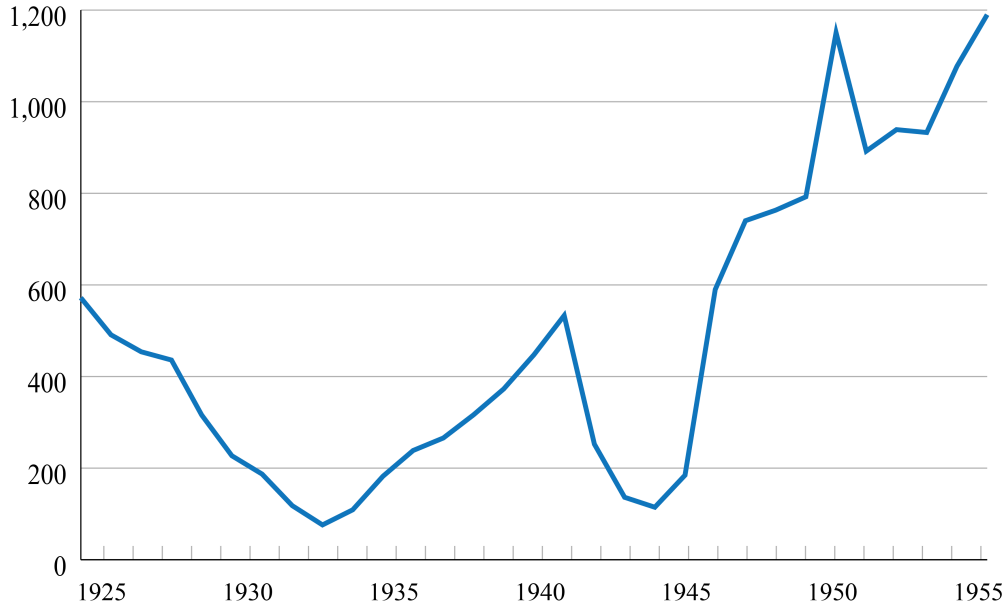
disabled people—enjoyed scant employment protections. These wartime manufacturing workers were encouraged to give up their jobs and sometimes fired outright. Married women, in particular, were not considered unemployed when they left their jobs—resulting in significant deviations between job separation rates and the unemployment rate in late 1945 and in 1946.

These discrepancies aside, the post-WWII transition was by any measure far smoother than economists and policymakers had feared. Civilian employment reached its nadir in September 1945, almost immediately after the end of the war, and was rebounding strongly by the spring of 1946. By September 1946 non-farm employment surpassed its wartime peak of 42.8 million from November 1943.

The best explanation for the relatively smooth transition out of WWII is pent-up demand. After years of rationing, Americans bought goods that had been subject to rationing—cars and household appliances large and small (ovens and refrigerators, but also hair dryers and toasters) as fast as suppliers could produce them. Reconversion of manufacturing plants from war production back to civilian production was slow, and at first demand outpaced supply by a huge margin. In the years immediately after WWII, Americans with cash on hand could easily wait a year for a car to be available to buy. Housing construction—also heavily restricted during WWII because it required strategic materials—also boomed, as shown in Figure 4.

Inflation was substantial in the late 1940s: prices rose by just under 34% from 1945 to 1948. Due to a mild deflation in late 1948 and 1949, price levels in mid-1950 matched price levels in mid-1948. This deflationary episode was much milder than widely expected: most observers had expected substantial deflation after the war ended (Friedman and Schwartz, 1963, p. 597). These stylized facts have two important implications. First, inflation was not high enough in the United States to erase wartime saving. For example, Series E war bonds lost about 18% of their real value between 1945 and 1950 (as the 2.9% annual return increased their nominal value by 15%, partially offsetting the 34% cumulative inflation). Second, informed households likely expected their liquid asset holdings to regain more value through deflation than they did.

