The impact of the American Civil War on city growth*

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March 2010

Abstract

This paper analyzes the persistence of the shock caused by the American Civil War on the relative city size distribution of the United States. Our findings suggest that the effects of this shock were permanent, which sharply contrasts with previous results regarding World War II for Japanese and German cities. It should be taken into account that the conflict considered in this paper took place at an earlier stage of the industrialization and urbanization processes. Moreover, our results are determined by the fact that the battles were fought in the open field, not in urban areas. Some related evidence regarding the presence of a 'safe harbour effect' is reported.

Keywords: U.S. city growth, relative size distribution, American Civil War, shock persistence.

JEL codes: J10, N41, N91, R12.

*The authors have benefited from the helpful comments of Domingo Pérez and Vicente Pinilla. Financial support from Ministerio de Ciencia e Innovación (Projects SEC2006-04893 and ECO2009-09332), Ministerio de Educación (Grant AP2008-03561) and Gobierno de Aragón (ADETRE research group) is gratefully acknowledged.

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1 Introduction

One recent research strand in economic geography focuses on the determination of the effects of temporal shocks on the relative size of cities and its resulting distribution, considering that the latter has a high degree of persistence. Reinforcing this idea, previous studies have found that strong demographic shocks caused by wars only had temporary effects and, hence, previous growth rates are recovered in a few years.

This is the case of Davis and Weinstein (2002) who, after proposing an empirical framework, analyzed the effects of the Allied strategic bombing on Japanese cities during World War II (WWII). Also in the context of this conflict, and using a very similar approach, Brakman et al. (2004) studied the consequences of the substantial destruction of German cities. Furthermore, it should be noted that these latter authors found some weak evidence of a persistent effect for East German cities.

The studies described above are the only ones that have seriously analyzed the effects of wars on urban structures. Nevertheless, it can be stated that Nitsch (2003) has tangentially tackled this issue by analyzing the impact of historical events on city growth by considering the break-up of the Austro-Hungarian Empire as a natural experiment of a dramatic reduction in country size. His findings lead us to conclude that this process did not have a sizeable effect on the subsequent population growth of the largest city (Vienna). In addition, Brakman et al. (2007) established the existence of multiple equilibria in the city growth of German cities after the WWII bombings. Another related analysis is that carried out by Glaeser and Shapiro (2002) about the impact of terrorism on U.S. cities.

This paper forms part of the literature disentangling the impact of temporary shocks caused by wars on the urban structure of a country by analyzing the case of the American Civil War (ACW). Our contribution is fourfold. First, it sheds further light on an issue about which there are few serious studies. Second, it explores a different conflict to that already analyzed. Third, empirical studies related to civil wars have focused on those that took place after WWII (see the exhaustive survey by Blattman and Miguel, 2009). Finally, this paper deals with the ACW applying the econometric rigour it deserves.

Before summarizing the main findings, it should be emphasized that the ACW has distinctive features with respect to WWII. Basically, it took place at an earlier stage of the industrialization and urbanization processes and the battles were fought on the

open field, not in urban areas. Furthermore, it is observed that only one of the cities in our sample decreased its population in absolute terms during the 1860s. For this reason, it cannot be stated that the shock caused by the ACW on absolute city size was negative.

Contrary to the results reported by Davis and Weinstein (2002) and Brakman et al. (2004) for WWII, we find that the ACW shock had a permanent effect on relative city size. That is, those cities that grew faster in the 1860s tend to experience a higher relative size growth rate in the following decade. This result should be interpreted taking into account that the population of the United States (U.S.) grew at a slower rate in the period 1860-1870 than in the adjacent decades. Moreover, it is observed that the cities close to combat zones grew at faster rates during the 1860s with respect to the previous and the following decades. Therefore, an explanation for the persistent nature of the shock may be the rural character of the ACW and the 'safe harbour effect' (Glaeser and Shapiro, 2002) derived from it.

The rest of the paper is structured as follows. Section 2 presents a brief historical account of the causes and the main events that took place during the ACW. In addition, relevant figures about the scope of the conflict are reported. Section 3 describes the empirical model used to estimate the persistence of relative city size shocks, the data sources and the variables that have been used in the analysis as well as the estimation technique. The main results and their discussion are included in Section 4. Finally, Section 5 concludes.

