

# Government Spending in War and Peace: Comparing the Impact of World War II and New Deal Spending on Economic Growth

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In response to two major crises during the first half of the 20th century, the Federal government distributed huge amounts of funds throughout the country. In the heart of the Great Depression, the Roosevelt administration established the New Deal, which handed out close to 5 percent of GDP for work relief, public works projects, and farm programs. In the next decade, during WWII, government expenditures reached unprecedented levels with war spending reaching 44 percent of GDP in 1944. Economic theory generally regards government spending as a stimulus to the economy; in practice the type of spending may certainly influence the end result. To this point, there has been a good deal of controversy surrounding the economic benefits of war time spending. Many authors point to the WWII era as a prime example of economic prosperity spurred by war spending attributing the emergence of the US economy from the Great Depression to war expenditures. According to some, the US was even able to escape the trade off between civilian and military production by producing both “more guns and more butter” (Melman 1985). Other authors, including Higgs (1992), have challenged this view, arguing instead that the economic welfare of the population floundered during the 1940’s. Higgs (1992) in particular argues that the time series approach to measuring the change in economic welfare inflates prosperity measures due to price controls, rationing, black market activities and other aspects of the command economy during WWII. This school of thought instead suggests that war spending and peace time spending can lead to very different effects on economic welfare.

This paper takes a novel approach to addressing the effect of war spending on the economy by exploiting cross-sectional variation in county level economic growth and government spending during WWII. During the 1940’s there was dramatic variation in government war spending as well as dramatic differences in measures of economic welfare across counties in the US. Using retail sales as a measure of economic welfare and a rich set of correlates as controls, this paper seeks to quantify the effect of war spending on local economies. Furthermore, economic research done on New Deal spending by Fishback, Horraine & Kantor (2005) offers an opportunity to compare the effect of peacetime spending during the 1930’s with estimates of the impact of wartime spending. The residual of the paper continues as follows: Section 1 discusses why one might expect differences between the effects war and peacetime spending on the economic growth; Section 2 describes the geographic distribution of war spending in the 1940’s; Section 3

discusses the growth of retail sales and its role in the empirical model; Section 4 introduces the estimation procedure; Section 5 presents and discusses the estimation results.

## 1 Differences between War and Peacetime Spending

There are two reasons why one might suspect there to be an economic difference between war and peace time spending. First, it is well known that government spending has the potential to crowd out private spending. The level of crowding out depends on the amount of government spending and the particularities of the market. For example, much of New Deal spending during the 1930's was targeted towards counties with high unemployment and low economic growth. Since there was a surplus of labor in these areas, the public works and relief programs of the New Deal were unlikely to crowd out much private activity. If, on the other hand, the government had allocated these same funds to counties with low unemployment more crowding out would have occurred. During World War II, most spending was allocated to economically capable, heavily industrialized counties. It seems uncontroversial that crowding out was a major problem during WWII. By 1942 military procurement had harnessed such a large part of the economy that open markets for raw materials markets failed; essential raw materials were allocated instead on a priority based system. Initially private firms were reluctant to switch to war production because they did not want to give up market share to rivals which might be difficult to regain after the war. When voluntary transformation to war production failed to produce war materials in sufficient quantities, the War Production Board restricted the production of non-essential civilian goods such as washing machines and automobiles. Firms who found they could no longer produce their usual products usually "chose" to produce war materials instead. Firms that were not explicitly restricted from producing their output often found raw materials were too scarce to obtain sufficient inputs to continue their operations. They also found themselves faced with the choice of switching to war production or going out of business<sup>1</sup>.

A second reason that the effects of war and peacetime spending might differ results from the differences in the end product of such spending. The end product of New Deal relief spending was ususally some product that could be directly utilized by the population. For example, in addition to providing wages to the unemployed, New Deal spending funded public projects such as dams, bridges, and sidewalks all of which had direct use for the local populations. War spending on the other hand was largely used to produce combat equipment such as tanks, planes, and warships. While the production of such equipment did provide wages to workers, the finished product was not directly utilized by consumers. Most of the equipment was sent overseas with a significant probability of not returning in one piece. In general national security expenditures are necessary to maintain an environment in which the economy can grow, but security itsel does not create economic growth<sup>2</sup>. Since the end product of war and peacetime spending are so

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<sup>1</sup>The distortion in the economy particularly hurt small businesses who generally did not have direct access to prime contracts. The distress on small firms was so intense and widespread that Congress passed The Small Business Act in 1942 which required that special efforts be made to spread war business among small firms. (Smith 1959)

<sup>2</sup>Such a view of military expenditures is not uncommon. Nordhaus & Tobin (1972) also argue that national defense spending is one of the "activities that are evidently not direct sources of utility themselves but are regrettably necessary inputs to activities that may yield utility"

different one might expect the effects of such spending to also differ. While both types would be expected to have a positive or at least non-negative impact on county level economic growth, war spending might be expected to have smaller impact on growth than peacetime spending.

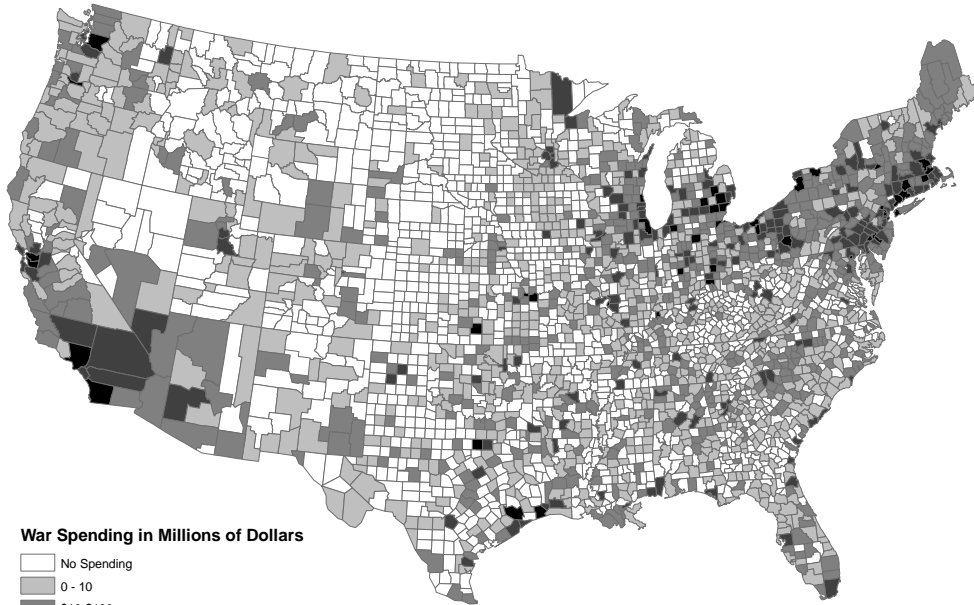
## 2 Geographic Distribution of War Spending