Figure 4: Non-Farm Housing Starts (thousands of single-family units)



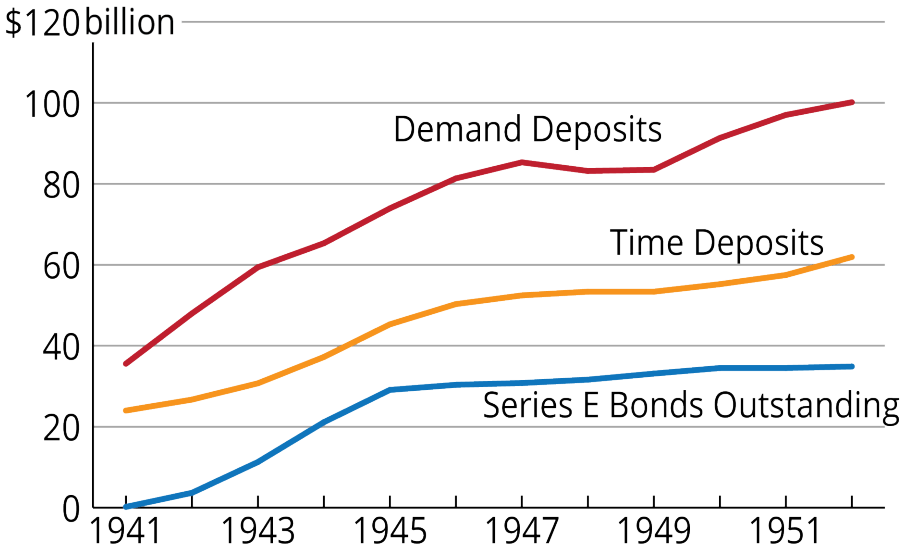
Source: NBER Macrohistory Database

Given the massive scale of WWII saving—and the parallels in household saving behavior between WWII and the COVID-19 pandemic—it is useful to understand how WWII saving influenced the economy in the immediate post-WWII years. Section 5.2 examines the evolution of liquid asset holdings in the immediate post-WWII years and then Section 5.3 describes the relationship between wartime saving and post-WWII consumption and house purchases.

5.2 Household Saving Post-WWII

After WWII the household savings rate fell, but liquid asset holdings remained above their pre-WWII levels, as can be seen in Figure 5. Individual holdings of government securities—for which data makes it easiest to separate households from firms—peaked (for the period) at $67.5 billion in November 1948 and only slowly receded thereafter, falling only to a low of $65.7 billion in December 1949 before the outbreak of the Korean War in summer 1950. I focus on Series E war bonds for the same reasons discussed in Section 3.2: they could only be purchased by individuals and dominated household purchases of government securities because they had

Figure 5: Growth in Asset Holdings During World War II



Source: Monthly Treasury Bulletins

the best terms. Deposit holdings—the other major vehicle for household saving, though the data do not separate individuals, partnerships, and non-financial corporations—also kept growing after WWII. Importantly, the data shown in Figure 5 exclude interbank deposits.

The stability of aggregate asset holdings masks considerable changes in the composition of asset ownership. Figure 6 shows the percentage of households holding A-F early Surveys of Consumer Finance (SCFs). The SCF began in 1947 as an annual survey of around 3,000 households. Surveys were conducted during Q1 of each calendar year and asked respondents detailed questions about their household finances in the previous year, e.g. the first SCF, conducted in Q1 1947, asked households about their asset holdings in 1946. In 1947, 73% of households reported owning A-F bonds (dominated by E-bonds) in the previous year. By the 1950 and 1951 SCFs, only 47% of households reported owning bonds. Coupled with the steady aggregate bond holdings shown in Figure 5 (other A-F bonds displayed very similar patterns), the SCF data suggests dramatically increasing concentration of bond ownership. Mean bond holdings (conditional on owning bonds) increase from $925 per household in the 1947 SCF to $1,241 in the 1951 SCF.

