

# *Second World War spending and local economic activity in US counties, 1939–58<sup>1</sup>*

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Studies of the development of local economies often point to large-scale Second World War military spending as a source of economic growth, even though spending declined sharply after demobilization. We examine the relationship between war spending per capita and the changes in economic activity in US counties between 1939 before the war and a period several years after the war. In the longer term counties receiving more war spending per capita during the war experienced greater population growth, but growth in per capita measures of economic activity showed little relationship with per capita war spending.

Many histories of state and local communities credit the influx of large amounts of federal military spending during the Second World War as a transformative episode that led to long-run economic growth despite the short-run nature of the spending. The descriptions of thriving communities and expanding manufacturing suggest that there was extensive growth in areas with high military spending. But was the extensive growth they describe just a sign of expanding populations or did per capita measures of economic activity rise as well? Was the war spending also associated with greater shifts in the local economies toward greater manufacturing, greater savings, and more roles for women? We examine the relationship between economic activity and the rise and fall in local military spending in the US during the Second World War at the county level by examining the changes between 1939 and the late 1940s and the 1950s.

During the decade of the 1940s, the US experienced the largest rise and fall in military spending in its history. At its 1944 peak, military spending accounted for over 35 per cent of GDP, before receding to about 5 per cent of GDP by 1950. For decades the traditional macroeconomic description has been that Second World

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War spending was a Keynesian stimulus that brought the US out of the Great Depression. This view received recent support from Gordon and Krenn, who find that an added dollar of military spending between 1939 and the second quarter of 1941 increased GDP by \$1.80. Some have claimed that the US produced 'more guns and more butter . . . Americans had never had it so good'.<sup>2</sup>

However, the economic stimulus view has faced several challenges that suggest that the US population faced extensive sacrifices in fighting the war. Barro finds that an additional dollar of military spending during the war only increased GDP by 60 cents, implying extensive crowding out.<sup>3</sup> Gordon and Krenn's own multiplier estimate falls to 88 cents per military dollar when they extend the analysis to the end of 1941.<sup>4</sup> Higgs and Edelstein show that real consumption per capita and per civilian population stagnated for most of the war, and durable good consumption per capita fell by 20 to 30 per cent. Private investment sharply declined. Field argues that the war may have actually slowed productivity growth rather than enhancing it because innovation was so heavily focused on military activities with limited spillover benefits to a peace-time economy. The crowding out discussion receives further support from the sharp rise in personal consumption and private investment that followed the war, even though Keynesians would have predicted a decline because government spending fell enough that total GDP fell afterward.<sup>5</sup>

We shift the emphasis here to the local effects of war spending at the county level. Did counties that experienced a larger military spending shock in the early 1940s experience larger changes in economic activity between 1939 before the war and the late 1940s several years after the war than the counties where little or no military spending took place? Because we are looking at county economies the analysis does not address the size of the fiscal multiplier at the national level. Nakamura and Steinsson show that the same estimate of a fiscal multiplier at the state level can lead to quite different national multipliers under different sets of assumptions that are commonly used in macroeconomic and regional models.<sup>6</sup> Another way to describe our analysis is that we are addressing the political economic question: would community leaders have found it beneficial in the longer run for their community to compete in the political arena for federal war spending?

We start by examining the impact of war spending on local growth in retail sales per capita for the periods 1939–1947, 1939–1954, and 1939–1958. The early portion of the article describes the military mobilization during the Second World War and shows the substantial variation in both war spending and retail sales growth across counties that is the source of identification of the relationship. The reduced-form coefficient we estimate summarizes the combined effects of stimulus, crowding out of local production, drags on growth from the federal tax rates on additional income, the shares of inputs for war production bought locally, the

<sup>2</sup> See Gordon and Krenn, 'End of the Great Depression'; Melman, *Permanent war economy*, p. 15.

<sup>3</sup> See Barro, 'Output effects'. Ramey, 'Government', surveys the literature on fiscal stimulus, in which many papers focus on the impact of military spending, and finds that most of the multipliers lie between 0.5 and 1.

<sup>4</sup> Gordon and Krenn, 'End of the Great Depression'.

<sup>5</sup> See Higgs, 'Wartime prosperity?'; idem, 'Private profit'; idem, 'Central planning'; idem, 'Wartime socialization'; Edelstein, 'War'; Field, 'Impact'. The benefits from the war were largely geo-political. The allied victory prevented the tyranny of a western Europe controlled by Hitler and Mussolini and a militaristic regime under Japan in Asia. These results aided economic freedoms and growth and international trade in western Europe and Japan, although large swaths of the world's population were now subject to the mercy of Stalin's USSR regime.

<sup>6</sup> See Nakamura and Steinsson, 'Fiscal stimulus'.

shares of consumer incomes spent on locally produced goods and services, and the impact on income of migration flows that altered the local supply of labour. The coefficients are estimated with a variety of different control variables. A series of robustness tests of the results are performed using different sub-samples and difference-in-difference analysis for retail sales per capita growth over the periods 1939–48, 1939–54, and 1939–58.

Similar reduced-form analysis is used to examine several other dimensions of economic activity that have received extensive comment in Second World War narratives. The dominant effect of greater war spending in a county was to raise population growth, but greater military spending left the residents of a county no better off in per capita terms than those residing in counties without war spending with respect to home ownership rates, non-farm home values, retail sales per capita, manufacturing annual earnings, labour productivity, or the share of manufacturing. The war spending was associated with higher E-bond sales and bank deposits during the war, but the relationship is gone by 1949. Consistent with the findings of Goldin, areas with greater war spending experienced only a minor increase in the share of women in the workforce between 1940 and 1950.<sup>7</sup>

## I

President Roosevelt initiated Second World War economic mobilization nearly two years prior to the US entry into the war, as military outlays as a share of GDP rose from roughly 1 per cent in 1939 to 4.7 per cent in 1941 to over 35 per cent during the heart of the war.<sup>8</sup> Roosevelt established civilian mobilization agencies, like the War Production Board (WPB), that in theory were expected to oversee the massive transition to a military economy. Yet, most scholars agree that the military procurement agencies wielded the power of allocation during the Second World War with little interference from the WPB and other civilian agencies. Economic problems in counties received virtually no systematic consideration in distributing funds, although political considerations still held some sway. Speed of production almost always overrode all other considerations. The sheer magnitude of the procurement effort and the necessity for speed led the army to contract with larger companies and left subcontracting up to the prime contractors. To expedite the process of procurement, contracts were placed by negotiation rather than competitive bidding. Firms with prior military contracts had a significant advantage in the process. In addition, the technological complexity of new war materials required significant engineering and manufacturing expertise that eliminated many firms from competition for contracts.<sup>9</sup>

By 1942 consumers faced price controls and rationing of consumer goods, as military objectives increasingly crowded out production for civilian consumption. Head of the WPB Donald Nelson noted that ‘converting the automobile industry was, in a sense, destroying it’.<sup>10</sup> The production of consumer durables, like washing machines and electric appliances, was restricted or prohibited altogether. Steel,

<sup>7</sup> See Goldin, ‘Role of World War II’.

