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The effect of the Spanish Civil War on city shares

Abstract

This paper examines the effect of the Spanish Civil War (1936-1939) shock on city shares of population applying the methodology proposed by Davis and Weinstein (2002). We make use of an unexploited long-term, historical dataset of populations disaggregated at the city level. Our instruments, a key methodological issue, are based on dead and wounded data collected by historians. We show that the effect of the Spanish Civil War on capital cities was temporary, and argue that the locational fundamentals theory is the principal explanation.

Keywords

War shocks; city growth; locational fundamentals; Spanish Civil War

JEL codes

J11, N94, R12

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1. **Introduction**

The effect of wars on the distribution of urban populations may be interpreted through the lenses of three theoretical frameworks, based on locational fundamentals, random growth and increasing returns to scale (Davis and Weinstein 2002). In a nutshell, do war shocks have transitory or permanent effects and, if the latter, to what extent, on city size distribution? Davis and Weinstein (2002) proposed that the impact of the bombing of Japanese cities was temporary, since most cities returned to their position in the distribution before World War II within around 15 years. Brakman et al. (2004) found similar results in their study on the bombing of German cities during World War II. While Sanso-Navarro et al. (2015) found that the effect of the US Civil War (1861-1865) shock on city growth was also transitory.

Here, we add to this sparse research by examining the Spanish Civil War (1936-1939). The Spanish Civil War (hereafter SCW) is usually depicted as one of the most, if not the most, critical phenomenon in recent Spanish history (e.g., Rosés 2008; Preston 2012). The victory by the "Nationalist" (rebel) side, and conversely the loss by the "Republican" (loyalist) side, brought about a dictatorship that lasted until 1975.

We follow the very same methodology as proposed by the aforementioned studies. However, rather than the study of an inter-state war, this paper builds on the literature by analyzing a civil war. The only previous analysis on the matter refers to a nineteenth-century war that took place in the early stages of the urbanization process and in which the battles were basically fought in the open field (Sanso-Navarro et al. 2015). Furthermore, as part of the disastrous European interwar period, the SCW has frequently been depicted as a prelude to World War II, due to the fact that it involved Germany and Italy (which cemented their alliance) and the Soviet Union, as well as France and Britain whose entente was weakened (e.g., Moradiellos 2008). As the SCW stands out for the toll it took on the population (e.g., Ortega and Silvestre 2006), a priori, we may anticipate a more permanent effect. However, there are also fair reasons to expect a temporary effect. Due to the fact that the level of material destruction caused by the SCW was not extraordinary (e.g., Rosés 2008). Moreover, internal, notably rural-to-urban, migrations acted as an adjustment mechanism. They resumed their pre-war flows, abruptly dismantled during the war years, shortly afterwards—at first slowly, but later consolidating. The principal pre- and post-war urban destinations remained basically the same (Paluzie et al. 2009).

2. Data and Methodology

Let S_{it} be the share of city *i*'s population over the total population of the country at time *t*. Davis and Weinstein (2002) proposed the following equation for city size:

$$s_{it} = \Omega_i + \varepsilon_{it} \qquad (1)$$

where s_{it} is the natural logarithm of S_{it}, Ω_i is the initial size city, and ε_{it} refers to city specific shocks.

Population data at the city level comes from the new and unexploited database by González-Val and Silvestre (2020). The spatial units are the 49 provincial capital cities (which would represent a selection of LAU II / NUTS V units), for which the demographic data necessary to estimate populations annually are available. Historical demographers refer to the Spanish capital cities as reflecting urban demographic behavior, even if they do not represent the whole urban population (Mikelarena 1996; Pérez-Moreda et al. 2015, esp. p. 214). In 1930 and 1950, the census dates that frame our analysis, the population of the capital cities represented 22.8 and 27.8 percent of the total national population respectively (25.6 percent in 1940); and 49.2 and 50.5 percent of the total urban (> 10,000 inhabitants) population (49.5 in 1940).[1] The number of inhabitants of the capital cities is above 10,000, which is a standard urban threshold in Spain (Tafunell 2005).

The persistence of a shock is modelled as:

$$\varepsilon_{it+1} = \rho\varepsilon_{it} + v_{it+1} \tag{2}$$

where v_{it} is an independently and identically distributed error term, and $\rho \in [0,1]$ refers to the 'persistence parameter'.

The first difference of equation (1) combined with equation (2) yields:

$$s_{it+1} - s_{it} = (\rho - 1)v_{it} + \left[v_{it+1} + \rho(\rho - 1)\varepsilon_{it-1}\right] \tag{3}$$

The ρ parameter reflects the degree of persistence of the shock. If $\rho = 1$, the shock is permanent and city size would follow a random walk. If $\rho \in [0,1)$ city size is stationary, and the shock would dissipate over time; the speed of dissipation being higher the closer ρ is to zero. The magnitude of ρ can be estimated by using a unit root test, provided that the innovation v_{it} is correctly identified with valid instruments for the war shock.