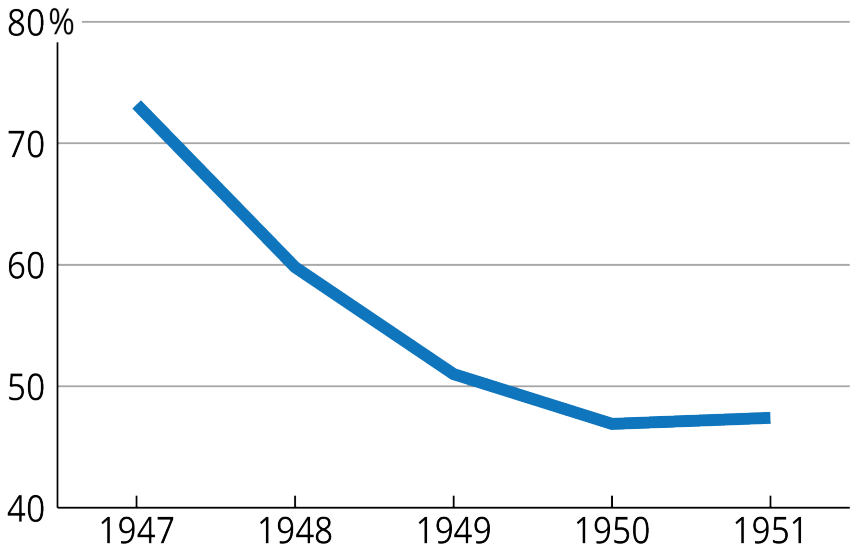
Why did the concentration of bond holdings increase? Households cashed bonds when

Table 6: Decreasing Bond Holdings Associated with Home and Car Purchases

	OLS			Probit		
	(1)	(2)	(3)	(4)	(5)	(6)
Bought car in past year		0.0374***			0.172***	
		(0.00653)			(0.0291)	
Bought house in past year			0.168***			0.582***
			(0.0151)			(0.0439)
Black	-0.0335***	-0.0292**	-0.0297**	-0.202***	-0.181**	-0.179**
	(0.0118)	(0.0124)	(0.0117)	(0.0711)	(0.0736)	(0.0699)
Grammar school	0.0251*	0.0219	0.0261*	0.212**	0.186*	0.222**
	(0.0134)	(0.0136)	(0.0139)	(0.107)	(0.106)	(0.109)
High School	0.0455***	0.0379**	0.0460***	0.316***	0.270**	0.326***
	(0.0151)	(0.0155)	(0.0158)	(0.116)	(0.116)	(0.120)
College	0.0663***	0.0596***	0.0690***	0.406***	0.364***	0.424***
	(0.0172)	(0.0175)	(0.0184)	(0.121)	(0.120)	(0.127)
Wage income	0.00804**	0.00493	0.00597	0.0363*	0.0212	0.0258
	(0.00375)	(0.00394)	(0.00409)	(0.0186)	(0.0193)	(0.0200)
Zero wage	0.0410	0.0158	0.0206	0.170	0.0455	0.0637
	(0.0323)	(0.0338)	(0.0356)	(0.165)	(0.171)	(0.179)
WWII veteran	0.0280***	0.0267***	0.0244***	0.111***	0.103***	0.0936***
	(0.00701)	(0.00675)	(0.00718)	(0.0313)	(0.0306)	(0.0323)
Head of household age 25–34	0.0102	0.00723	0.00418	0.0430	0.0308	0.0171
	(0.00894)	(0.00970)	(0.00996)	(0.0399)	(0.0432)	(0.0430)
Head of household age 35–44	0.0130	0.0108	0.00782	0.0584	0.0505	0.0357
	(0.00990)	(0.0106)	(0.0109)	(0.0444)	(0.0474)	(0.0477)
Head of household age 45–64	0.00649	0.00251	0.00398	0.0374	0.0213	0.0251
	(0.0107)	(0.0114)	(0.0114)	(0.0499)	(0.0535)	(0.0520)
Head of household age 65+	-0.0314***	-0.0303**	-0.0303**	-0.187***	-0.181***	-0.182***
	(0.0112)	(0.0121)	(0.0125)	(0.0596)	(0.0645)	(0.0646)
Non-metro area, pop 50K+	-0.00898	-0.0119	-0.0104	-0.0420	-0.0558	-0.0479
	(0.0106)	(0.0102)	(0.00974)	(0.0452)	(0.0439)	(0.0419)
Population 2.5 – 50K	0.00627	0.00120	0.000365	0.0439	0.0213	0.0193
	(0.0112)	(0.0109)	(0.0106)	(0.0499)	(0.0485)	(0.0474)
Town, population < 2.5K	-0.00955	-0.0159	-0.0119	-0.0366	-0.0638	-0.0420
	(0.0118)	(0.0120)	(0.0117)	(0.0554)	(0.0570)	(0.0555)
Countryside	0.000386	-0.00998	-0.00499	-0.0140	-0.0655	-0.0469
	(0.0119)	(0.0121)	(0.0119)	(0.0574)	(0.0599)	(0.0586)
1939 mfg emp (county)	0.119	0.127	0.115	0.533	0.558	0.501
	(0.0952)	(0.0947)	(0.0907)	(0.420)	(0.419)	(0.401)
Farm pop share (county)	-0.164*	-0.139	-0.178*	-0.973**	-0.884*	-1.065**
	(0.0960)	(0.0943)	(0.0927)	(0.496)	(0.484)	(0.477)
Observations	15,798	14,648	14,861	15,798	14,648	14,861
R-squared	0.033	0.036	0.044			