<sup>8</sup> Outlays are reported in Carter, Gartner, Haines, Olmstead, Sutch, and Wright, *Historical statistics*, pp. 5–367.

<sup>9</sup> See Schubert, *Mobilization*; Koistinen, *Arsenal*; Smith, *Army*; Higgs, ‘Private profit’; idem, *Depression, war, and cold war*, p. 91; Rhode, Snyder, and Strumpf, ‘“Great arsenal”’.

<sup>10</sup> Nelson, *Arsenal*, p. 218.

aluminium, rubber, and numerous other materials were primarily allocated to military production under the priority allocation system. Approximately 43 per cent of the nation's 184,000 manufacturing firms were used directly or indirectly for war production and the rest were typically not spared critical materials for nonessential output at even curtailed rates.<sup>11</sup> Nelson noted that 'business firms of sub-average size, more often than not, did get the dirty end of the stick . . . [as] thousands and thousands of small firms . . . were beginning to be pinched because of the purchases of goods and raw materials by the large manufacturers'.<sup>12</sup>

The day following the surrender of Japan on 15 August 1945, the military was already demobilizing and all controls over manpower and fuel rationing restrictions were lifted. The remaining rationing orders (except for sugar) were lifted by the end of 1945. Price controls were lifted in stages through 1946 and 1947. On the producers' side, most priority controls on input materials were eliminated, over 2.5 million workers were released from war jobs, and almost one-third of the almost 300,000 outstanding war contracts had been cancelled by the end of August.<sup>13</sup>

Many businesses then went about the process of converting back to the production of consumer goods. During the expansion in private investment and production of consumer goods, some companies benefitted from improvements to factories made during the war. A number of new facilities in aluminium and synthetic rubber were used for decades after the war. On the other hand, Higgs found that the bulk of the government investment was too specific to military production needs to be useful for consumer goods after the war.<sup>14</sup>

## II

Planners divided war spending for the period 1940 to 1945 into two broad categories: contract spending (87 per cent) and facilities spending (13 per cent). Contract spending is reported as the net value after subtracting contract cancellations and reductions and included all supply contracts with a value of \$50,000 or higher that were awarded by the military to individual producers for combat supplies such as planes, tanks, guns, or ships, as well as incidental materials like clothing, medical supplies, and paper. Facilities spending involved the building of government-financed military or industrial facilities of more than \$25,000 and included aircraft plants, shipyards, air fields, and cantonments. The facilities and contract spending were so strongly correlated across counties that concerns with multicollinearity led us to combine them into one sum called war spending.

War spending was assigned to a county if the principal producing plant was located in the county. The firms were generally reluctant to subcontract to smaller firms except for the least profitable parts of the contract. As a result, contract funds remained largely where the prime contract was allocated. As the demand for military products grew, the firms expanded production at existing facilities, and then began expanding facilities. Most did not set up new plants in new locations.<sup>15</sup>

<sup>11</sup> Koistinen, *Arsenal*, pp. 278–9.

<sup>12</sup> Nelson, *Arsenal*, p. 269.

<sup>13</sup> US Bureau of the Budget, *United States at war*, p. 492.

<sup>14</sup> See Gordon, '\$45 billion', on the successful conversions; and Higgs, 'Wartime socialization', on the unsuccessful ones.

<sup>15</sup> Koistinen, *Arsenal*.

Table 1. *Information on top five counties in terms of total and per capita war spending*

		War spending in 1967\$			Growth rates	
Rank	County	Total in billions	Per capita	% of total	Retail sales per capita (1939–48)	Population (1939–48)
Highest total spending						
1	Wayne, MI	\$28	\$13,884	6%	60%	21%
2	Los Angeles, CA	\$24	\$8,612	5%	39%	49%
3	Cook, IL	\$22	\$5,420	4%	55%	11%
4	New York City, NY	\$15	\$2,048	3%	37%	6%
5	Erie, NY	\$11	\$14,134	2%	47%	13%
Highest spending per capita						
1	Sarpy, NE	\$1.60	\$144,771	0.32%	45%	45%
2	Orange, TX	\$1.60	\$90,500	0.32%	107%	133%
3	Sagadahoc, ME	\$1.20	\$63,890	0.25%	26%	9%
4	Mineral, NV	\$0.10	\$53,456	0.03%	17%	137%
5	Contra Costa, CA	\$5.00	\$49,404	1.01%	23%	198%
Sample average						
	County average	\$0.20	\$1,326		92%	5%
	Nation as a whole	\$493	\$3,761		57%	14%

Sources: See notes to tab. 2.

Much of the war spending was concentrated in heavily industrialized areas, with the top 20 counties accounting for almost 40 per cent of total spending. The top five counties receiving war spending and listed in table 1 contain Detroit, Los Angeles, Chicago, New York City, and Buffalo, each with more than 2 per cent of total spending. The war spending data do not include information on the secret nuclear projects at Hanford, Washington; Oak Ridge, Tennessee; and Los Alamos, New Mexico; therefore, we eliminated their counties from the analysis.

Per capita war spending was less concentrated than total spending as the ratio of the standard deviation to the mean was 3.6 compared to 6.5 for total spending. Per capita spending was highest in Sarpy County near Omaha, Nebraska, which received \$144,771 (1967\$) per 1940 resident from 1940 to 1945 after it became the site of Glenn Martin's bomber assembly plant.<sup>16</sup> At the bottom of the list, 43 per cent of the 3,065 counties in the US failed to receive even one dollar of war spending.

The central issue in this article is how war spending changed the peace-time economy from the situation before the war to the peace-time economy several years after the war. We illustrate the logic of the analysis by examining the relationship between war spending and the growth in retail sales per capita between 1939 and 1948. By 1948 price controls and rationing had ended and the production of military goods had receded; therefore, retail sales no longer faced the measurement problems for consumer activity that had been caused by the price ceilings, rationing, and black markets during the war. We focus on retail sales per capita because measures of income at the county level are not available yet for this period, and Fishback, Horrace, and Kantor show that per capita retail sales

<sup>16</sup> Rhode et al., ' "Great arsenal" '.