2 The American Civil War (1861-1865)

U.S. political debate in the 1850s was centered on the slave system that existed in Southern states. In 1858, Abraham Lincoln expressed his desire to abolish slavery and his election as President on 6 November 1860 triggered the ACW, also known as the War of Secession. The historical legacy of this conflict was very important because it led to the abolishment of slavery, the reinstatement of the Union and the strengthening of the role of federal government. As a consequence, and together with the subsequent reconstrution, the country became a superpower.

The war began when eleven Southern slave states that wanted to maintain the racial hierarchy of their societies[1] declared their independence and formed the Confederate

[1] South Carolina was the first state to secede (20 December 1860), followed by Mississipi (9 January

States of America (CSA), whose (only) President was Jefferson Davis. The support for secession in any given state increased with the number of plantations it contained. Those with an intermediate number (Virginia, North Carolina, Arkansas and Tennessee) joined the Confederacy after the battle of Fort Sumter[2]. The Union was made up of the states where slavery had been abolished and the five border slave states with the lowest number of plantations (See Figure 1). It should be noted that the Confederates had an economy based on the exportation of agricultural products (mainly cotton, sugar and tobacco), while the economy of the Union states was more industrialized and urban.

[Insert Figure 1 here]

The events that led to the end of the war began in 1864 when Ulysses S. Grant was appointed as commander of the Union armies. To gether with Lincoln and William T. Sherman, he introduced the concept of 'total war' which was focused on the defeat of both the forces of the CSA and its economy. Instead of seeking civilian casualities, they were more interested in deteriorating the morale of the Confederates through the destruction of homes, farms and railroads. Many of battles were fought during Grant's 'Overland Campaign', in which the Union troops suffered many casualties. Nevertheless, it led to the capture of Atlanta in September, which was a decisive event for the re-election of Lincoln (November 1864).

The Union forces had a decisive victory at the Battle of Five Forks (April 1865, Virginia), forcing the Conderates to evacuate Petersburg and Richmond (capital of the CSA). This defeat, together with that at Sayler's Creek (April 1865, Virginia), made their commander, Lee, realize that it was not possible to fight further against the Union. He surrendered in Virginia on 9 April 1865, at the court of Appomattox. On the 14$^{\text{th}}$ of April, Lincoln was murdered and Andrew Johnson became the new President of the U.S.

Although the battle of Manassas/Bull Run (July 1861,Virginia) is known as the first large engagement, it was not very important in terms of causalities: 2,708 Union and 1,981 Confederate soldiers. On the contrary, many minor battles were famous

1861), Florida (9 January 1861), Alabama (11 January 1861), Georgia (19 January 1861), Louisiana (26 January 1861) Texas (1 February 1861), Virginia (17 April 1861), Arkansas (6 May 1861), North Carolina (20 May 1861) and Tennessee (8 June 1861).

[2]It took place in 12-13 April 1861 when the Confederates bombed this fortification located in South Carolina.

for their severity. For example, General Hood lost 6,000 of his 21,000 men in about two hours and six Confederate generals died at Franklin (November 1864, Tennessee). Moreover, many regiments lost more than 80 per cent of their members in a single day. For example, the 26th North Carolina lost 714 of its 800 men at Gettysburg (July 1863, Pennsylvania).

[Insert Table 1 here]

The ACW is the conflict that has claimed the greatest number of American lifes in U.S. history. Of the 4 million that fought, 620,000 died (see Table 1), about 2 percent of the total population. The enormous sacrifice of this war in terms of population[3] is evident if the relative number of dead is compared to the Americans that lost their lifes during WWII (407,316 out of 133,400,000 inhabitants: 0.31 % of the population) or in Vietnam (around 55,000 out of a population of 208,600,000: 0.03 %).

All these figures lead us to conclude that the ACW was an important demographic shock that inevitably affected U.S. relative city size distribution. This paper is intended to determine whether the effects of this shock were transitory or permanent. The empirical model, data sources, variables analyzed and estimation method used to answer this question are presented in the following section.