Data come from the Surveys of Consumer Finance from 1947–1951. The inverse hyperbolic sine transformation is used for all dollar amounts. Standard errors are clustered by location. Omitted categories are white, less than grammar school education, head of household age < 25, and metropolitan area. Survey year is included but not shown. *** p<0.01, ** p<0.05, * p<0.1

Figure 6: Fraction of Households Holding A-F Bonds



Source: Surveys of Consumer Finance

they made major purchases such as homes and cars. Table 6 shows the association between household characteristics and an indicator for whether the household decreased its holdings of A-F bonds in the previous year. Columns 1-3 show OLS estimates (linear probability model) and columns 4-6 show estimates from probit regressions. Columns 1 and 4 include only demographic variables. Columns 2 and 5 add an indicator variable for whether the household purchased a car in the past year, while columns 3 and 6 add an indicator variable for whether the household purchased a house in the past year. There is a strong statistical relationship between the purchase of a car or house in the past year and households decreasing their war bond holdings.

5.3 WWII Saving and the Post-WWII Boom

As suggested by the household-level results shown in Table 6 , wartime saving fueled the post-WWII booms in housing and durables consumption. To examine the relationship between wartime saving and post-WWII consumption, I estimate the following specification:

$$y_i = \alpha + \beta s_i + \gamma' X_i + \epsilon_i \tag{6}$$

Table 7: Wartime Saving, Residential Investment, and Durables Consumption

	(1) # Housing Units (HU)	(2) % HU w/ modern bathrooms	(3) % HU w/ electric fridge	(4) # Cars registered
Wartime saving	0.0525***	0.0948***	0.106***	0.0446***
	(0.0156)	(0.0253)	(0.0217)	(0.00946)
1939 mfg employment	-0.0255	0.00304	0.0601	0.0165
	(0.0492)	(0.0183)	(0.0520)	(0.0107)
% pop rural farm 1940	-0.126***	-0.0648***	0.0450	0.0494***
	(0.0215)	(0.0236)	(0.0417)	(0.00995)
1941 deposits	0.00222	0.00865	0.00624	-0.00445
	(0.0144)	(0.0120)	(0.0226)	(0.00825)
Population change '30–'40	0.00264***	0.000353***	-0.000516***	-0.000302***
	(0.000443)	(8.07e-05)	(0.000181)	(4.40e-05)
Population change '40–'50	0.00602***	0.000721***	0.000277*	-0.000591***
	(0.000189)	(0.000176)	(0.000145)	(6.16e-05)
# Housing Units '40	0.977***			
	(0.00666)			
HU w/ modern bathrooms		0.732***		
		(0.0390)		
HU w/ electric fridge '40			0.690***	
			(0.0461)	
# Cars registered '39				0.746***
				(0.0825)
Observations	2,926	2,926	2,926	2,925
R-squared	0.982	0.937	0.726	0.906