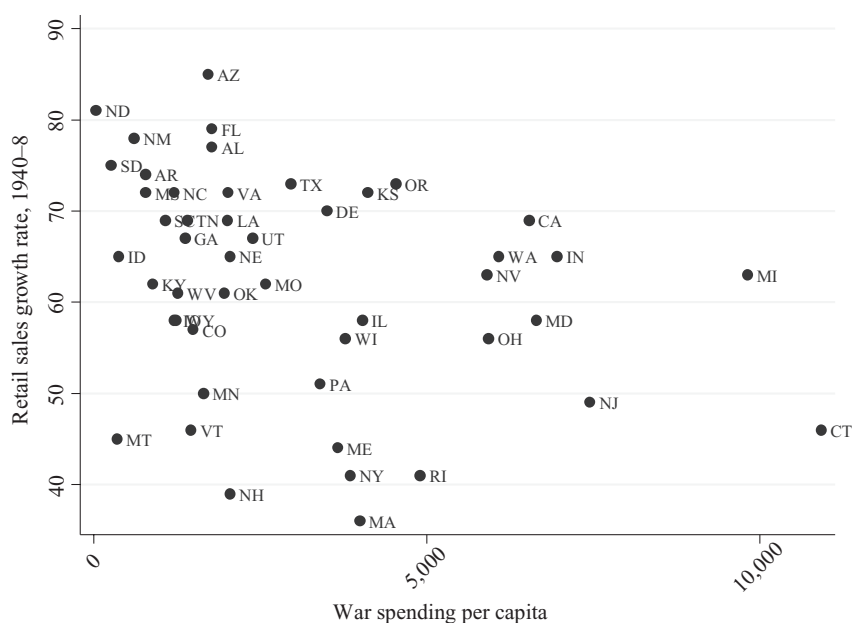


Figure 1. Scatter plot of state retail sales per capita (1967\$) growth rate and war spending per capita, 1939–48

Sources: See tab. 2 sources.

and per capita personal income have correlation coefficients above 0.87 across states for several years in the 1930s.<sup>17</sup>

The raw data suggest that war spending per capita was not positively associated with retail sales per capita growth. The plots for state aggregates in figure 1 suggest a negative relationship between the two. Connecticut and Michigan had the greatest per capita war spending at over \$10,000 per person, but their growth rates in retail sales were lower than in many states. Meanwhile, a number of farm-oriented states experienced high retail sales growth while receiving much less war spending.

The situation for farm-oriented states is mirrored in comparisons of county maps of retail sales growth per capita in figure 2 and the per capita war spending in figure 3. Many of the Midwestern farm counties experienced rapid growth in retail sales per capita but received little or no war spending per capita. The lack of relationship is demonstrated further by the spending for the leading war spending counties in table 1. Nearly all of the counties in the list had slower rates of per capita retail sales growth than the national average, although most had more rapid rates of population growth.

There are a variety of reasons why this negative relationship might appear in simple correlations. For example, many of the high growth areas were areas with low levels of retail sales per capita as of 1939. Thus, the same dollar increase in retail sales per capita would generate higher growth rates for those counties than for counties with higher 1939 levels. There are also likely to be a number of correlates that are related to both war spending and retail sales growth and thus the

<sup>17</sup> Fishback, Horrace, and Kantor, 'New Deal grant programs'.



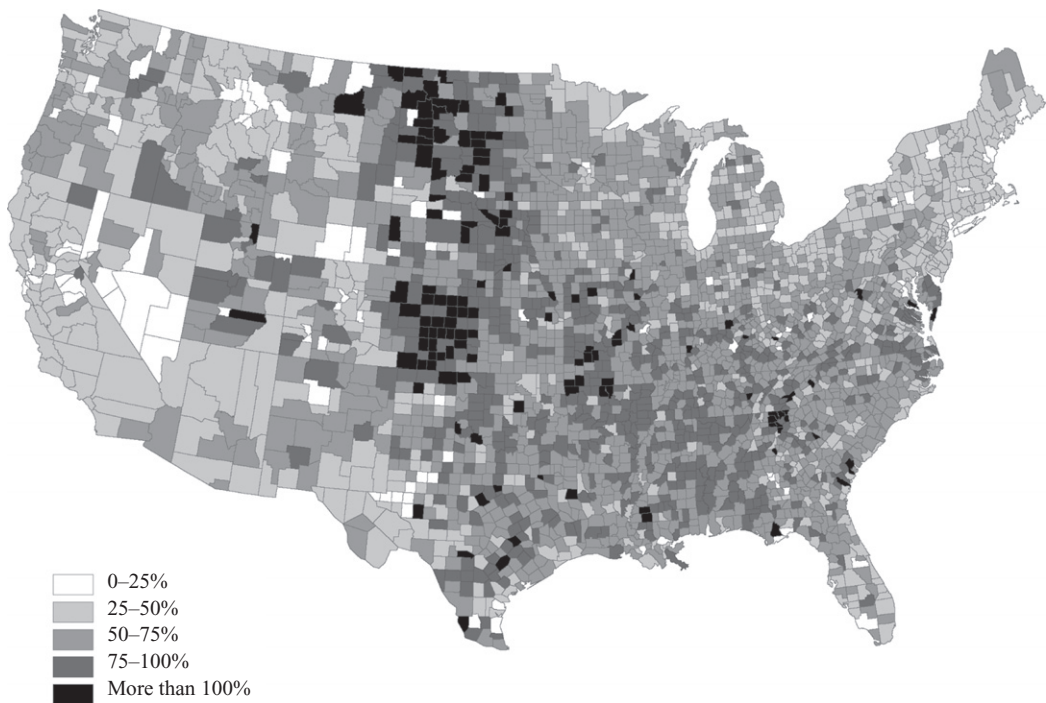


Figure 2. *Per capita retail sales growth, 1939–48*

Sources: See tab. 2 sources.

simple negative relationships shown by the raw data may be the result of omitted variable bias that can be eliminated by including a variety of correlates in the econometric analysis.