3 Testing for the persistent nature of the shock

The persistence of the temporal demographic shocks caused by wars on the urban structure of a given country can be analyzed using the data of city population in absolute terms. However, it seems more appropriate to work with the share of the city population relative to that of the country. As suggested by Gabaix and Ioannides (2004), this type of normalization is suitable when analyzing long-run issues because it is necessary to work with steady-state distributions. Moreover, working with relative city size allows us to reflect more factors than when using absolute rates. On the one hand, a city can grow in absolute terms but not in relative terms whenever it experiences a lower growth rate than the other cities. On the other, a city can have a positive relative growth rate but a negative absolute one. In the latter case, the decrease would be lower

[3]From the financial point of view, the war cost the Confederates 4,000 million dollars and four times this amount for the Union. More than half of this quantity for the Union were pensions to veterans and their families.

than that experienced by the other cities. These are the kind of effects we are interested in disentangling.

3.1 The empirical model

Let $S_{i,t}$ be city i's share of total population (relative city size) at time t, and $s_{i,t}$ its natural logarithm. Considering that the initial size of each city Ω_i is affected by city-specific shocks $\varepsilon_{i,t}$, the logarithm of the relative size of a city at a given point in time can be expressed as:

$$s_{i,t} = \Omega_i + \varepsilon_{i,t} \tag{1}$$

The persistence of these shocks is modeled as an autoregressive process:

$$\varepsilon_{i,t+1} = \rho\varepsilon_{i,t} + \nu_{i,t+1} \tag{2}$$

where $\rho \in [0, 1]$ is the persistence parameter. The innovation $\nu_{i,t}$ is assumed to be an independently and identically distributed error term.

The persistence parameter in equation (2) reflects how much of a temporary shock is dissipated in one period. If $\rho = 1$, then all shocks are permanent and relative city size follows a random walk. If $\rho \in [0, 1)$, then city share is stationary and shocks dissipate over time. Therefore, the temporary and permanent hypotheses can be tested by estimating ρ[4].

To examine the evolution of city relative size, equation (1) is first-differenced

$$s_{i,t+1} - s_{i,t} = \varepsilon_{i,t+1} - \varepsilon_{i,t} \tag{3}$$

Substituting equation (2) into (3), it is obtained that:

$$s_{it+1} - s_{it} = (\rho - 1)\nu_{i,t} + [\nu_{i,t+1} + \rho(\rho - 1)\varepsilon_{i,t-1}] = (\rho - 1)\nu_{i,t} + \xi_{i,t} \tag{4}$$

One alternative for estimating the persistence parameter is by using unit root tests (Clark and Stabler, 1991). Nevertheless, in this paper, we are following the proposal of Davis and Weinstein (2002) so, in our present context, we are interested in the following version of (4):

[4]Davis and Weinstein (2002) considered $\rho = 1$ as consistent with the pure random growth theory (which gives a foundation for understanding Zipf's Law). On the contrary, $\rho = 0$ is interpreted as evidence of the locational fundamentals theory.

$$s_{i,1865+k} - s_{i,1865} = (\rho - 1)\nu_{i,1865} + \xi_{i,1865} \tag{5}$$

where $\nu_{i,1865}$ denotes the ACW shock, k is the time horizon considered and

$$\xi_{i,1865} = \nu_{i,1865+k} + \rho(\rho - 1)\varepsilon_{i,1860} \tag{6}$$

From equation (2), it can be expressed that:

$$\varepsilon_{i,1860} = \rho\varepsilon_{i,1850} + \nu_{i,1860} \tag{7}$$

Combining (2) and (3), and referring to the ACW period, leads to:

$$s_{i,1865} - s_{i,1860} = \varepsilon_{i,1865} - \varepsilon_{i,1860} = \nu_{i,1865} + (\rho - 1)\varepsilon_{i,1860} \tag{8}$$

Equation (8) reflects that the shock caused by the ACW is incorporated in to the relative city size growth rate during the conflict ($s_{i,1865} - s_{i,1860}$). Nevertheless, this growth rate might also contain past information ($\varepsilon_{i,1860}$) and, given (7), will be correlated with (6). Therefore, there is a measurement error problem that, as will be explained in the next subsection, is further complicated by the fact that city population is observed every 10 years. For this reason, the ACW relative city size shock ($\nu_{i,1865}$) can only be proxied by the growth rate experienced during the 1860s. These circumstances make it necessary to resort to the use of Instrumental Variables (IV) estimation methods in order to identify the ACW shock and, hence, obtain an unbiased estimation of the persistence parameter.