In line with Brakman et al. (2004), our final equation, in logs, to test the effect of the SCW shock on relative city growth is:

$$s_{i,1940+t} - s_{i,1940} = \alpha\left(s_{i,1939} - s_{i,1936}\right) + \beta_0 + u_i\,, \tag{4}$$

where $\alpha = (\rho - 1)$. Therefore, if $\alpha = 0$ city growth would follow a random walk; and if $-1 \le \alpha < 0$, there would be evidence to support mean reversion in city shares, and the war shock would have, at most, a temporary effect, or no effect at all ($\alpha = -1$).

A period *t* has to be chosen for the dependent variable. Brakman et al. (2004, p. 208) distinguish between the short term (t = 4) and the long term (t = 17 or 18). Their adopted short term corresponds to the point at which Germany split into two and, consequently, post-

[1] The latter percentages are estimated using the Fundación BBVA-Ivie database (See the References section).

war economic development took different paths. While their long term corresponds to that adopted by Davis and Weinstein (2002). We chose t = 6 for the short term, implying the year 1945. Albeit the complete recovery of the pre-war economic situation would need more time, 1945 is the year in which the capital stock recovered its pre-war levels, and may be considered the first turning point (Rosés 2008). Equation (4) was also estimated with longer periods (t = 11, 1950; and t = 16, 1955), and the main results remained similar.

Because city growth during war time may include information not only about the impact of war but also about the previous period, the next challenge with estimating equation (4) is the selection of instruments for the right-hand side variable. Our preferred instruments are based on the accounting of war casualties estimated by the late political scientist at the University of Kansas, Ronald A. Francisco (see the References section). This database is based on previous research done by SCW historians. As a matter of fact, the total number of deaths in Francisco's database, 386,719, is slightly overestimated in comparison with other estimates closer to 350,000 (Ortega and Silvestre 2006). Nevertheless, to the best of our knowledge, this database is unique in terms of recording casualties at a disaggregated urban level.

In our final results, we considered the power of three instruments: the local number of dead and wounded (in both cases, relative to the total number of dead and wounded) and a dummy variable set to 1 for cities still on the Republican (loyalist), and ultimately losing, side at the beginning of the last year of the war (1939). We expect the relative number of dead and wounded to be negatively correlated with relative city growth during the war. The dummy variable capturing cities under Republican control throughout most of the war proxies for the effect of enduring the advancement of the rebels. According to Glaeser and Shapiro's (2002) framework for the effects of warfare, we expect a positive relationship between this variable and relative city size. There is evidence that the safe harbor effect, and the disruption of the transport system, as contributors to city growth, may have predominated over the target effect and the destruction of buildings, as contributors to city population size decrease.[2]

A pertinent question concerns whether our third instrument may in fact be capturing post-war influences in the differing growth pattern of cities under the control of the loyalists during most of the war. Two clear candidates would be government interventions and specific migration patterns. However, public efforts after the destruction caused by the war—in any case slowly implemented and with little effect—were mainly directed at the areas in which the majority of the most damaging battles occurred, which thus received much more finance, regardless of their status during the war (Más-Torrecillas 2008, p. 85). While a return, mainly urban-to-rural, post-war migration process may have particularly affected some more loyalist cities, such as Madrid (due to its gain in population during the war years), the truth is the setback was short lived and, as argued above, 'traditional', i.e. pre-war, rural-to-urban, migration flows resumed as the 1940s progressed.[3] The result of one test suggests that the correlation between this instrument and the residuals from the IV second-stage regressions presented in the next section is not significant, and, therefore, that the exclusion restriction is not violated.[4]

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[2] Available data, although incomplete, confirm increases in population during the war in some of the most important Republican centers, such as Madrid, Barcelona and Valencia (Ortega and Silvestre 2006). The most important destruction of physical capital was that of transportation networks. Whereas, with some exceptions, cities were not exposed to heavy bombing, and the housing stock only suffered a slight reduction (e.g., Rosés 2008).

[3] A further factor may be political repression after the war. However, repression predominantly occurred during the war years, and a spatial pattern, in which former more loyalist cities were more targeted, is difficult to prove (e.g., Casanova 1999; Prada 2010; Espinosa 2021).

[4] Spearman's rho (correlation between the residuals from the IV regression and the Republican dummy variable) = -0.13; test of Ho: instrument and residuals are independent: prob > |t| = 0.42. These results are similar for the three IV regressions we run in Table 1 (differences arise from the third decimal place).

A shortcoming of the adaptation of Davis and Weinstein's (2002) approach to our case is that Francisco's dataset does not include data for 11 out of the 49 capital cities, so we were not able to instrument their growth rate over the war years. In any case, the excluded capitals only represent 9.9 percent of the total capital-cities population. [5]

3. Results

The main results for equation (4) are reported in Table 1. In Panel A, the first-stage regressions show that our instruments (relative number of dead and wounded, and a dummy variable set to 1 for the cities which remained under Republican control at the beginning of the last year of the war) have the expected signs and tend to be significant at the usual levels. When the three instruments are included at the same time in column (3), the estimated coefficient of the relative number of deaths becomes non-significant, more than likely due to the fact that the numbers of dead and wounded are highly correlated (Spearman's rho = 0.8). Overall, our instruments seem to perform reasonably well, given that the specifications pass the F test of excluded instruments, and the null hypothesis of the overidentification test (Hansen J statistic) cannot be rejected in all the cases at the 5% level. The three instruments explain between 18 and 25 percent of the variation in the population growth of cities during the war period.