### III

The coefficient of per capita war spending that we estimate is a reduced-form estimate that summarizes a variety of effects. In nearly every regional model, Keynesian or neo-classical, a sharp rise in external spending on production is expected to lead to a rise in per capita incomes. However, there are a number of features of the war spending that might have weakened the effect. First, the war spending clearly crowded out private activity. Many manufacturers converted their production lines from private goods to military goods.<sup>18</sup> Given that unemployment rates in 1940 were still over 9 per cent (including people on work relief as unemployed), the shift to war production still would have had a positive effect by soaking up unused capacity. Second, there were additional costs specific to the conversion from private to military good production and back again that offset the positive stimulus of war spending. Third, an increase in federal tax rates from less than 7 to roughly 20 per cent imposed a fiscal drag on consumption. Fourth, any multiplier effects within a regional model were weakened to the extent that the spending went to materials imported from other counties or consumption of goods

<sup>18</sup> Kuznets, *National product*; Higgs, 'Wartime prosperity'; idem, 'Central planning'.

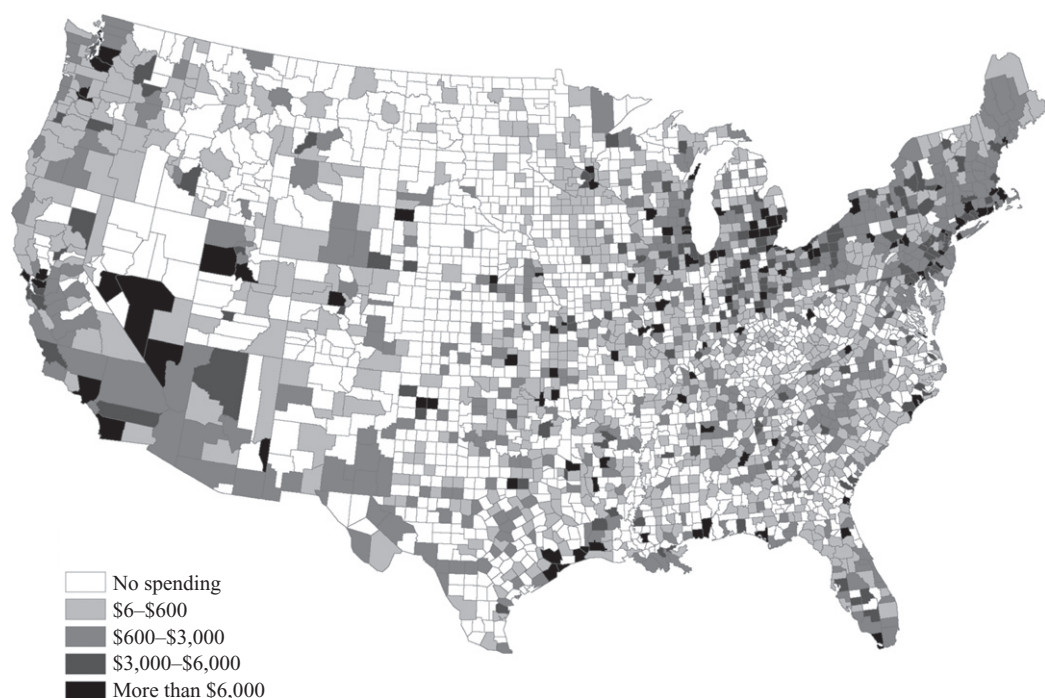


Figure 3. *Total war spending per capita, 1940–5 (1967\$)*

Sources: See tab. 2 sources.

was focused on imports from other counties. Using a simple framework of identities, we show in online appendix S1 that reasonable assumptions about these first four effects could lead to a very low and even a negative coefficient on per capita war spending.

In addition, there were labour market relationships that may have further weakened the effect of war spending. Wage controls set at the national level during the war would have limited the effect on wages that arose from increased demand for workers along a positively sloped labour supply in areas with high war spending per capita. Finally, to the extent that the war spending led to in-migration into counties, the increased supply of workers would have put downward pressure on wages in those areas. Meanwhile, the reduction in labour supply in areas of out-migration with no or low military spending would have put upward pressure on incomes in those areas. In these mostly agricultural regions where out-migration occurred, wages started at lower levels and thus there was more room for increase before they hit wage ceilings. Given all of these leakages and interactions, the summary relationship between economic activity and various war measures is clearly an empirical question.

#### IV

Following Fishback et al.'s work on the New Deal, we estimate a growth equation with the change in the natural log of retail sales between 1939 and 1948



as a measure of growth in economic activity as a function of per capita war spending.<sup>19</sup>

$$\ln(R_{i,48}) - \ln(R_{i,39}) = \beta_0 + \beta_1 \text{WAR}_{i40-45} + \beta_2 \ln(R_{i39}) + \beta_3 Z_{i39} + \beta_4 S + \varepsilon_i \quad (1)$$

where  $\ln(R_{i,48})$  and  $\ln(R_{i,39})$  are per capita retail sales in 1948 and 1939,  $\text{WAR}_{i,40-45}$  is per capita war spending from 1940 through 1945,  $Z_{i39}$  is a vector of structural correlates measured in 1939 that might have determined economic growth over the decade,  $S$  is a vector of state dummies, and  $\varepsilon_i$  is an unobservable error term.

As in most growth models, we include the lagged log level of retail sales per capita to control for convergence and the mechanical negative relationship between growth rates and prior levels. To control for prior economic trends, the growth rate of retail sales from 1929 to 1939 is included. The correlates are grouped into several categories. Economic structure correlates include the share of employment in manufacturing and farming and a measure of wealth in the form of radios per household in 1940. Demographic correlates include the 1940 percentages of females, blacks, urban dwellers, foreign-born, illiterates, and seven age categories. A series of demographic correlates control for differences in retail consumption patterns and income levels by age, race, ethnicity, education, gender, urbanization, and wealth. Geographic features include access to major rivers; ocean and Great Lakes coast lines; measures of elevation; and the number of bays, lakes, beaches, and swamps. Weather information on average temperature, precipitation, and months of severe or extreme wetness and drought, and the carryover from the Dust Bowl in the 1930s is included to control for the impact of building activity and farm productivity. The weather information is interacted with the farm population in case the impact of weather was stronger in farm counties. Finally, we incorporated state fixed effects to control for factors that were common to all counties within a state but varied across states. The state dummies control for unmeasured heterogeneity such as the extent of mobilization of the population into the armed forces, state taxation and revenue policies, retail laws, and differences in the cost of living across states.<sup>20</sup> The use of county-level, intra-state variation in the variables of interest is a key advantage of our analysis as it allows us to control for arbitrary state differences.