Data come from the decennial censuses and the County Data Books. 1941 bank deposits were provided by Paul Rhode, 1939 car registrations by Paul Rhode and Joshua Hausman. Population, employment, liquid asset, and car registration variables are measured as fractions of the adult population in the nearest decennial census year. The inverse hyperbolic sine transformation is used for all dollar amounts, numbers of housing units, and numbers of car registrations. The pre-war manufacturing employment rate, fraction of population employed on rural farms in 1940, fraction of housing units with modern bathrooms, and fraction of housing units with electric refrigerators are all measured as fractions between 0 and 1, so the inverse hyperbolic sine transformation is not necessary. State fixed effects estimated but not shown. Standard errors are clustered by state.
*** p<0.01, ** p<0.05, * p<0.1

where y_i is outcome y for county i, s_i is total wartime saving in county i, divided by the area's 1940 adult population, and X_i is a vector of controls. Given the available county-level data on saving, I measure total wartime saving s_i as

$$s_i = (\text{bank deposits}_{i,1944} - \text{bank deposits}_{i,1941}) + \text{E-bonds}_{i,1944}. \tag{7}$$

All prices are adjusted to 1950 dollars, and then scaled by the county's adult population (age 21+) in the nearest decennial census year. Outcomes include the number of housing units in a county (as enumerated in the decennial census), the percentage of each county's housing units with modern bathrooms[15], the percentage of each county's housing units with electric refrigerators, and the percentage of cars registered in a county. Controls (X_is) include the area's pre-war manufacturing employment rate[16], the fraction of the area's population which lived on rural farms in 1940, and the percent change in county population over both 1930 to 1940 and 1940 to 1950. The first two controls are important predictors of both income and trends in economic growth during the 1940s. Including population changes from the 1930s and 1940s controls for underlying trends in migration, including migration driven by the war. X_i also includes state fixed effects.

As with wartime saving, 1941 bank deposits and car registrations are calculated relative to adult population and then transformed using the inverse hyperbolic sine transformation. Since residential investment revolves around the stock of physical capital, I do not scale the number of housing units by population, though I do apply the inverse hyperbolic sine transformation. I also include the pre-WWII measures of each outcome as a control in each regression. The coefficient on 1940 housing units is slightly below 1, as one should expect

[15]A modern bathroom is defined as a private bathroom with an indoor toilet, hot water, and a shower or bathtub. Both rural homes with outhouses and tenement apartments with shared bathrooms are excluded.

[16]The pre-war manufacturing employment rate is calculated as the county's manufacturing employment in 1940 divided by the 1940 labor force age 14 and up. Labor force statistics for 1940 were defined relative to population 14 and older, so the employment rate follows this convention for consistency. Other variables scaled by population are calculated relative to adult population to avoid confounding effects from differential fertility. Adult population is defined by age 21+ because that cutoff allows for the highest degree of consistency across years for the middle of the 20th century given the changing age bins used to record population in each decennial census.

given the persistence of housing over time.

Table 7 shows the estimates derived from equation 6. A 10% increase in per capita wartime saving (about $43.50 in 1950 dollars, or $471 in 2020 dollars) in a county is associated with a 0.5% increase in the number of housing units in a county between 1940 and 1950, a 0.9% increase in the fraction of a county's housing units with modern bathrooms, a 1.1% increase in the fraction of a county's housing units with electric refrigerators, and a 0.5% increase in the number of cars registered in the county.

These estimates are not causal in the sense that wartime saving itself may be driven by unobserved location characteristics. However, these results are driven by wartime saving and not some other feature of the WWII economy. War production spending, at least, appears to have had minimal effects after 1945 except through influencing migration patterns. Fishback and Cullen (2013) find that county-level WWII spending did not affect county-level retail sales in 1948, nor did WWII spending affect manufacturing wages or value added in 1947. They conclude that the lasting effects of World War II spending were largely through within-US migration towards counties with higher war spending. All of the results shown in Table 7 control for population change between 1940 and 1950. Rhode (2003) finds lasting effects of WWII on economic activity, but also focuses on a channel driven by migration: expanded economic activity on the pacific coast. Jaworski (2017) examines the effects of World War II spending on economic development in the U.S. South, particularly through capital deepening, and concludes that capital deepening from World War II did not systematically drive southern economic development in the post-war years.