War spending can be put into two broad categories: contract spending and facilities spending. Contract spending, which accounted the bulk of all war spending, includes the value of all supply contracts awarded to individual producers for the procurement of combat supplies such as planes, tanks, guns or ships as well as incidental materials like clothing, medical supplies, and paper. Contract spending in this analysis is comprised of supply contracts from 1940-45 with of value of \$50,000 or greater awarded by major procurement branches of the military. Although there was military spending before June of 1940 and after September of 1945, this snapshot captures the vast a majority of military spending during the decade. Spending for a particular contract was assigned to a county as having been spent there if the principle producing plant was located in the county<sup>3</sup>. The value of contracts per county reported reflects the net value of contracts with any contract cancelations or contract reductions having been subtracted. The bulk of the contract awards by value went to combat equipment such as flight planes, tanks and ships. By value about 65 percent of total contracts went to combat equipment.

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<sup>3</sup>The measure of spending is not an exact allocation of war funds to counties because of the difficulties in making proper assignments and since it does not take into account any subcontracting of work to other counties. Additionally some contracts were completely removed from the measure of spending due to the inability to assign the contract definitely to any county. However, the measurement error resulting from these complications is assumed to be random and rather small.

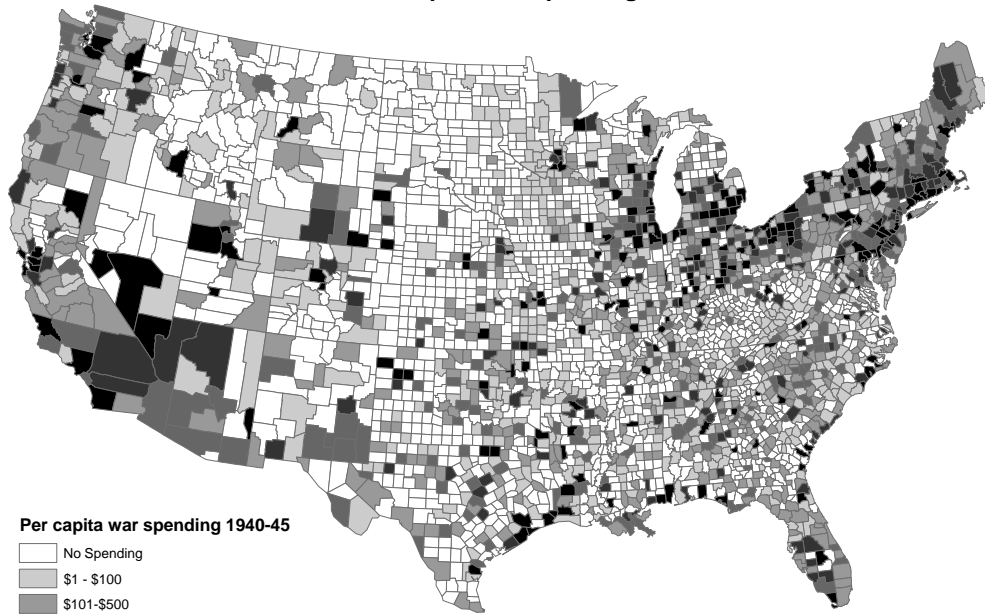
### Gross War Spending



War Spending in Millions of Dollars

- No Spending
- 0 - 10
- \$10-\$100
- \$100 - \$1000
- more than 1 billion

### Per Capita War Spending



Per capita war spending 1940-45

- No Spending
- \$1 - \$100
- \$101-\$500
- \$501 - \$1000
- \$1001 - \$2000
- more than \$2000

Table 1: **Per Capita War Spending 1940-1945 by State**

<b>State</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Max</b>	<b>Min</b>
New England				
Connecticut	4588	2361	8168	1219
Maine	1538	6545	26833	32
Massachusetts	1677	1131	4124	207
New Hampshire	859	429	1392	7
Rhode Island	2058	1556	4660	831
Vermont	613	699	2120	0
Mid-Atlantic				
Delaware	1469	968	2020	220
New Jersey	3129	2096	8248	147
New York	1617	2400	16213	0
Pennsylvania	1429	1857	11316	0
East North Central				
Illinois	1694	901	4404	0
Indiana	2921	2890	20593	0
Michigan	4125	2656	17823	0
Ohio	2490	1412	5421	0
Wisconsin	1586	1715	9586	0
West North Central				
Iowa	506	638	4602	0
Kansas	1728	1578	10572	0
Minnesota	691	818	5692	0
Missouri	1084	1022	9182	0
Nebraska	859	6311	60803	0
North Dakota	14	16	85	0
South Dakota	110	413	3302	0
South				
Virginia	846	2141	18863	0
Alabama	745	1050	6317	0
Arkansas	325	555	3429	0
Florida	745	1303	7107	0
Georgia	575	988	8083	0
Louisiana	844	971	4327	0
Mississippi	327	1776	15852	0
North Carolina	507	1128	9709	0
South Carolina	450	432	2023	0
Texas	1241	2632	38010	0
Kentucky	370	463	3614	0
Maryland	2792	1711	7153	0
Oklahoma	822	1031	7684	0
Tennessee	588	577	3713	0
West Virginia	530	968	6094	0
Mountain				
Arizona	721	889	3174	0
Colorado	627	860	6128	0
Idaho	157	407	2475	0
Montana	146	311	2139	0
Nevada	2480	5991	22451	0
New Mexico	254	404	1449	0
Utah	1000	1257	5030	0
Wyoming	519	564	2322	0
Pacific				
California	2745	2998	20749	0
Oregon	1905	970	5158	0
Washington	2555	2444	14117	0

*Source:*

Facilities spending constituted a much smaller portion of war spending. Facilities spending was defined as funds used to build military facilities or industrial facilities<sup>4</sup> which were financed by the government<sup>5</sup>. Facilities spending excludes any private investment in industrial capacity used to produce war materials. For reason explained later, facilities and contract spending are highly correlated. Consequently, for this analysis all spending will be considered jointly under the term “war spending”.