Ordinary Least Squares (OLS) estimates of the coefficients on per capita war spending with standard errors clustered at the state level are shown in table 1 for specifications that add correlates cumulatively. In specification (1) with no controls, the coefficient is negative and statistically significant, similar to the results of the comparisons of figures 1, 2, and 3. A one standard deviation increase in per capita war spending of \$4.487 thousand was associated with a reduction in the growth in retail sales per capita of  $-0.041$  ( $-0.00854 \times 4.487$ ), which is 0.19 standard deviations for the growth in retail sales per capita. The coefficient implies that at the average level of retail sales per capita in the US in 1939 of \$557, a dollar increase in war spending per capita was associated with a relatively small decrease in retail sales per capita in 1948 of less than half a cent. As each subsequent

<sup>19</sup> Fishback et al., 'New Deal grant programs'.

<sup>20</sup> We have explored aggregating individual draft records up to the county level, but the large number of glitches in the assignments of counties of residence for people mobilized gives us no confidence that these would be accurate counts. We have been unable to find numbers by county.

specification in table 1 adds correlates cumulatively, the coefficient becomes less negative and the *P*-value rises. The reduction of omitted variable bias leads to a very small negative change of 0.02 standard deviations in retail sales growth when war spending per capita is increased by one standard deviation, also described as a one-standard-deviation (OSD) effect of  $-0.02$ . The impact of an additional dollar of war spending per capita was virtually zero.<sup>21</sup>

The results thus far suggest that the growth in retail sales per capita was no higher in counties with more war spending per capita. We perform a series of robustness checks with different subsamples and a variety of methods with coefficients listed in specifications (8) to (12) in table 1.<sup>22</sup>

Potentially, the tremendous variation in the amount of war spending across counties includes outliers that are driving the results. It is also possible that counties receiving different amounts of war spending were different in some unmeasured way. Specification (8) focuses on the counties with moderate to zero spending in case they are more similar in unmeasured attributes than in the heavily industrialized counties; therefore, we eliminated the counties ranking in the top 5 per cent in terms of war spending per capita. The top 5 per cent received 72 per cent of the \$493 billion in war spending while accounting for only 26 per cent of the population. In case the counties receiving no spending were structurally different from those receiving positive amounts, specification (9) considers only counties that received a strictly positive amount of war spending. Specification (10) still considers only counties with positive spending but eliminates counties below the 5th percentile and above the 95th percentile of per capita spending in that group.

Specification (11) uses propensity score econometric methods from the treatment literature as another way to identify counties that are similar in terms of their propensity to be allocated war expenditures. A probit model was used to estimate the probability that a county received a positive amount of spending on the full set of correlates in specification (7) in table 1. The probability developed from the probit model is used to create a histogram of counties with positive or zero spending to determine a 'thick region' of common support. Counties with positive war spending in this thick region are being compared to zero spending counties with similar observable characteristics. Counties with a propensity score outside the thick region were eliminated. The model was then estimated using OLS with the continuous measure of war spending and all structural correlates.

When we examine all of these subsamples, the results change little; the coefficients are negative, the OSD estimates are between  $-0.022$  and  $-0.05$  and an additional dollar of war spending per capita is associated with 0.3 cents less in retail sales per capita in 1948.

Another possibility is that the weak relationship of retail sales growth with per capita war spending is being driven by a strong positive shock to farm incomes in areas where there was little war spending. There were numerous reports of a sharp rise in agricultural production as US farmers grew foodstuffs that were transported and sold to allies in war-torn lands. Specification (12) incorporates the growth in the value of crop output during the period as a correlate. While the

<sup>21</sup> A full set of OLS results for specification 7 is reported in online app. S1.

<sup>22</sup> We have also performed the complete analyses in the article by adding a squared term for war spending per capita and by using natural logs of war spending per capita after adding a dollar to all values to eliminate zeroes). The qualitative findings are unchanged.

Table 2. *The estimated impact of war spending per capita (in thousands of \$1967) on retail sales growth, 1939–48, under different specifications and robustness checks*

Spec.	Variables in specification	Per capita war spending coefficient	P-value	OSD change	Dollar change	N
1	War	-0.00854	0.000	-0.190	-0.0046	3,036
2	(1) + Retail sales 1939	-0.00509	0.000	-0.113	-0.0027	3,036
3	(2) + Economic correlates	-0.00291	0.000	-0.065	-0.0016	3,036
4	(3) + Demographic correlates	-0.00111	0.041	-0.025	-0.0006	3,036
5	(4) + Geographic correlates	-0.00127	0.028	-0.028	-0.0007	3,036
6	(5) + Climatic correlates	-0.00104	0.059	-0.023	-0.0006	3,036
7	(6) + State dummies	-0.00095	0.122	-0.021	-0.0005	3,036
Robustness checks using specification 7						
8	No spending above 95 percentile	-0.00588	0.034	-0.032	-0.0031	2,885
9	Positive spending only	-0.00074	0.193	-0.026	-0.0004	1,763
10	Positive spending, 5th < war < 95th	-0.00202	0.330	-0.022	-0.0011	1,587
11	Common support	-0.00208	0.000	-0.050	-0.0011	1,252
12	Agricultural production	-0.00066	0.378	-0.015	-0.0004	3,035
OLS estimates of specification 7 by region						
13	Northeast census region	-0.00003	0.965	-0.002	0.0000	212
14	Midwest census region	-0.00233	0.000	-0.061	-0.0012	1,047
15	South census region	0.00071	0.305	0.013	0.0004	1,374
16	West census region	-0.00167	0.531	-0.034	-0.0009	406
Longer range using specification 7						
17	Retail sales growth, 1939–54	-0.00077	0.387	-0.013	-0.0004	3,028
18	Retail sales growth, 1939–58	-0.00052	0.476	-0.008	-0.0003	3,029
Differenced: decade surrounding war minus 1930s						
19	Growth 1939–48 minus growth 1929–39	-0.00253	0.000	-0.031	-0.0013	3,032
20	Growth 1939–54 minus growth 1929–39	-0.00374	0.000	-0.043	-0.0020	3,028
21	Growth 1939–58 minus growth 1929–39	-0.00427	0.001	-0.046	-0.0460	3,029

Notes: P-value is from t-tests on the coefficient using standard errors clustered at the state level. OSD change is the number of standard deviations the growth rate in per capita retail sales changes when war spending per capita rises by one standard deviation. Dollar change is the number of dollars by which retail sales per capita rises in 1948 with a one-dollar increase in per capita war spending when starting at the mean retail sales per capita of \$557. See text and online app. S1 for variable lists.