The city size data frequency leads us to estimate the persistence of the shock 15 years after the war ended. This is not problematic because the resulting time horizon is similar to those analyzed by previous studies that considered it to be the preferred adjustment period. The reason is that it seems to reflect the time required for shocks to dissipate (Brakman et al., 2004).

Summarizing, an unbiased estimation of the persistence parameter will be obtained by the application of an IV estimator to

$$s_{i,1880} - s_{i,1870} = \alpha + \beta(s_{i,1870} - s_{i,1860}) + u_i \tag{9}$$

where $\beta = (\rho - 1)$.

The method used in this paper is that known as Two-Stage Least Squares (2SLS). The instruments that will allow us to identify the ACW shock must be correlated with the shock but not with the error term in (9), which, following (6), is given by:

$$u_i = \nu_{i,1880} + (\rho - 1)\varepsilon_{i,1860} + m_i \tag{10}$$

where m_i is related to the measurement error due to the frequency with which the data population is observed.

Finally, note that Equation (9) includes a constant term because we are working with the share of city population relative to total U.S. population, and not of all the cities in the sample. This parameter might reflect long-run trends of the urbanization process.

3.2 Data sources and variables

Blattman and Miguel (2009) pointed out that *"a major goal of civil war researchers within both economics and political science in the coming years should be the collection of more data"*. This is not an easy task for war periods and is even more complicated for conflicts that took place in the 19^{th} century.

The total U.S. and city population data studied in this paper have been extracted from the Bureau of the Census (Department of the Interior). As noted before, this information is available on a 10-year basis. Our final sample consists of data on 104 cities that had more than 25,000 inhabitants in 1890. 93 of them were in Union states and the other 11 were Confederates[5]. This resulting sample size is determined by the data availability of the instruments. Finding the latter has been the most difficult stage of this research.

Davis and Weinstein (2002) used deaths and buildings destroyed per capita as instruments for the WWII shock. Similarly, Brakman et al. (2004) considered the loss of housing stock during this war and its casualties. In addition, they also included the amount of rubble in cubic meters per capita as an instrument.

The only city that was destroyed during the ACW was Atlanta. As has already been noted, this war was basically fought in the open field. For this reason, a measure

[5] Our sample size and composition are similar to those in Brakman et al. (2004). These authors analyzed 103 German cities during WWII, 81 of which were in West Germany and the other 22 in the East.

of the destruction suffered by a city would not be a good instrument to identify the shock. In addition, the information of the soldiers furnished or dead is only available at the State level and refers only to the members of the Union army.

The main instrument considered in our analysis in order to identify the ACW demographic shock is the share of widows as a percentage of city population. This information has been obtained from the 11^{th} Census and is classified according to the place of residence of the dead soldier. The reason for this variable being introduced in relative terms is to better gauge the shock intensity. Moreover, and in light of the scatter plot in Figure 2, this instrument is expected to be negatively related to the shock.

[Insert Figure 2 here]

It can be considered that the shock caused by the ACW will also be related to the number of men involved from a given city. In order to reflect this effect, it would be interesting to use the number of men of military age (between 18 and 45) as an additional instrument, but this information is only available for States. Nonetheless, there is information available in the Census about the number of men in a given city. So, as a robustness check, the proportion of men as a percentage of total population in 1860 has also been included as an instrument. Although there is no a priori expected sign for the relationship of this variable with the shock, especially when it is introduced as an instrument jointly with the percentage of widows, the scatter plot reported in Figure 3 suggests that it is positively correlated to the relative size growth rate experienced in the 1860s. This implies that cities with a higher percentage of males at the beginning of the war were less adversely affected by its demographic shock. That is, the higher this percentage, the higher the potential growth due to reproductive and labor force motives and, hence, the ACW shock should be less severe. Nevertheless, this relationship should be interpreted with caution because it might be influenced by the presence of outlying observations (Dehon et al., 2009).

[Insert Figure 3 here]

4 Results

4.1 Descriptive analysis

Before estimating the persistence of the ACW shock on relative city size, this subsection describes the demographic trends in the U.S. and the cities that conform our sample during the period 1850-1880.

Free and slave population, omitting the Indian tribes, increased by 8,251,445 people from 1850 to 1860, a growth rate of 35.46 per cent, which is almost the same as in the previous decade (35.87 %). None of the states experienced a decrease in its population until 1860 and New York (25.29 %) and Pennsylvania (25.71%) had the highest growth rates.