Due to the nature of materials needed for the war, the geographic distribution of war spending was highly concentrated in the heavily industrialized areas of the United States. The geographic distribution of county level war spending is shown in the map below. Note the concentration of spending in the Northeast, along the Great Lakes and the West Coast where large industrial firms were concentrated. Looking at spending in per capita terms softens the distribution somewhat, but spending is still highly concentrated in the aforementioned areas.

Table 1 shows per capita spending aggregated by states across the US . While informative, these summary statistics do not expose the true concentration of spending which was highly concentrated in a handful of counties. Collectively, the top twenty counties account for almost 40 percent of total spending from 1940-1945.

At the top of the list are chiefly large industrial counties as we would expect. Wayne County, MI, home of the Detroit automakers, captures the most spending of any county with 5.7 percent of the total. Los Angeles, CA is number two with 4.9 percent and Cook County, IL, driven by the industrial power of its county seat Chicago, ranks third with 4.4 percent of total spending. Looking at spending in per capita term does reveal some surprises. For example, Sarpy County, Nebraska received the most spending per capita with \$60,800 per 1940 resident, over 30 times the national average. According to Rhode, Snyder & Strumpf (n.d.) “this county, located just south of Omaha, had been home to the Army’s Offutt Air Field since the early 1920s and in 1940 became the site of Glenn Martins bomber assembly plant.” On the bottom end of the list, 1283 of the 3065 counties, or 43 percent of all counties, failed to receive even one dollar of war spending.

### 3 Retail Sales Growth during the 1940’s

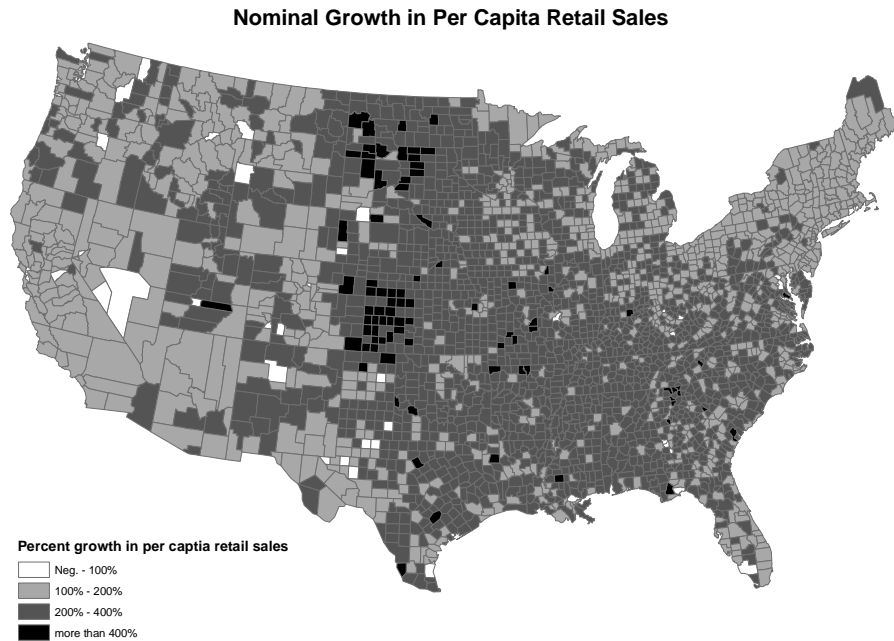
The object of this paper is to estimate an empirical growth model to quantify the impact of World War II spending on local economies using the cross sectional variation in economic growth and war spending across counties. Ideally the change in incomes from 1940-45 would be used as the measure of growth. Given the lack of income data at the county level during the 1940’s, the model follows the lead of Fishback et al. (2005) by estimating the impact of war spending on retail sales growth instead. All other things equal, an increase in government spending will increase incomes and also retail sales. The size of this effect depends directly on the share of after tax income that is spent on goods and services. A higher share of consumption per dollar will induce more retail sales per additional dollar of war spending. The impact of government spending on incomes and

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<sup>4</sup> Industrial facilities are plants which produce war materials such as aircraft plants or shipyards. Military facilities represent military installations such as air fields or cantonments.

<sup>5</sup>Projects financed by the Army, Navy, Maritime Commission, Defense Plant Corporation, Reconstruction Finance Corporation, and British Empire governments with estimated value greater than \$25,000 were reported to the War Production Board. The value of each project represents an estimate of the final cost of the project

retail sales also depends on the extent that government spending may crowd out private activities that would have occurred in the absence of spending.



In nominal terms, retail sales experienced massive growth between from 1939 and 1948 in both nominal and per capita terms. Table 2 shows the ratio of 1948 retail sales to 1939 retail sales in per capita terms. Retail sales increased by more than 200 percent over their 1939 levels in most states. Looking at map 3 shows highest growth occurred in the sparsely populated areas in the interior of the US. This is somewhat an artifact of the low level of retail sales of these counties in 1939; a level increase in retail sales across the US would lead to a higher percentage increase in areas with low levels of retail sales. This will need to be controlled for when estimating the growth model.

Although retail sales figures were generally collected every three to four years, no data on retail sales was collected between 1939 and 1948. However, this is not a problem since using only the 1939 and 1948 retail sales measures would be advantageous even if intermediary data were available. Retail sales data from the war period of 1940-1945 would likely be troublesome since price controls, rationing, and black market transactions would distort such measures beyond use. Rationing and price controls would destroy all hope of using the value of retail sales as a measure of economic welfare of the population and the black market would add significant measurement error to retail sales measured in the war period. In fact these same problems are what plague the time series approach to measuring consumer welfare during the war. (Higgs 1992) However, starting in 1945 price controls and rationing were discarded and the reconversion of industrial capacity to civilian production began. It is uncontroversial that by 1948 the markets in the US economy had returned to a peace-time status where prices reflected market values and retail sales could be used as a proxy for incomes and consumer welfare. Hence, our estimates of the impact of WWII spending on retail sales reflect not the immediate effect, but the medium run consequences of war spending which occurred after the economy was allowed to readjust.