Sources: War spending figures come from US Bureau of the Census, *County and city data book*, as digitized in ICPSR data set 2896 (Haines and Inter-university Consortium for Political and Social Research, 'Historical, demographic, economic and social data'). Many of the correlates for 1940 and 1930 were compiled for New Deal studies by Fishback, Horrace, and Kantor ('New Deal grant programs', and 'Impact of New Deal expenditures') and the data and details of the data associated with those articles can be downloaded from Price Fishback's website at [http://www.u.arizona.edu/~fishback/Published\\_Research\\_Datasets.htm](http://www.u.arizona.edu/~fishback/Published_Research_Datasets.htm). Population in 1948 was calculated via linear interpolation of populations for 1940 and 1950 from Haines and Inter-university Consortium for Political and Social Research, 'Historical, demographic, economic and social data'.

growth in farm output has a positive coefficient, the coefficient of war spending per capita remains negative and smaller than in specification (7).

In specifications (13) to (16), we explore possible regional variation in the coefficients because the size and isolation of counties varies by region. The South is the only region where the war spending coefficient is positive but it is statistically insignificant, the OSD effect is only 0.015, and the dollar-for-dollar effect is 0.04 cents.

The medium-term effects measured may understate the longer-range benefits of the military spending because by 1948 the factories had been converted within the prior three years. We have also run the same sequence of estimates for growth rates in retail sales per capita from 1939 to 1954 and again for retail sales per capita from 1939 to 1958. The patterns for the war spending coefficients found for specifications (1) through (12) in table 2 for the 1939–48 regressions are repeated in those regressions. Specifications (17) and (18) in table 2 show the results for 1939–54 and 1939–58 using specification (7). The coefficients are statistically

insignificant and the OSD and dollar-for-dollar effects are slightly less negative for the longer-term regressions.<sup>23</sup>

## V

As an additional robustness check, we estimate the differenced version of equation 1 with some adjustments that lead to equation 2. By differencing, the identification of the relationship comes from comparing growth rates over time within the same county during periods before and surrounding the war. In the process we control for time-invariant unmeasured features of the county. Within this differencing equation we are still controlling for differences in prior levels and trends as well.

$$\begin{aligned} & [\ln(R_{i,48}) - \ln(R_{i,39})] - [\ln(R_{i,39}) - \ln(R_{i,29})] \\ &= \alpha_0 + \alpha_1 \text{WAR}_{i,40-45} - \alpha_2 \text{NDPR}_{i,33-39} + \alpha_3 [\ln(R_{i,39}) - \ln(R_{i,29})] \\ &+ \alpha_4 [X_{i,39} - X_{i,29}] + \alpha_5 [C_{39} - C_{29}] + \alpha_6 S + \eta_i \end{aligned} \quad (2)$$

The equation was developed by adding information collected by Fishback et al. for their studies of the New Deal at the county level.<sup>24</sup> There are several adjustments required. First, we include New Deal spending on public works and relief programs, which was the vast majority of federal spending in the 1930s. We do not have specific war spending for the 1930s, but annual military spending in the 1930s was less than one-twenty-sixth of the spending in 1942 and one-seventieth of the levels around 1944.<sup>25</sup> Second, the differencing of the vector of correlates between 1939 and 1929 drops the geographic variables because they do not vary over time. Third, in a typical difference equation the state fixed effects are differenced out, but we put them back into the model to capture the changes in policy and cost of living at the state level that might have influenced the changing growth rates. Fourth, AAA farm program spending was a key feature of the New Deal and continued in the 1940s. We have AAA information by county for the 1930s but not for the 1940s. To control for the AAA spending in both decades, we use the shares of crop output devoted to the major AAA crops—corn, wheat, cotton, and tobacco—in 1929 and in 1939 as proxies for the extent of AAA activity. Fifth, due to lack of information on retail sales growth per capita in the 1920s, we control for lagged growth in the X difference vector by using the difference in the growth rate of population between 1920–30 and 1930–40.<sup>26</sup>

The war spending results for the differenced equation are similar to all of the results reported in table 2. Although the coefficient of war spending per capita is statistically significant, the OSD effect of  $-0.031$  is similar and an additional dollar of war spending per capita lowered retail sales in 1948 by only 0.1 cents.

## VI

The results suggest that a mixture of crowding out of private production, fiscal drag of taxation, leakages of military input spending, consumption of goods

<sup>23</sup> The war spending coefficients from the full sequence of estimations are reported in online app. S1.

<sup>24</sup> Fishback et al., 'New Deal grant programs; idem, 'Impact of New Deal expenditures'.

<sup>25</sup> US Bureau of the Census, *Historical statistics*, p. 1120.

<sup>26</sup> Population growth seems to be a good proxy for retail sales growth. Substituting lagged population growth for lagged retail sale growth in the un-differenced estimations yielded similar results.

produced external to the county, and migration wage effects meant that retail sales per capita were no higher in counties with greater war spending per capita.<sup>27</sup>

One natural critique of our finding of little effect might be that there is a negative endogeneity bias.<sup>28</sup> We have guarded against an endogeneity bias arising from omitted variables by including a rich set of correlates, controlling for prior levels and trends, and differencing to control for unmeasured time invariant heterogeneity for counties and trend changes in features of the states.

If military procurement plans focused on areas with less economic activity during the 1940s, then the allocation of war funds to counties that were economically distressed during the war would make it appear as though war spending impeded economic growth. However, the narrative history of the military's control of the allocation process suggests that the endogeneity bias left over after all of these controls might well have been positive. The narratives argue that the military dominated the allocation of the contracts and that production was allocated wherever it could be produced most quickly and efficiently with little regard to the economic status of the location. Given the urgency of production for the war effort, it can be argued that the primary determinants of war spending were decided long before the start of the war. From historical documents we know that large firms, businesses with established production records, and firms with manufacturing expertise had an advantage in acquiring contracts from military procurement agencies. Those counties with a strong and successful manufacturing base received significantly more war contracts than those with few manufacturing facilities. Thus the most industrially capable and urbanized counties received the most war dollars. The WPB had some programmes meant to provide funds to areas with more unemployment and to smaller firms. However, the programme funds were dwarfed by the funds controlled by the military, and the military paid little attention to the civilian-focused programmes.<sup>29</sup>

While the narrative evidence suggests that war spending does not seem to have been endogenously allocated to areas with ailing local economies, the distribution

<sup>27</sup> The war spending reported was total value and not value added. The use of value added would have focused more specifically on spending that would initially have been spent in the county. Based on typical patterns in manufacturing, our best estimate suggests that about 40% of the war spending could be considered value added. In cross-county analysis in other periods the correlation between manufacturing value added per capita and total revenue for manufacturing per capita is 0.93, which is very close to being a constant. Since value added is typically 40% of total revenue, assume that the constant ratio of value added to revenue is 0.4, which implies that the ratio of total revenue to value added is 2.5. Econometrically, we have come close to estimating the equivalent of the following simple relationship.