At the beginning of the war, the population structure was predominantly rural, especially in the southern states. As an example, New York was the biggest city of its state in 1860, and 99.01 per cent of the population of its county lived there. However, they represented only 20.76 per cent of the whole state. Only 13.61 per cent of the population of the U.S. lived in cities of more than 10,000 inhabitants included in the sample.

Contrary to what would have happened if the U.S. population had followed the pre-war trends, the figure of 40 million inhabitants was not reached by 1870. In fact, the U.S. population growth rate in the 1860s was only 22.62 per cent, a fall with respect to the previous decades. So, it is necessary to analyze the impact of the Civil War and, thereby, account for the "loss" of nearly 2 million inhabitants, the difference between the population that would have been expected following th pre-war trends and the figure that actually appeared in the 1870 Census.

The deceleration of population growth was not only due to lives lost in the war but also to indirect losses like those derived from the large number of single men fighting in the war who could not form families, the paralysis of the inmigration process and changes in the daily habits of citizens. Nevertheless, the population grew by more than 7 million in this decade. Unlike what has been reported for Japan and Germany during WWII, all except one[6] city in our sample increased their population in absolute terms during the 1860s. However, this increase tended to be lower than that of the 1850s. For example, the population of New York increased by 290,111 inhabitants in the 1850s

[6]New Bedford (Massachusetts) had 22,300 inhabitants in 1860 and 21,320 in 1870.

and by 136,634 in the 1860s. Therefore, it can be stated that the War of Secession led to a slowdown in population growth.

[Insert Table 2 here]

Table 2 reports the growth rates of the U.S. and the average growth rate of the cities in our sample for the three decades between 1850 and 1880. While, the total population growth decreased in the 1860s with respect to the 1850s, it later recovered in the 1870s but without reaching the initial level. Nonetheless, the cities that conform our sample followed a different pattern to that of the country as a whole. On the one hand, it can be observed in the second row that the average growth rate follows a decreasing trend. On the other, the magnitude of the growth rate of the sample cities is higher than that of the country. More interestingly, we have grouped the cities according to whether they are located in a state where battles were fought (third row) or in a state without battles (sixth row). Comparing the two cases, it is observed that, although the average growth rates of both types of cities followed a decreasing trend, the reduction experienced by those in battle zones is nearly negligible between the 1850s and the 1860s. Moreover, if we differentiate the cities in states where more than 15 battles took place (intense) and those with fewer than that number (less intense), it is observed that the former, not only did not reduce their growth rate, but experienced a much higher average growth rate during the 1860s.

All these figures lead us to suspect that, given the open field character of this war, the big cities experienced a 'safe harbor effect'. As noted by Glaser and Shapiro (2002), *"[T]he first, and probably most important, interaction between warfare and urban development is that historically cities have provided protection against land-based attackers. Cities have the dual advantages of large numbers and walls and thus, holding the size of the attack constant, it is much better to be in a city than alone in the hinterland"*. This suspicion will be supported in the next subsection devoted to presenting the estimation results.

4.2 Estimation of the persistence parameter

Estimation results using Two-Stage Least Squares (2SLS) are reported in Table 3. The upper panel shows those corresponding to the first stage when the relative city size growth rate during the 1860s is regressed on the instruments. In order to capture

further unobserved specific factors, state dummies have also been introduced in to this first stage. Only three of them were systematically significant in all the specifications included in Table 3. The first corresponds to the state of Colorado for which only the city of Denver is included in the sample. It has a negative sign and its significance is a result of its outlying nature. People went to Denver in 1858 when gold was discovered in Cherry Creek. Denver and Auraria joined together to form a bigger city and became the capital of Colorado seven years later. The city was almost destroyed by a fire in 1863 and a flood affected a great number of buildings. Together with the Indian wars, are this led to a deceleration of population growth during these years. In 1870, the inhabitants numbered 4,759 and in 1880, 35,629, this growth was mainly related to the arrival of the railway. Another significant dummy is that for Nebraska, whose sign is positive, which may be related to the fact that it is one of the states that lost less population in absolute terms (239 soldiers). Finally, Missouri also has a positive and significative associated dummy. It is a frontier state and was the scene of a great number of battles, which can be considered as a first statistical evidence of the presence of a 'safe-harbor effect'. The second column displays the results from the regression that uses widows as a percentage of city population as the instrument to identify the ACW shock. As expected, this variable is negatively related to the relative size growth.