Table 2: **Percent Growth in Nominal Retail Sales by State**

<b>State</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Max</b>	<b>Min</b>
New England				
Connecticut	175%	14%	177%	133%
Maine	168%	31%	247%	118%
Massachusetts	147%	22%	197%	111%
New Hampshire	157%	19%	177%	118%
Rhode Island	159%	31%	156%	93%
Vermont	173%	17%	208%	142%
Mid-Atlantic				
Delaware	247%	84%	320%	155%
New Jersey	183%	16%	201%	130%
New York	162%	27%	268%	108%
Pennsylvania	189%	31%	309%	145%
East North Central				
Illinois	208%	56%	451%	132%
Indiana	231%	47%	410%	116%
Michigan	226%	38%	305%	109%
Ohio	202%	32%	278%	135%
Wisconsin	204%	37%	302%	135%
West North Central				
Iowa	210%	38%	324%	124%
Kansas	256%	122%	878%	114%
Minnesota	185%	34%	287%	112%
Missouri	223%	75%	561%	150%
Nebraska	231%	74%	490%	-26%
North Dakota	289%	94%	588%	104%
South Dakota	267%	94%	487%	93%
South				
Virginia	254%	55%	374%	137%
Alabama	275%	49%	352%	149%
Arkansas	263%	62%	504%	147%
Florida	280%	61%	416%	61%
Georgia	237%	99%	950%	3%
Louisiana	245%	50%	349%	112%
Mississippi	257%	50%	482%	135%
North Carolina	255%	51%	441%	147%
South Carolina	245%	48%	449%	144%
Texas	261%	69%	554%	32%
Kentucky	223%	57%	379%	38%
Maryland	209%	76%	421%	82%
Oklahoma	219%	65%	482%	151%
Tennessee	244%	57%	385%	128%
West Virginia	218%	52%	394%	108%
Mountain				
Arizona	305%	34%	235%	127%
Colorado	207%	85%	443%	90%
Idaho	230%	47%	334%	130%
Montana	171%	73%	391%	77%
Nevada	224%	64%	254%	-52%
New Mexico	279%	53%	335%	123%
Utah	238%	85%	479%	85%
Wyoming	208%	51%	319%	112%
Pacific				
California	245%	42%	353%	87%
Oregon	261%	37%	282%	89%
Washington	232%	52%	352%	82%

*Source:*

## 4 The Allocation of War Spending

A brief look at the distribution of war spending is enough to convince the most ardent skeptic that the allocation of war contracts was not random. It might also be proposed that war spending would not be exogenous in a linear growth model. Such was certainly the case for government spending in the previous decade; New Deal officials allocated funds based on the economic status of the county. Areas with high levels of unemployment, and corresponding low level of retail sales, received more grants than areas that were economically better off. However, unlike New Deal spending, it is not immediately apparent that retail sales growth should explain the allocation of war contracts. To answer this question we need to probe more deeply into the somewhat complicated process that determined the distribution of war contracts.

There were three main entities involved in the process of contract allocation, 1) mobilization agencies, 2) military procurement agencies, and 3) private industry. Civilian mobilization agencies were created for the expressed purpose of directing the utilization of economy for the war effort. Their creation in part was due to the economic failures of WWI. Throughout the economic mobilization of WWI the use of war materials far outpaced supplies, war profiteering was common, and intergovernmental competition resulted in price structure failure and binding in the economy in general. (Army & Board 1933) A closer look at the mobilization agencies of WWII of which the War Production Board was the most famous, reveals that in practice they had little control over the distribution of funds or allocation of contracts. Thus the policies of civilian mobilization agencies cannot explain the actual distribution of war funds.

Research reveals that it was the military procurement agencies that wielded the power of allocation during WWII. The military decided where contracts were allocated with little interference from the WPB. Although contract placement was a complicated process dependent on many factors which changed in importance over the course of the war, speed almost always overrode all other considerations. (Smith 1959) The military would contract with whomever could produce the most quickly and reliably. In general, the firms who could accomplish this were large corporations. Price considerations frequently fell to the bottom of the list of priorities. (Smith 1959) It is important to note that economic welfare of counties receiving spending received virtually no consideration.

Industry, for their part, controlled how and to some extent where goods were produced. Firms participating in negotiations for contracts were generally large players in industry which were located in major industrial centers of the US. They were also generally reluctant to subcontract to smaller firms except for the least profitable parts of the contract (Koistinen 2004). As a result, contract funds remained largely where the prime contract was allocated. As the demand for military products grew, production was expanded at first using existing facilities. Eventually, as military demand exceed productive capacity, facilities also had to be expanded. Industry revealed a strong preference for expanding existing facilities rather than setting up a new plant in a new location; most of the time the military did not challenge their decision. Thus because of the concentration of contracts and the concentration of facilities expansion, production was concentrated in a relatively small number of firms and counties especially at the beginning of the mobilization effort.

It would appear that economic growth, at least in the early part of the war, seemed to have no bearing on the allocation of contracts. Thus there does not seem to be reason

to doubt the exogeneity of war spending. However due to the massive mobilization of the US economy, serious problems began to emerge by 1942 in the form of labor shortages due to heavily concentrated war spending. This was further exacerbated by the conscription of able bodies workers. Also by this same time, restrictions on raw material usage began to severely squeeze small firms that did not have direct access to prime contracts. In response to these economic disturbances, Critical Labor Areas and small business programs were developed. These programs, although never the primary determinants of war contract allocation, on the margin steered contracts into areas with higher unemployment and excess productive capacity. Thus during peak war production from 1942-1944, a small part of war funds were probably allocated to areas because they were experiencing economic hardship. Since with the data available for this analysis it is not possible to separate endogenous spending after 1942 from the exogenous spending before 1942, the entire measure of war spending will be assumed endogenous.

## 5 Estimation Procedure

To compare the effect of war and peacetime spending on local economies estimates need to be obtained for the effects of New Deal spending on growth in 1930's and war spending on growth in the 1940's. Growth models for the 1930's are taken from Fishback et al. (2005) and re-estimated using the same correlates and controls as specified in that paper. A growth model for the 1940's is developed following a similar pattern to allow for a consistent comparison.