Retail sales growth =  $\alpha + \gamma (2.5 \times \text{War production value added per capita})$   
when we wanted to estimate

Retail sales growth =  $\alpha + \beta \text{ War production value added per capita}$ .

Econometric theory shows that the coefficient we actually estimated ( $\gamma$ ), would be

$\gamma = 0.4 \times \beta$ , which implies  $\beta = 2.5 \times \gamma$

Therefore, we should scale up the coefficient estimates that we have produced by 2.5. However, the estimates of the impact of war spending on retail sales growth are so small, that even after scaling them by 2.5, it does not change the finding that war spending had a very small effect on retail sales growth per capita.

<sup>28</sup> In the macroeconomic literature on multipliers, military spending, particularly in war time, has often been treated as exogenous because it is seen as unrelated to current economic conditions. See Ramey, 'Government'.

<sup>29</sup> See Koistinen, *Arsenal*, for a discussion of the limited influence of the War Production Board. We have also explored using the number of firms in each county assigned to each branch of the military in war mobilization plans set up in the 1930s from US Joint Army and Navy Munitions Board, *Industrial mobilization*, as instruments for the distribution of war spending. The Donald F-statistic for the set of instruments was 3.6 and the results showed a very small and statistically insignificant positive effect. The F-statistic was low enough that we decided that there was too much weak instrument bias.



of military monies was clearly not random. Since most spending was focused on the manufacturing counties, a negative shock to the manufacturing sector, if unrelated to prior levels or trends and experienced at the same time that war dollars were flowing into these counties, would bias our results if not controlled for in the model. This shock would need to be correlated with, but not directly or indirectly caused by, the economic mobilization effort of the war. In addition, the magnitude of this shock would need to be of equal size to the shock of war spending in order to negate a positive effect of war spending on economic growth in those manufacturing counties. We have not been able to find any historical evidence of such a simultaneous negative shock to manufacturing in the 1940s; therefore, we believe that the existence of such a large, negative shock to manufacturing seems implausible.

## VII

Given the narratives about the effects of Second World War spending, the lack of an effect of war spending on retail sales growth will surprise most observers. It is natural to wonder how the other dimensions of the economic fabric of the local economies stretched to accommodate such intense spending. Therefore, we have estimated the same models for a series of other measures of economic activity. Table 3 shows the number of standard deviations by which the growth in the dependent variable changes with a one-standard deviation increase in war spending per capita (the OSD effect) from regressions using specification (1) with no correlates, the level specification (7) with all correlates, and the differenced speci-

Table 3. *Change in number of standard deviations in growth rate of variables associated with a one standard deviation increase in war spending per capita*

<i>Dependent variable</i>	<i>Specification 1</i>	<i>Specification 7</i>	<i>Specification 19</i>
Growth in:			
E-bonds (1940–4)	0.359**	0.294**	0.305**
E-bonds (1940–9)	0.024	0.003	0.006
Bank deposits (1936–44)	–0.060**	0.050**	0.017**
Bank deposits (1936–49)	–0.160**	–0.036**	–0.038**
Home ownership rate (1940–50)	–0.099**	–0.056	–0.029*
Housing value growth (1940–50)	–0.074**	0.035**	0.001
Share of workers in manufacturing (1939–47)	0.147**	0.061*	0.059**
Manufacturing average annual earnings (1939–47)	–0.058**	0.021	0.001
Manufacturing value added per worker (1939–47)	–0.017	0.014	0.007
Manufacturing value added per capita (1939–47)	–0.047**	0.035**	0.012
Share of workforce female (1940–50)	0.022	0.026*	0.022*
Share of women employed in manufacturing (1940–50)	0.012	0.007	0.004
Population growth (1940–8)	0.347**	0.217**	0.207**

Notes: \*\* Statistically significant at 5% level in two-tailed test. \* Statistically significant at 10% level in two-tailed test.

Specifications are the same as in tab. 2 with retail sales per capita replaced in all parts of the specification with the variable listed. See text for descriptions of specifications. We have also run specifications where we made adjustments to the samples like the ones we made in specifications 8 to 12 in tab. 2. The results suggest that there would be no qualitative change in our final conclusions using the more restricted samples.

Sources: In addition to sources for regressions for tab. 2, E-bond sales in 1944 and 1949; population in 1920, 1930, 1940, and 1950; shares of women employed and the share of women in the workforce in 1940 and 1950; home ownership rates and housing values in 1920, 1930, 1940, and 1950; manufacturing annual earnings and value added per worker in 1919, 1929, 1939, and 1947 were calculated from data provided in computerized form in Haines and Inter-university Consortium for Political and Social Research, 'Historical, demographic, economic and social data'; from the US Censuses of 1920, 1930, 1940, and 1950; and from the US Bureau of the Census, *County data book*; idem, *County and city data book*. All dollar figures are adjusted for inflation with the Consumer Price Index, with the 1967 value as 100 (series E-135 in US Bureau of the Census, *Historical statistics*, pp. 210–11).

fication (19) from table 2. In each case retail sales per capita in all parts of the regression are replaced with the variable listed in table 3. The results show that omitted variable bias is probably an issue for the simplest specification with the growth rate as a function of per capita war spending. The addition of other controls and the switch to differencing between the war decade and the 1930s generally leads to substantial changes in the size of the coefficients used to calculate the OSD effects. In our discussions we will focus on the differenced specification (19) because it has incorporated the most controls.<sup>30</sup>

Standard descriptions of strong effects of the war spending on prosperity argue that workers faced with rationing often put their increased income into savings by buying war bonds, accumulating bank deposits, and/or buying housing. E-bonds, also known as 'war' bonds, were first sold in 1941 and were the dominant form of savings bond sold to small investors during the war.<sup>31</sup> War spending had a positive and statistically significant impact on E-bond purchases and bank deposits in 1944 during the war.<sup>32</sup> In the differenced specification (19), a one-standard-deviation increase in war spending per capita over the period 1939 to 1945 raised E-bond sales per capita in 1944 by 0.304 standard deviations and bank deposits by 0.017 standard deviations. In dollar-for-dollar terms an additional dollar per capita of war spending during the war raised E-bond sales by 0.4 cents in 1944. This may seem small at first, but remember that only about 30 per cent of the war spending was paid directly as wages. Assuming the typical worker saved about 5 per cent of their income, they normally would have saved 1.5 cents out of the 30 cents of income derived from the dollar of war spending. Thus, the 0.4 cent increase would have accounted for a little less than one third of the rise in a worker's savings. The effect was much smaller for bank deposits.