[Insert Table 3 here]

The validity of the instruments is reflected by the fact that they are able to explain almost 30% of the variability of the growth rate during the 1860s. Using this first specification, the estimated value for the β parameter in (9) is 0.07, that is, very close to zero and not significantly different from it. The implied persistence parameter (ρ) for the shock is 1.07, with a confidence interval of 95% (0.83,1.31). Therefore, it can be stated that the persistence parameter is equal to 1 and, hence, the ACW shock had a persistent effect on relative city sizes.

The second column in Table 3 reports the results when the share of men as a percentage of the total population in 1860 is included as an additional instrument. In principle, the intention is to reflect the potential soldiers of a given city. However, the estimated sign of the relationship between the share of men and the growth rate in the first stage regression is positive. This implies that cities with a higher number of men before the war experienced a smaller shock in their population. In this case, the

explanatory power of the instruments is clearly higher than that of the specification described above. Nonetheless, the estimated persistence of the shock does not change.

It can be concluded from the results presented above that the shock of the ACW had a permanent effect. This constrasts sharply with the findings of previous analyses of WWII in Germany and Japan. Except in the case of Atlanta, most of the battles were fought in open country. As a result, urban infrastructures did not suffer important damage. This is an essential difference with the studies of WWII, in which there were many civilian losses and a systematic destruction of cities. Apart from the different era in which the conflict took place, this distinctive feature of the War of Secession may be one explanation for the different nature of the shock caused on relative city size growth. The descriptive analysis in subsection 4.1 gives the idea that the ACW shock was of not so negative. On the contrary, the rural aspect of the war leads us to suspect that people tended to take refuge in large cities. In order to corroborate this impression, a dummy reflecting that no battles took place in the state to which a given city belongs to has also been included as an instrument. Results are shown in the fourth column of Table 3. The sign of the parameter related to this dummy is negative implying that cities located in states with no battles experienced a lower growth rate. The explanatory power of the instruments is even greater but, nonetheless, the rest of the conclusions do not change.

Although the results have not been reported[7] due to the small number of cities in the sample that are located in Confederate states, we have repeated the same analysis distinguishing between Southern and Northern states. The evidence obtained suggests that the persistence of the shock in the Confederate cities was smaller than in those of the Union. The persistence parameters for the former are around 0.5, while those for the latter are almost the same as those reported in Table 3.

5 Concluding remarks

Previous studies have established that German and Japanese cities recovered their pre-WWII relative size growth rates in a short time. That is to say, the strategic bombing of the Allied air forces during that war only had temporary effects. The only existing evidence of a persistent nature of the shock is weak and corresponds to the cities in East Germany.

[7] They are available from the authors upon request.

This paper tries to contribute to the scarce literature about the persistence of the demographic shocks caused by wars on urban structures by analyzing relative U.S. city sizes during the period 1860-1880. The shock derived from the ACW is of an important magnitude as more than 600,000 men of the 31 million inhabitants died in the conflict. This figure, in relative terms, is much greater than the U.S.lives lost in WWII or in Vietnam. Moreover, and to the best of our knowledge, the ACW has never been analyzed with the econometric rigour it deserves.

The main conclusion we can draw is that the temporary shock of the ACW had a permanent effect on relative city size distribution. Therefore, those cities that experienced a higher (lower) growth during the war were those with a higher (lower) growth rate in the 1870s. In addition, evidence has been reported regarding the fact that the ACW did not induce a decrease in city size and that the U.S. total population growth rate only decelerated in the 1860s with respect to the adjacent decades. So, apart from the different historical stage, there are other differences between the ACW and WWII. While WWII caused many civilian casualties and significant destruction of buildings in Japanese and German cities, the rural nature of the ACW led to the appearance of a 'safe harbour effect'. The latter mitigated the (direct and indirect) casualties derived from the war and was more intense in the States where more battles were fought.

Finally, it is worth mentioning that our results should be taken with caution, mainly because of the shortage of data that forces us to work with a sample of 104 cities. Moreover, the frequency of the information in the Census has obligated us to proxy the shock with data referring to the whole decade. Nevertheless, we believe that the effort made to carefully explain the empirical model, the availability of information regarding the number of widows by city and the reasoning used throughout the paper give creedence to the analysis.