Table 8 replicates Table 7 but replaces wartime saving with war spending as the variable of interest. All coefficients on war spending are both very small and statistically insignificant. The results shown in Table 7 cannot be driven by war spending. Table 6 provides further evidence for the mechanism, as decreases in bond holdings are associated with home and car purchases by individuals.

Excess saving during WWII fueled new housing, improvements in housing quality, and car purchases in the years immediately following WWII. These post-WII purchases were

Table 8: Falsification Test: Effects of Wartime Saving Not Driven by War Spending

	(1) # Housing Units (HU)	(2) % HU w/ modern bathrooms	(3) % HU w/ electric fridge	(4) # Cars registered
War Spending	0.00475	0.00273	-0.00392	0.00187
	(0.00401)	(0.00298)	(0.00322)	(0.00113)
1939 mfg employment	-0.0465	-0.0221	0.0483	0.00675
	(0.0460)	(0.0220)	(0.0496)	(0.0114)
% pop rural farm 1940	-0.123***	-0.0510*	0.0529	0.0525***
	(0.0215)	(0.0265)	(0.0453)	(0.0108)
1941 deposits	0.0182	0.0338***	0.0368	0.0128
	(0.0131)	(0.0115)	(0.0259)	(0.0120)
Population change '30–'40	0.000316	1.83e-05	-0.000486**	-6.24e-05
	(0.000440)	(0.000121)	(0.000216)	(7.65e-05)
Population change '40–'50	0.00618***	0.00101***	0.000646***	-0.000453***
	(0.000222)	(0.000141)	(0.000178)	(5.47e-05)
# Housing Units '40	0.977***			
	(0.00632)			
HU w/ modern bathrooms		0.767***		
		(0.0393)		
HU w/ electric fridge '40			0.741***	
			(0.0500)	
# Cars registered '39				0.776***
				(0.0792)
Observations	3,072	3,072	3,072	3,033
R-squared	0.990	0.930	0.671	0.880

Data come from the decennial censuses and the County Data Books. 1941 bank deposits were provided by Paul Rhode, 1939 car registrations by Paul Rhode and Joshua Hausman. Population, employment, liquid asset, and car registration variables are measured as fractions of the adult population in the nearest decennial census year. The inverse hyperbolic sine transformation is used for all dollar amounts, numbers of housing units, and numbers of car registrations. The pre-war manufacturing employment rate, fraction of population employed on rural farms in 1940, fraction of housing units with modern bathrooms, and fraction of housing units with electric refrigerators are all measured as fractions between 0 and 1, so the inverse hyperbolic sine transformation is not necessary. State fixed effects estimated but not shown. Standard errors are clustered by state.
*** p<0.01, ** p<0.05, * p<0.1

concentrated in areas of consumption that were restricted by WWII: housing and durable goods.

5.4 Implications for the Post-Pandemic Economy

The smooth economic transition after WWII and post-WWII consumption boom suggest cautious optimism about the performance of the U.S. economy after the COVID-19 pandemic finally subsides—whenever that may be. However, several salient features of the pandemic economy are quite different from the WWII economy. It is important to consider how those differences may influence the performance of the post-pandemic economy.

First, the types of consumption constrained by WWII differ from the types of consumption constrained by the COVID-19 pandemic. WWII consumption constraints were heavily concentrated in durables and housing. A large literature has consistently found that consumers are more likely to shift durables consumption across time than they are to shift non-durables consumption. Because durable goods are particularly well suited to intertemporal shifting, a key question is whether consumption of services constrained by the pandemic can be shifted to the same extent. There appears to be at least some pent-up demand for these services—people are eager to travel when they can safely do so, and the decline in preventative health care during the pandemic will almost certainly lead to higher consumption of health care later—but the magnitude of shifting for services may well be substantially smaller than it was for durables during and after WWII due to intrinsic differences between types of consumption.