The surge in savings associated with war spending during the war did not carry over to the end of the 1940s. The OSD effect of war spending per capita on the growth in E-bond sales per capita between 1940 and 1949 was only 0.006, and the OSD effect for bank deposits per capita was negative at -0.038.

Since housing is a major portion of the typical home owner's wealth, housing might also be considered a form of saving. Similar to the small effects found on bond sales and bank deposits, counties with more war spending per capita experienced slightly higher growth rates of housing values between 1940 and 1950 and slightly lower home ownership rates between 1940 and 1950.

The war spending was focused heavily on manufacturing; therefore, it is likely that the strongest structural changes arising from the war spending would have

<sup>30</sup> For all of the different variables, we have run specifications where the dependent variable is the level in the final year as a function of the prior level before the war and all of the other correlates. The qualitative results are the same and the magnitudes do not vary much.

<sup>31</sup> E-bond sales accounted for roughly 75–80% of all savings bond sales each year between 1943 and 1950. See US Secretary of the Treasury, *Annual Report, 1950*, p. 558. Since there were no E-bonds sold prior to 1941, the numbers of E-bond sales in 1944 and in 1949 are the same as the change in E-bond sales over that period. There were four issues of savings bonds between 1935 and 1940 (A, B, C, and D), but we do not have information on sales of those bonds at the county level. The total national sales of the earlier issues were one-tenth the level of E-bond sales in 1944; therefore, we do not believe that controlling for their prior level will make much difference. Series F and G bonds were also sold to the public but were targeted at larger investors. The E bonds could be obtained at post offices and a wide range of financial institutions. F and G series bonds could be purchased only at the Federal Reserve Banks and the Treasury Department, usually with the assistance of a commercial bank. See US Secretary of the Treasury, *Annual Report, 1941*, p. 23.

<sup>32</sup> For the growth rate of the bank deposits we use bank deposits in 1936 as the starting year because information on bank deposits was not available for counties from 1937 to 1943.

come in the form of a shift to the manufacturing sector. The results in table 3 show that there was a statistically significant OSD shift of 0.059 toward a higher share of workers in manufacturing. However, the OSD effects for manufacturing value added per person in the county, average annual manufacturing earnings, and manufacturing labour productivity were all less than 0.013.

Histories of the Second World War point to women's participation in the workforce as a key element of the war effort. Many people had thought that the Second World War led to permanent changes in women's labour force participation. Goldin, however, examined the issue using retrospective labour histories from 1944 and 1951 surveys collected by Gladys Palmer.<sup>33</sup> The retrospective histories show that only 20 per cent of women working in 1950 had entered the workforce during the Second World War and that the rate of entry of women into the workforce was roughly the same during the war as it was from 1946 to 1950. The results here are similar to Goldin's finding. War spending had at best a small positive relationship with changes in women's roles in the workplace by 1950. Counties with war spending per capita that was one standard deviation larger than the mean had a female share of the workforce that rose by a relatively small but statistically significant 0.022 standard deviations. However, the employment rate for women rose a small and statistically insignificant 0.004 standard deviations.

Numerous narratives describe the Second World War as a period of significant internal movement within the US. A substantial number of people moved from economically stagnant areas to cities experiencing labour shortages due to rapid expansions in war production.<sup>34</sup> The rise in population described during the war carried through the end of the decade, as a substantial number of civilians moved to war production areas during the war and many stayed in the new location rather than incur the costs of a return migration. The effect may have been compounded somewhat when soldiers were demobilized and returned to new locations rather than their original homes. Counties with war spending per capita that was higher by one standard deviation experienced population growth that was 0.217 standard deviations higher.

## VIII

Our goal is to measure whether community leaders would have found it beneficial in the long term for their peace-time economies to compete to obtain military contracts and facilities for their communities during the war. If their goal was to expand population, the answer is yes. The sharp rise and fall in Second World War military spending contributed to a substantial redistribution of the population between 1940 and 1950 toward the counties where the spending was concentrated during the war. Increased war spending also contributed to a slightly elevated share of employment in manufacturing and share of women in employment. During the war greater munitions spending was associated with higher savings in the form of E-bond purchases and bank deposits, but the positive effect did not carry over to the end of the decade. Counties with greater war spending per capita generally did not have more growth in other per capita measures of economic activity between

<sup>33</sup> Goldin, 'Role of World War II'.

<sup>34</sup> US Bureau of Labor Statistics, 'State variations'.

1939 and the late 1940s, including retail sales, E-bond sales, bank deposits, manufacturing annual earnings, manufacturing productivity per worker, women's share in manufacturing, the share of manufacturing in the economy, housing values, and home ownership.

The question remains as to why the longer-term effect of spending on per capita measures is so small. One possibility is that the true effect of Second World War spending was a series of economy-wide macroeconomic shocks to the entire economy at once, including a large-scale shift towards a command economy. The tremendous economic diversity of the various regions of the US raises some doubts that such a shock would have the same effects everywhere. However, it is possible that the war years pushed the US economy to the edge of the production possibility frontier on every dimension. Thus farmers and areas that did not receive much in military manufacturing spending and facilities still experienced large-scale increases in demand, so that it did not matter whether a county participated or not in the scramble for military manufacturing contracts in the short or the long term.

There were specific features of the war spending that may have led to the lack of an effect. First, Second World War spending largely replaced production of private consumption and investment goods. Second, there were significant short-run costs when factories that normally produced civilian goods were converted into war production facilities in the early 1940s and then were reconverted to civilian production after the war. In a number of cases, war production facilities ended up as scrap because they could not be converted at reasonable cost to production of civilian goods.<sup>35</sup> High federal tax rates that were paid by the majority of households imposed strong fiscal drags on any stimulation to income provided by greater war spending. Finally, the migration flows themselves probably contributed to the lack of a finding of an effect. As more migrants flowed into war spending areas, the expanded labour supply slowed the growth in wages, while the reductions in labour supply in the markets without war spending probably contributed to an increase in wages in those areas.

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<sup>35</sup> Higgs, 'Wartime socialization'.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

**Appendix S1.** Additional econometric results and predictions of contemporaneous effects of war spending under different assumptions