References

[1] Blattman, C. and E. Miguel, 2009. Civil War. Forthcoming in the Journal of Economic Literature.

[2] Brakman, S., M. Garretsen and M. Schramn, 2004. The strategic bombing of German cities during World War II and its impact on city growth. Journal of Economic Geography 4, 201-218.

[3] Bosker, M., S. Brakman and H. Garretsen, 2007. Looking for multiple equilibria when geography matters: German city growth and the WWII shock. Journal of Economic Geography 61, 152-169.

[4] Clark, J. S. and J. C. Stabler, 1991. Gibrat's Law and the Growth of Canadian Cities. Urban Studies 28, 635-639.

[5] Davis, D. R. and D. E. Weinstein, 2002. Bones, Bombs and Break Points: The Geography of Economic Activity. American Economic Review 92, 1269-1289.

[6] Dehon, C., M. Gassner and V. Verardi, 2009. Beware of 'Good' Outliers and Overoptimistic Conclusions. Oxford Bulletin of Economics and Statistics 71(3), 437-452.

[7] Gabaix, X. and Y. M. Ioannides, 2004. The evolution of city size distributions. In Henderson, J. V. and J. F. Thisse (eds.) Handbook of Regional and Urban Economics 1(4), 2341-2378.

[8] Glaeser, U. S. E. and J. Shapiro, 2002. Cities and Warfare: The Impact of Terrorism on Urban Form. Journal of Urban Economics 51, 205-224.

[9] Nitsch, V., 2003. Does history matter for urban primacy? The case of Vienna. Regional Science and Urban Economics 33(4), 401-418.

Tables and Figures

Table 1: Relevant data. American Civil War, 1861-1865.

	Union	Confederates
Dead in battle	110,070	94,000
Other dead	250,152	164,000
Total	360,222	258,000
Furnished	2,777,304	1,400,000
Population in 1860	22,339,989	9,103,332

Sources: www.census.gov and www.civilwarhome.com

Table 2: Population growth rate (%) comparison, 1850-1880.

	1850s	1860s	1870s
Total U.S.	35.46	22.62	30.07
Sample cities	107.49	94.75	55.62
Battle	105.13	103.30	61.21
Intense	75.68	115.02	31.40
Less intense	115.93	99.28	71.44
No battle	109.39	87.70	51.00

Table 3: Instrumental variables (2SLS) estimation results.

Specification	(1)	(2)	(3)
	First stage		
Endogenous variable: Relative city size growth 1860-70			
Constant	0.53^{***}	-1.28^{***}	-0.88^{*}
Widows	-0.54^{***}	-0.46^{**}	-0.70^{***}
Men		0.04^{***}	0.03^{***}
No battle			-0.20^{***}
R^2	0.28	0.38	0.42
	Second stage		
Endogenous variable: Relative city size growth 1870-80			
Constant	0.10^{**}	0.08^{*}	0.07^{*}
Relative city size growth 1860-70	0.07	0.13	0.15
R^2	0.08	0.12	0.13
Number of observations	104	104	104
Persistence parameter ($\widehat{\rho}$)	1.07	1.13	1.15
95% confidence interval	[0.83 , 1.31]	[0.92 , 1.33]	[0.96 , 1.34]

Note: ***, ** and * denote significant at the 1, 5 and 10% level, respectively. First stage estimations include state dummies for Colorado, Nebraska and Missouri.

Figure 1: The Confederate and the Union states during the American Civil War. Source: www.worldbook.com.