### 5.1 Retail Growth in the 1930's

The growth model constructed by Fishback et al. (2005) is a linear model that uses a rich county level data set to examine the effect of New Deal spending on county retail sale growth rates during the 1930's. A 2SLS procedure is used to estimate the model to control for endogeneity in the allocation of New Deal spending. The model is structured as follows.

$$\ln\left(\frac{R_{i39}}{R_{i29}}\right) = \alpha_1 NDPR_{i33-39} + \alpha_2 NDA_{i33-39} + \alpha_3 \ln(R_{i29}) + \alpha_4 Z_{i29} + \alpha_5 S + \xi_i \quad (1)$$

With instrumental equations for New Deal spending.

$$NDPR_{i33-39} = \lambda_1 INST2_i + \lambda_2 R_{i29} + \lambda_3 Z_{i29} + \lambda_4 S + \zeta_i \quad (2)$$

$$NDA_{i33-39} = \psi_1 INST2_i + \psi_2 R_{i29} + \psi_3 Z_{i29} + \psi_4 S + \varepsilon_i \quad (3)$$

where  $R_{i39}$  and  $R_{i29}$  are the level of per capita retail sales in 1939 and 1929 in county  $i$ ;  $NDPR_{i33-39}$  is per capita New Deal public works and relief grants from March 1933 through June 1939;  $NDA_{i33-39}$  is per capita New Deal AAA grants.  $Z_{i29}$  is a vector of structural correlates, measured in 1929 or 1930, that might have determined the growth in economic activity over the decade;  $S$  is a vector of state dummy variables; and  $INST2_i$  is a vector of instrumental variables that were selected because they are correlated with the New Deal grants but uncorrelated with the error term,  $\xi_i$ , of the growth equation.

## 5.2 Retail Growth in the 1940's

Following the lead of Fishback et al. (2005), a linear growth model is used to estimate the impact of war spending on the change in retail sales between 1939 and 1948. Given that war spending is endogenously chosen, the model will need to be estimated using instrumental variables. The proposed model follows:

$$\ln \left( \frac{R_{i48}}{R_{i39}} \right) = \beta_1 WAR_{i40-45} + \beta_2 \ln(R_{i39}) + \beta_3 Z_{i39} + \beta_4 S + \epsilon_i \quad (4)$$

$$WAR_{i40-45} = \alpha_1 INST_i + \alpha_2 R_{i39} + \alpha_3 Z_{i39} + \alpha_4 S + \omega_i \quad (5)$$

where  $R_{i48}$  and  $R_{i39}$  are the level of per capita retail sales in 1948 and 1939;  $WAR_{i40-45}$  is war spending from contracts and on facilities between 1940-45;  $Z_i$  is a vector of structural correlates that might have determined economic growth over the decade;  $S_i$  is a vector of state dummies; and  $INST_i$  is a vector of instrumental variables correlated with  $WAR_{i40-45}$ , but uncorrelated with  $\epsilon_i$ . The error terms  $\omega_i$  and  $\epsilon_i$  are assumed to be independently, identically distributed and uncorrelated.

As in Fishback et al. (2005), the vector of structural correlates includes a wide set of variables measuring the demographic and geographic composition of each county. The reason for including a wide set of control variable is to avoid problems stemming from omitted variables that would lead to biased coefficients and incorrect inference about the impact of war spending on local economies.

Many studies have shown that the demographic composition of a population has a strong effect on income growth and consumption. In this analysis key features of the population such as age distribution, racial composition, urbanization, and education are controlled for in the model. These variables capture the effect of varying skill levels and earning opportunities which could affect income. They also capture the effect that factors such as age, urbanization, and education might have had on the share of income spent on retail goods. The model also directly controls for the overall wealth of the population by using radio ownership, a luxury good in 1939. The use of demographic characteristics controls for differences in wealth, income, and consumption behavior which would have influenced the growth of retail sales on the county level.

Fishback et al. (2005) also notes that recent studies have shown that geographic variables also have a significant effect on economic growth. For example, coastal counties might experience higher than average growth due to transportation advantages they hold over counties in the interior of the US. Similarly, mountainous counties would have an agricultural disadvantage compared to counties in the low elevation plains which might lead to differences in economic growth. To control for these factors the vector of structural correlates includes variables measuring the range of elevation in the county, maximum elevation, access to rivers, the presences of bays, lakes, swamps, and beaches, and dummies for coastal counties along the Atlantic Ocean, Pacific Ocean, Gulf Coast, and the Great Lakes.

Controlling for prior economic trends would obviously be an important part of a properly specified model. Factors such as prior unemployment or the growth of retail sales during the 1930's will have an important impact on retail growth during the period of this study. As mentioned before the level of retail sales in 1939 will also need to be controlled for due to scale effects on the percentage growth rate. To control for these

factors, variables for unemployment, retail sales growth during the 30's, and per capita retail sales in 1939 are included in the regression.

Also included in the model are state dummies to control for factors that are common to all counties within a state but vary across states. The state dummies will capture unmeasured heterogeneity such as state taxation policies, state laws regarding retailers, differences in the cost of living across states, and state spending during the 1940's.

As previously discussed, the allocation of war spending was not random and may not have been exogenous. Since there is reason to suspect that war spending was in part endogenously allocated, there is the possibility that OLS estimates of the model will be biased. In particular if war funds were increasingly allocated to counties experiencing economic hardship then the OLS estimates of the impact of war spending on retail sales growth would be downward biased. A natural recourse in this situation is to use the instrumental variables procedure to correct the bias. To use this procedure appropriate instrument must be found that are correlated with per capita war spending, but uncorrelated with error term of the growth equation. Instruments used here include average firm size, distance from the border, and prior levels of productive capacity. The justification for these instruments follows.

Firm size was an important determinate of war spending. There were three reasons that large firms were so attractive to the military procurement officials. First, the military's most important priority was speed<sup>6</sup>. Also, many of the most urgently needed items were still in the developmental stage making it necessary to have research staff on hand to begin production. (Smith 1959, p. 414) Large corporations were the only firms with the necessary staff and knowledge of mass production techniques to produce large quantities of complex output quickly.<sup>7</sup> Second, with the rapidly multiplying number of contracts contracting with a few large corporations, as opposed to many smaller companies, eased the administrative load on military procurement staff. While firm size is definitely correlated with the placement of war contracts we have no reason to believe that average firm size of a county would be an important determinate of the growth of county retail sales directly.

Second, the type of industries in a county also would likely explain the amount war spending it could attract. Manufacturing, as opposed to service or agriculture, was the industry that produced most of the output needed by the military. In particular, heavy manufacturing industries that could be easily converted to produce tanks, planes, ships, or artillery were able to secure large contracts. The presence of industries in 1939 which could easily be converted to major war production will likely be correlated with amount of spending in a county. This idea is substantiated by previous research. In a study of the determinants of the allocation of county level war spending by Rhode et al. (n.d.), the authors find that the presence of war industries is an important determinant of spending.

It seems reasonable to use the number of firms in "war industries" in each county as an

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<sup>6</sup>Smith (1959) quotes Secretary of War Patterson as stating

Speed is of the essence...It would have been folly to have ignored the great productive facilities [of large corporations] and to have placed our business with companies that could not produce quickly.