Second, the US labor force grew substantially during WWII while it shrank substantially during the COVID-19 pandemic. This suggests a greater heterogeneity in households' ability to save: saving is much easier for the employed than the unemployed or those outside the labor force. Unsurprisingly, Coibion et al. (2020) found that unemployed households were much less likely to save their stimulus payments than other households. Increased employment and labor force participation during WWII (in addition to wartime wage compression) meant that WWII savings were spread broadly across many households. With much higher unemployment and

lower rates of labor force participation during the COVID-19 pandemic, saving is likely to be concentrated within a smaller segment of the population.

Finally, the dominant savings vehicles during WWII were very different from the dominant savings vehicles during the COVID-19 pandemic. During WWII, the majority of household saving occurred via deposits in bank accounts and purchases of war bonds. These were extremely safe assets—reflecting risk preferences immediately after the Great Depression—with relatively small, predictable returns. Excess saving during the COVID-19 pandemic, in contrast, has fed a stock market boom and particularly speculation in cryptocurrency. Among the share of households with the means to save during the pandemic, returns on savings are likely to be highly variable. The pandemic has also fed a housing boom, driving up housing prices across the US—with very different implications for homeowners and renters.

The post-pandemic economy may be fairly strong due to pent-up demand and excess saving during the pandemic. However, the strength of pent-up demand is hard to predict because it is concentrated in services rather than durables—intrinsically different categories of consumption—and it is not clear whether the responsiveness intertemporal shifting of services consumption during and after the COVID-19 pandemic will match the intertemporal shifting of durables consumption during WWII. Also, both pandemic saving and returns on pandemic saving are likely to be more heterogenous than saving and returns to saving during WWII. These distributional differences may have aggregate consequences.

6 Conclusion

Although the underlying economic environments were quite different during WWII and the COVID-19 pandemic, there are clear similarities in household saving behavior between the two episodes. Comparing household saving behavior—and the individual drivers of saving in both crises—can help us understand the effects of household saving in the pandemic. WWII can also be used as a bounding exercise to understand the influence of high saving rates on the pandemic fiscal multiplier.

References

Auerbach, Alan and Yuriy Gorodnichenko (2012) "Measuring the Output Responses to Fiscal Policy," *American Economic Journal: Economic Policy*, Vol. 4, pp. 1–27.

——— (2013) "Output Spillovers from Fiscal Policy," *American Economic Review*, Vol. 103, pp. 141–146.

Baker, Scott R., Nicholas Bloom, and Steven J. Davis (2016) "Measuring Economic Policy Uncertainty," *Quarterly Journal of Economics*, Vol. 131, pp. 1593–1636.

Barro, Robert J. (2020) "Non-Pharmaceutical Interventions and Mortality in U.S. Cities during the Great Influenza Pandemic, 1918-1919," *NBER Working Paper*.

Barro, Robert J., José F. Ursúa, and Joanna Weng (2020) "The Coronavirus and the Great Influenza Pandemic: Lessons from the "Spanish Flu" for the Coronavirus?s Potential Effects on Mortality and Economic Activity," *NBER Working Paper*.

Beach, Brian, Karen Clay, and Martin Saavedra (2020) "The 1918 Influenza Pandemic and its Lessons for COVID-19," *Journal of Economic Literature, forthcoming*.

Brunet, Gillian (2021) "Stimulus on the Home Front: the State-Level Effects of WWII Spending," working paper.

Bureau of the Budget (1946) *The United States at War: Development and Administration of the War Program by the Federal Government*.

Card, David and Michael Ransom (2011) "Pension Plan Characteristics and Framing Effects in Employee Savings Behavior," *Review of Economics and Statistics*, Vol. 93, pp. 228–243.

Chodorow-Reich, Gabriel (2019) "Geographic Cross-Sectional Fiscal Spending Multipliers: What Have We Learned?," *American Economic Journal: Economic Policy*, Vol. 11, pp. 1–34.