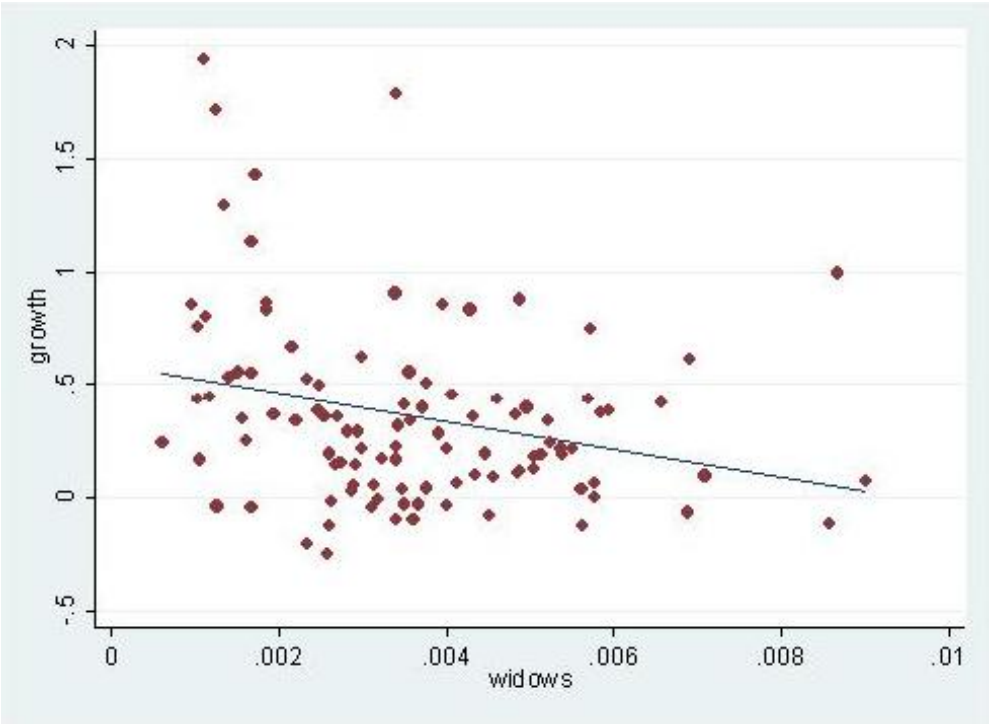

Figure 2: Scatter plot between relative city size growth rate during the 1860s and the percentage of widows over the city population.

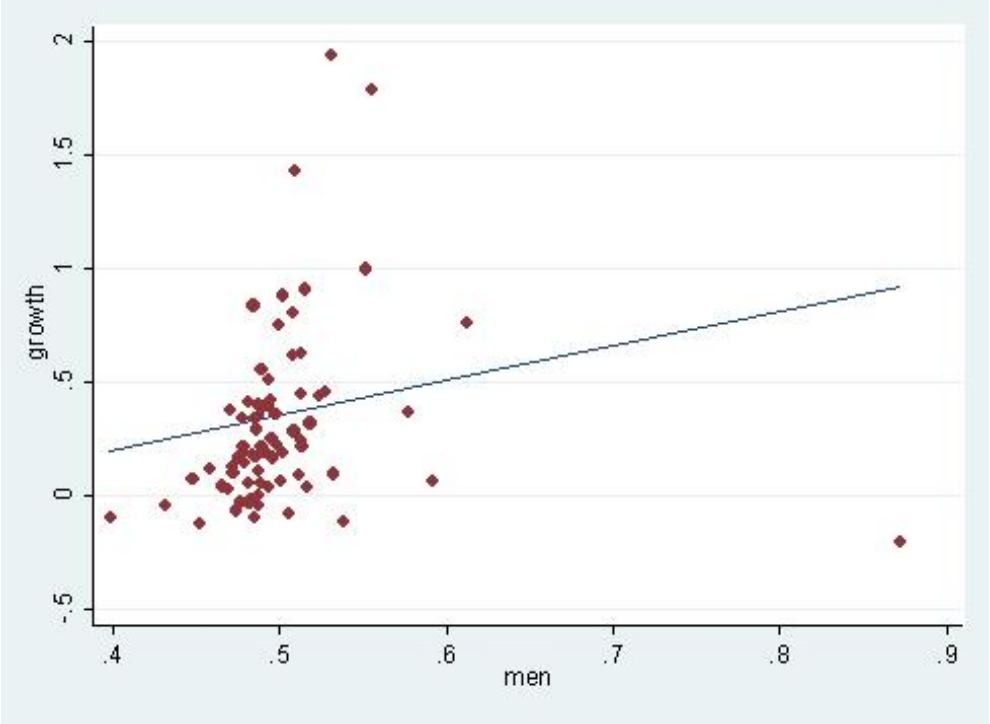

Figure 3: Scatter plot between relative city size growth rate during the 1860s and the percentage of men over the city population.