<sup>7</sup>To paraphrase military officials, it was better to be blamed for an uneven distribution of contracts than to be blamed for a shortage of war materials (Smith 1959).

instrument. Industries that are considered war industries for this analysis include firms producing aircraft, ships, ammunition, explosives, firearms, cars, vehicles, and motor vehicle bodies. There is no reason to believe that firms in particular industry would lead to a higher growth rate directly. It may be true that firms in a heavy manufacturing industry may pay higher wages which would affect incomes and thus retail sales. However, we would expect this effect to already be in place at the beginning of 1940; that is, in 1939 areas of manufacturing would have higher retail sales than non-manufacturing areas. Holding war spending constant, in the 1940's we would expect no effect on county retail sales from the presence of war industries.

Geographic location would also be a good instrument. Rhode et al. (n.d.) notes that pre-WWI strategic doctrine held that munitions plants should be placed in the interior of the country. Here interior is defined as at least 200 miles from borders of the US. There is concrete evidence that military officials continued this doctrine during WWII by mandating that new munitions facilities not be located on the exterior portions of the US except in special circumstances. Since the distance from the political borders of the US is a geographic characteristic, it could not be correlated with the errors in the growth equation which makes it an ideal instrument. However, this instrument is likely to be weak. First, while this policy applied to the funding of new facilities, it seems not to have been applied to contract placement. New facilities spending made up a relatively small part of total war spending. Second, the spatial distribution of new facilities actually built indicates that the implementation of doctrine was weak; most new facilities were actually built within 200 miles of the US borders. Indeed, Rhode et al. (n.d.) also concluded that "strategic considerations such as seeking secure areas in the countrys interior appear to receive relatively little weight." Although the effect on the distribution of funds may be weak it still is a valid instrument.

### 5.3 Differencing Retail Growth models of the 1930's and 1940's

The final specification combines information from the 30's and 40's by differencing the models of war and peacetime spending. Differencing the growth models of the 1930's and 1940's will control for unmeasured time-invariant heterogeneity across counties and thus further refine the estimates of the impact of war spending. After differencing the following set of equations emerge:

$$\ln\left(\frac{R_{i48}}{R_{i39}}\right) - \ln\left(\frac{R_{i39}}{R_{i29}}\right) = \theta_1 WAR_{i40-45} - \theta_2 NDP R_{i33-39} - \theta_3 NDA_{i33-39} + \theta_4 (\ln(R_{i39}) - \ln(R_{i29})) + \theta_5 H_i + \eta_i \quad (6)$$

$$WAR C_{i40-45} = \alpha_1 INST_i + \alpha_2 INST2_i + \alpha_3 (\ln(R_{i39}) - \ln(R_{i29})) + \alpha_4 H_i + \omega_i \quad (7)$$

$$NDP R_{i33-39} = \lambda_1 INST_i + \lambda_2 INST2_i + \lambda_3 (\ln(R_{i39}) - \ln(R_{i29})) + \lambda_4 H_i + \zeta_i \quad (8)$$

$$NDA_{i33-39} = \psi_1 INST_i + \psi_2 INST2_i + \psi_3 (\ln(R_{i39}) - \ln(R_{i29})) + \psi_4 H_i + \varepsilon_i \quad (9)$$

where the notation is consistent with the parent equations. Note that after differencing the state dummies fall out. The common time invariant correlates, such as geographic

characteristics, also difference out and we are left with a vector  $H$  of time varying correlates and unique geographic correlates.

## 6 Estimation Results

Previous work by Fishback et al. (2005) uses a wide set of correlates as controls in the New Deal economic growth model. A simple comparison of the specifications illustrates why a lengthy specification for a linear growth model is advisable. Using the same dataset as Fishback et al. (2005), the New Deal economic growth model is reproduced using varying levels of specification. Table 3 outlines the changes in the variables of interest in response to changes in the model specification.

Table 3: Estimation results for New Deal specifications

Specification	NDPR Coeff. (P-value)	NDA Coeff. (P-value)
$\ln\left(\frac{R_{i39}}{R_{i29}}\right) = \alpha_1 NDP R_{i33-39} + \alpha_2 NDA_{i33-39} + \xi_i$	0.00014 (0.000)	-0.00101 (0.000)
$\ln\left(\frac{R_{i39}}{R_{i29}}\right) = \alpha_1 NDP R_{i33-39} + \alpha_2 NDA_{i33-39} + \alpha_3 R_{i29} + \xi_i$	0.00021 (0.000)	-0.00090 (0.000)
$\ln\left(\frac{R_{i39}}{R_{i29}}\right) = \alpha_1 NDP R_{i33-39} + \alpha_2 NDA_{i33-39} + \alpha_3 R_{i29} + \alpha_4 Z_{i29} + \xi_i$	0.00004 (0.257)	-0.00015 (0.288)
$\ln\left(\frac{R_{i39}}{R_{i29}}\right) = \alpha_1 NDP R_{i33-39} + \alpha_2 NDA_{i33-39} + \alpha_3 R_{i29} + \alpha_4 Z_{i29} + \alpha_5 S + \xi_i$	0.00009 (0.040)	0.00006 (0.659)
Full specification using 2SLS	0.00137 (0.064)	-0.00105 (0.414)

Note that  $\alpha_1$  and  $\alpha_2$  change significantly as additional controls are added. Using instruments in the final 2SLS estimate greatly magnifies the positive impact of New Deal relief spending on retail sales growth. This underlines the importance of controlling for possible endogeneity in government spending as well as controlling for economic factors. It is interesting to note that while more complete specifications strengthen the impact of New Deal spending they do not change the sign of the estimates.

Running a similar set of regressions on war spending yields surprising results(see Table 4). A simple regression of per capita war spending on per capita retail sales growth produces a negative coefficient implying a negative correlation between the amount of government spending and the economic prosperity of the county. Naturally, given the simplicity of the model we cannot interpret this relationship as causal, but simply as descriptive. While the results of the first specification may be odd, even more puzzling is that the negative relationship between spending and growth persists even as structural correlates and state dummies are added to the model. Although the coefficient weakens by an order of magnitude in the last specification of the table, the war coefficient is still negative and statistically significant at almost any level.