The second-stage regressions are shown in panel B.[6] The estimated coefficient of α (Growth in relative population between 1936 and 1939) is around -1 in the three columns,

[5] Wars can affect age cohorts differently—and therefore the economic recovery (we thank a reviewer for this remark). However, available sources do not allow us to disaggregate by age. This is also a limitation to be borne in mind when interpreting our evidence. Notwithstanding, estimates of the effect of the SCW on mortality at the level of the nation as a whole show relatively small differences between the 20-30 age group, the most impacted, and the 30-40 and 40-50 age groups (Ortega and Silvestre 2006, pp. 72-73).

[6] Results may be biased if variations in city size during the war were in some way associated with pre-war growth trends (Davis and Weinstein 2002, p. 1281; Brakman et al. 2004, p. 211). In unreported regressions, as

although it is not significant in column 1. Recall that if $\alpha = -1$ the war would not have any effect on relative city growth. We also run a formal test to check whether the estimated α is different from -1 and, consequently, the persistence parameter ρ is equal to zero. The results are shown at the bottom of the table. In column 1, we cannot reject either of the two hypotheses, $\alpha = 0$ and $\alpha = -1$, and therefore the results are not conclusive. But in columns 2 and 3 the null hypothesis $\alpha = 0$ is rejected, while the hypothesis $\alpha = -1$ cannot be rejected. In short, an estimated persistence parameter (ρ) of around zero suggests that the SCW shock had a short temporary effect or virtually no effect at all, in our case implying that the typical city completely recovered its pre-war relative size within 5 years. Such a degree of persistence is similar to that found for Japan after the Second World War (Davis and Weinstein 2002, p. 1281), and lower than those found for Germany after the Second World War (0.6) and the US after its civil war (between 0.4 and 0.6) (Brakman et al. 2004, p. 209; Sanso-Navarro et al. 2015, p. 3079).

4. Conclusion

Our results show that the shock caused by the Spanish Civil War had, at most, a temporary effect on city shares. Davis and Weinstein (2002) suggested two theoretical explanations for this kind of behavior: increasing returns to scale and locational fundamentals. Their methodology, however, is not intended as a way to decide between these two competing theories. In any event, to explain the high persistence in Spanish city growth on the basis of increasing returns we would need to rely strongly on path dependence. Thus, if initial advantages accumulate, even after a dramatic change in the

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additional explanatory variables we alternatively added two pre-growth trends: between 1932 and 1935, a period of the same length as the SCW; and between 1930 and 1935, a period starting the year immediately following the 1929 international economic crisis. However, these variables were not significant and have been excluded from the final results reported in Table 1.

industrial sector, the head start would provide an advantage in the next stage of competition, that is, after the war (Krugman 1991; Davis and Weinstein 2002). However, just a small proportion of Spanish capital cities were important industrial centers before the SCW (Mikelarena 1996).

As a result, our impression is that the temporary war effect on city size is best explained by the locational fundamentals theory. According to this theory, exogenous, fixed, natural-resource endowments or geographical advantages, in addition to playing a role in early settlements, contribute to determining the evolution of populations. Therefore, even large shocks would be temporary, as long as they do not alter the fundamental characteristics of cities.

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Table 1. Effects of the SCW shock on relative city growth. Two-stage least square estimates, cross-sectional data

Panel A. First stage regressions	(1)	(2)	(3)
Dependent variable: Growth in relative population between 1936 and 1939			
Relative number of deaths	-0.152***		-0.077
	(0.021)		(0.052)
Relative number of wounded		-0.252***	-0.188*
		(0.077)	(0.098)
Still under Republican control in 1939	0.019**	0.022*	0.023**
	(0.009)	(0.011)	(0.010)
Constant	0.044***	0.046***	0.046***
	(0.006)	(0.006)	(0.006)
Panel B. Second stage regressions (2SLS)	(1)	(2)	(3)
Dependent variable: Growth in relative population between 1940 and 1945			
Growth in relative population between 1936 and 1939	-0.953	-1.164**	-1.019**
	(0.589)	(0.495)	(0.470)
Constant	0.060**	0.069***	0.063***
	(0.026)	(0.020)	(0.019)
First stage statistics			
Test of excluded instruments, F test, (p-value)	25.42	11.60	12.11
	(0.000)	(0.000)	(0.000)
Shea partial R^2	0.175	0.224	0.249
Second stage (2SLS) statistics			
Hansen J statistic, p-value	0.095	0.120	0.259
Test $\alpha = 0$ ($\rho = 1$), p-value	0.106	0.018	0.030
Test $\alpha = -1$ ($\rho = 0$), p-value	0.937	0.739	0.968
Observations	38	38	38

Notes: Regressions based on Davis and Weinstein's (2002) methodology. Robust standard errors between brackets. Significant at the *10%, **5%, ***1% levels.