Chodorow-Reich, Gabriel, Laura Feiveson, Zachary Liscow, and William Gui Woolston (2012) "Does State Fiscal Relief During Recessions Increase Employment? Evidence from the American Recovery and Reinvestment Act," *American Economic Journal: Economic Policy*, Vol. 4, pp. 118–145.

Coibion, Olivier, Yuriy Gorodnichenko, and Michael Weber (2020) "How Did U.S. Consumers Use Their Stimulus Payments?," *NBER Working Paper*.

Engen, Eric M., William G. Gale, and John Karl Scholz (1996) "The Illusory Effects of Saving Incentives," *Journal of Economic Perspectives*, Vol. 10, pp. 113–138.

Fishback, Price and Joseph A. Cullen (2013) "Second World War spending and local economic activity in US counties, 1939–58," *Economic History Review*, Vol. 66, pp. 975–992.

Friedman, Milton and Anna Jacobson Schwartz (1963) *A Monetary History of the United States*: Princeton University Press for NBER.

Gale, William G. and John Karl Scholz (1994) "IRAs and Household Saving," *American Economic Review*, Vol. 84, pp. 1233–1260.

Gelber, Alexander (2011) "How do 401(k)s Affect Saving? Evidence from Changes in 401(k) Eligibility," *American Economic Journal: Economic Policy*, Vol. 3, pp. 103–122.

Hall, Robert E. (2009) "By How Much Does GDP Rise If the Government Buys More Output?," *Brookings Papers on Economic Activity*, Vol. fall, pp. 183–231.

Hlatshwayo, Sandile (2016) "Unpacking Policy Uncertainty: Evidence from European Firms," *working paper*.

Jaworski, Taylor (2017) "World War II and the Industrialization of the American South," *Journal of Economic History*, Vol. 77, pp. 1048–1082.

Keynes, John M. (1940) *How to Pay for the War: a radical plan for the Chancellor of the Exchequer*: MacMillan and Co.

Lacey, James G. (2011) *Keep From All Thoughtful Men: How U.S. Economists Won World War II*: Naval Institute Press.

Nakamura, Emi and Jón Steinsson (2014) "Fiscal Stimulus in a Monetary Union: Evidence from U.S. Regions," *American Economic Review*, Vol. 104, pp. 753–792.

Nelson, Donald M. (1946) *Arsenal of Democracy: the Story of American War Production*: Harcourt, Brace and Co.

Poterba, James M., Steven F. Venti, and David A. Wise (1995) "Do 401(k) Contributions Crowd Out Other Personal Saving?," *Journal of Public Economics*, Vol. 58, pp. 1–32.

——— (1996) "How Retirement Saving Programs Increase Saving," *Journal of Economic Perspectives*, Vol. 10, pp. 91–112.

Ramey, Valerie A. and Sarah Zubairy (2018) "Government Spending Multipliers in Good Times and in Bad: Evidence from U.S. Historical Data," *Journal of Political Economy*, Vol. 126, pp. 850–901.

Rhode, Paul W. (2003) "After the War Boom: Reconversion on the U.S. Pacific Coast, 1943–49," *NBER Working Paper 9854*.

Rhode, Paul W., James M. Snyder Jr., and Koleman Strumpf (2017) "The Arsenal of Democracy: Production and Politics During WWII," working paper.

Rockoff, Hugh (2012) *America's Economic Way of War: War and the US Economy from the Spanish-American War to the Persian Gulf War*: Cambridge University Press.

Romer, Christina D. (1990) "The Great Crash and the Onset of the Great Depression," *Quarterly Journal of Economics*, Vol. 105, pp. 597–624.

Smith, R. Elberton (1959) *United States Army in World War II: the Army and Economic Mobilization*: Center of Military History, United States Army.

Venti, Steven F. and David A. Wise (1990) "Have IRAs Increased U.S. Saving? Evidence from Consumer Expenditure Surveys," *Quarterly Journal of Economics*, Vol. 105, pp. 661–698.

Wilson, Mark R. (2016) *Destructive Creation: American Business and the Winning of World War II*: University of Pennsylvania Press.