The instrumental specification takes advantage of the instruments discussed earlier in the paper namely, pre-war industrial capacity, average firm size, and distance from

Table 4: Estimation results for war spending specifications

<b>Specification</b>	<b>War Coeff.</b> (P-value)
$\ln\left(\frac{R_{i48}}{R_{i39}}\right) = \beta_1 WAR_{i40-45} + \epsilon_i$	-0.000020 (0.000)
$\ln\left(\frac{R_{i48}}{R_{i39}}\right) = \beta_1 WAR_{i40-45} + \beta_2 R_{i39} + \epsilon_i$	-0.000012 (0.000)
$\ln\left(\frac{R_{i48}}{R_{i39}}\right) = \beta_1 WAR_{i40-45} + \beta_2 R_{i39} + \beta_3 Z_{i39} + \epsilon_i$	-0.000004 (0.005)
$\ln\left(\frac{R_{i48}}{R_{i39}}\right) = \beta_1 WAR_{i40-45} + \beta_2 R_{i39} + \beta_3 Z_{i39} + \beta_4 S + \epsilon_i$	-0.000003 (0.012)

borders. Table 6 shows the results from the first and second stages of the instrumental procedure as well as a side by side comparison with the fully specified OLS regression.

**Table 6: OLS AND 2SLS ESTIMATES OF THE IMPACT OF WWII SPENDING ON LOG RETAIL SALES GROWTH RATE, 1939-1948**

Variables	2SLS					
	OLS Retail sales growth equations		Second-Stage Retail Sales Growth		First Stage War Spending	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
Constant	-0.3034	0.427	-0.1712	0.662	8,524	0.066
Endogenous Variables:						
<i>Per capita war spending</i>	-0.000003	0.059	-0.000019	0.029		
Instrumental Variables:						
<i>Interior of Country</i>					85.97	0.391
<i>Avg. Firm Size</i>					1.22	0.228
<i>War Production Capacity 1939,# of firms per capita:</i>						
<i>Aircraft</i>					90,900,000	0.081
<i>Ships</i>					17,100,000	0.093
<i>Ammunition</i>					114,000,000	0.040
<i>Explosives</i>					1,051,156	0.785
<i>Firearms</i>					-6,305,168	0.692
<i>Cars</i>					33,100,000	0.045
<i>Vehicles</i>					1,763,327	0.674
<i>Motor Vehicle Bodies</i>					46,200,000	0.032
Exogenous Variables:						
<i>Retail sales per capita, 1939</i>	-0.0545	0.007	-0.0626	0.003	-465.86	0.002
<i>Pct. of population unemployed, 1940</i>	-0.0044	0.000	-0.0042	0.000	3.85	0.781
<i>Pct of households owning a radio, 1940</i>	-0.0002	0.829	0.0000	0.990	8.66	0.437
<i>Retail sales growth from 1929-1939</i>	-0.0021	0.000	-0.0021	0.000	1.58	0.284
<i>Pct of population employed in manufacturing, 1939</i>	-0.0005	0.609	0.0013	0.322	90.96	0.000
<i>Pct. of population female, 1940</i>	0.0085	0.084	0.0081	0.107	-28.68	0.587
<i>Pct. of population black, 1940</i>	-0.0010	0.011	-0.0010	0.013	2.54	0.331
<i>Pct. of population living in urban area, 1940</i>	-0.0017	0.000	-0.0015	0.000	10.47	0.000
<i>Pct. of population foreign born, 1940</i>	0.0003	0.825	0.0004	0.761	12.8	0.519
<i>Pct. of population illiterate, 1940</i>	-0.0018	0.318	-0.0020	0.262	-17.3	0.193
<i>Pct. of population in age categories, 1940:</i>						
10-19	0.0419	0.000	0.0393	0.000	-159.05	0.033
20-29	-0.0038	0.539	-0.0026	0.686	77.35	0.113
30-34	0.0295	0.034	0.0261	0.065	-179.71	0.349
35-44	-0.0025	0.722	-0.0030	0.677	-50.34	0.353
45-54	0.0129	0.051	0.0140	0.035	66.86	0.121
55-64	0.0234	0.001	0.0202	0.007	-191.58	0.003
Over 64	0.0022	0.689	0.0019	0.730	-19.31	0.716
<i># rivers in county flowing through 11-20 counties</i>	0.0090	0.142	0.0119	0.070	185.23	0.213
<i># rivers in county flowing through 21-50 counties</i>	0.0114	0.214	0.0131	0.156	91.12	0.190
<i># rivers in county flowing through &gt; 50 counties</i>	0.0228	0.020	0.0263	0.010	173.05	0.468
<i>Elevation range</i>	0.0000	0.747	0.0000	0.862	0.06	0.420
<i>Maximum elevation</i>	0.0000	0.563	0.0000	0.405	-0.11	0.151
<i>Number of bays</i>	-0.0002	0.551	-0.0001	0.755	0.15	0.982
<i>Number of lakes</i>	0.0000	0.904	0.0000	0.765	-0.15	0.823
<i>Number of beaches</i>	-0.0019	0.024	-0.0018	0.051	-6.92	0.710
<i>Number of swamps</i>	0.0005	0.156	0.0003	0.285	-3.65	0.496
<i>Atlantic Coast county</i>	0.0375	0.035	0.0465	0.014	373.35	0.281
<i>Pacific Coast county</i>	-0.0104	0.656	-0.0031	0.897	480.62	0.368
<i>Gulf Coast county</i>	0.0154	0.529	0.0235	0.380	536.08	0.181
<i>Great Lakes county</i>	0.0016	0.906	-0.0030	0.836	-276.89	0.283
State Fixed Effects	Included		Included		Included	
R <sup>2</sup>	0.53		0.53		0.19	
N	3040		3040		3040	

The first thing to notice is that even after instrumenting that the coefficient on war spending remains negative and statistically significant. In fact it has almost the same value as the simple regression of war spending on retail sales growth. At first glance, the small value of the coefficient might indicate that war spending lacks any economic significance. However, a more thorough interpretation is needed before reaching any conclusion.

One common way of interpreting the economic significance of a coefficient is to examine how a change of one standard deviation in explanatory variable affects a change in the dependent variable. In this case a one standard deviation change in war spending produces a .17 standard deviation change downward in retail sales growth.<sup>8</sup> Given the high level of variation in war spending, this a smaller effect than would be expected. Another way to interpret the economic significance of the war coefficient is to measure the effect of an extra dollar of war spending on the level of retail sales. If an extra \$100 were spent per capita in a county this would lead to a  $-0.0019$  percent change in the growth of retail sales over the period. Using that the average level of retail sales per capita in the US in 1939 was \$317, this translates into a \$0.06 decrease in retail sales for every \$100 spent per capita. Thus while the coefficient on war spending is statistically significant, its economic significance is negligible.

The second observation to make when looking at Table 6 is the relatively poor performance of several instruments earlier justified. In particular, average firm size and the dummy for being located on the interior of the country are both insignificant in the first stage. While it is not surprising that the location dummy is not significant (previously it was mentioned that there was some uncertainty about its explanatory power), average firms size which seemed a good choice for an instrument also lacks explanatory power. Several of the pre-war capacity variables also turn out to be insignificant in the first stage. In particular, the presence of explosives and firearms manufacturing capacity do not explain war spending. This again goes against conventional wisdom since both explosives and firearms were an important part of military procurement. However, almost all of the other indicators of prewar capacity are significant at the ten percent level. A look at the bottom of the table reveals the  $R^2$  of the excluded instruments is quite low; this probably due to the poor performance of some of the instruments. A Hausman test was conducted to determine if the instruments were overidentified; the null hypothesis, which is that the excluded instruments are uncorrelated with the errors from the growth equation, was rejected. Consequently, better instrument will need to be found in order to properly control for possible endogeneity.

The final specification of the growth model involves differencing the growth model of the 1930's from the model of the 1940's as specified in the previous equations. Table 5 gives the estimation results from estimating the differenced 2SLS specifications of war and peacetime spending. Differencing does not seem to add or subtract much from the result of the undifferenced war spending 2SLS result. The war coefficient has relatively the same magnitude, the same sign and is still statistically significant with little economic significance. Given the unresolved problems of the simpler specification, this is not surprising.

Since it is generally believed that government spending should have had a non-

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<sup>8</sup>The standard deviation of county level war spending per capita is 2034. The standard deviation of retail sales growth is 0.21. Using the coefficient of 2SLS regression, we have  $-0.000019 \times 2034 = -0.038$ . Dividing by the standard deviation of retail sales growth  $\frac{-0.038}{0.21} = -0.174$

Table 5: Estimation Results Differenced Model

<b>War Coeff.</b>	<b>NDPR Coeff.</b>	<b>NDA Coeff.</b>
(P-value)	(P-value)	(P-value)
-0.00002	-0.00007	-0.00163
(0.004)	(0.610)	(0.001)

negative effect on economic growth, then it might be suspected that the estimation procedure is producing biased results. There are several sources of potential bias that could be influencing the estimates. The first and most plausible source of bias is endogeneity of war spending in the growth equation. As mentioned earlier, if war spending was allocated to counties having lower growth rates endogeneity could cause a downward bias in the war coefficients. This would explain our counter intuitive value for the war coefficient. The instruments used thus far in the analysis are admittedly less than ideal; the obvious solution is to find valid instruments to control for the endogeneity of war spending and retail sales growth. There are several good candidates for instruments for which data is currently being obtained. Two variables, congressional power and military bases, were suggested by Rhode et al. (n.d.) as being important determinants of war contract allocation. House representation on key military committees, such as military affairs, naval affairs, or appropriations committees, may have lead to more military contracts for counties in that district. Although Rhode et al. (n.d.) reports that the overall impression for the effects congressional power is that they are small, he also states that power in the house was associated with higher levels of contract spending. Committee representation would not directly effect retail sales growth and thus be uncorrelated with the errors of the growth equation.

Next, the location of military bases could be a useful instrument. The presence of military bases in a county prior to the war likely be highly correlated with military facilities spending. Direct military outlays for expanding bases or other military facilities constituted 37 percent of facilities spending or around 5 percent of total war spending. Rhode et al. (n.d.) found that military bases were an important for explaining war facility spending. Since the location military bases were decided long the beginning of our analysis and were not easily relocated during the war, they will are unlikely to have any direct effect on retail sales growth.

The third and most promising instrumental variable derives from the Industrial Mobilization Plan of 1938. The Industrial Mobilization Plan (IMP) was first issued in 1931 in response failures of economic mobilization efforts of World War I with the purpose of serving as a guide for military procurement during time of major war. (Army & Board 1939) Besides setting up the basic administrative structure of the war time economy, an important part of the plan involved identifying firms that could effectively produce war materials and allocating the firms to the different branches of the armed forces. Despite the fact that the plan was never formally invoked, evidence strongly suggests that military procurement followed the plan quite closely. (Smith 1959) Given that allocations were made prior to economic mobilization of the US economy makes the allocation plan an ideal instrument for war spending.

Beside endogeneity, another potential source of bias could be introduced by war spending measurement error. The measure of war spending used in the growth model reflects on prime contracts and does not account for any subcontracting that may have occurred

below the prime contractor level. Although military historians suggest subcontracting played a minor part in the war effort, subcontracting might play a significant role in determining retail sales growth especially for neighbors of counties which were recipients of large contracts. Spill over effects are not allowed in the current model. Specifying a more flexible model to accommodate these spill over effects between counties could improve the estimates.

Of course, the alternative hypothesis is that the estimate of the impact of war spending is not biased but reflects the true impact of war spending on local economies. If this is the case then comparing the effects of war and peacetime spending leads to a very interesting conclusion. According to Fishback et al. (2005), New Deal relief spending had a strong positive impact on local economies. In particular they find that a one dollar increase in per capita New Deal spending lead to a 44-cent increase in retail sales. This is dramatically different than the negligible increase in retail sales due to a 100 dollar increase in war spending as found by the current study. These results would imply that peace spending has a significant positive effect on growth while war spending has a negligible effect. Thus if the estimates of the effects of war spending are not far off, then there appears to be a dramatic difference in the impact of government spending in war and peace during the early 20th century.

## 7 Conclusion

The 1940's growth model for this paper produces very counterintuitive estimates of the impact of World War II spending on county level economic growth. Given the magnitude of government spending during the war, we would expect that more government spending on the county level would lead to significantly higher levels of economic growth. On the contrary the results of the model would seem to indicate that increased government spending has a negative, but economically insignificant, impact on the growth of retail sales.

While more work needs to be done to test the robustness of these estimates, the preliminary results are interesting in their own right. Even if the estimates do not reflect a casual relationship, why would increased war spending be correlated with lower growth rates? Also, note that the estimates of war spending are always negative regardless of the specification of the model; on the other hand the estimates for New Deal relief spending are always positive for all specifications.

More work needs to be done before concluding that war spending actually did not lead to economic growth in local economies. Previous studies have shown that the peacetime spending of the New Deal had a positive and economically significant impact on county level growth. When compared preliminary results from this paper, the outcomes suggest that the type of government spending could have very different effects on the economic welfare of local populations.

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