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### Returns to Education in Greece: Evidence from the 1977 Labor Market Survey using the Greek Civil War as an Instrument

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#### Abstract

Greece experienced a devastating civil war in 1946-1949. This led to many deaths, economic losses, and severe reductions in schooling expenditures and attendance. Using an instrumental variables approach, we estimate the 1977 returns to schooling, showing that for those affected by the civil war, the returns to schooling are higher than the corresponding least squares estimate.

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# 1 Introduction

Studies have attempted to estimate the returns to education in Greece using a variety of methods and controls (Kanellopoulos 1997; Prodromidis and Prodromidis 2008; Chletsos and Roupakias 2020). Psacharopoulos (1982) analyzed the 1977 labor market survey and estimates the rate of return to schooling. He finds a relatively low rate of return, at 5.8 percent, which is lower than estimates for Greece from the 1960s. The low rate and decrease at the time are attributed to the expansion of higher education enrolment and graduates driven by a strong social demand for education (see also Livanos and Pouliakas 2011; Kanellopoulos 1997; Cholezas and Tsakloglou 1999). Also, the returns to education are higher in the private sector but graduates prefer the public sector in Greece (Magoula and Psacharopoulos (1999). Over the decades, the returns to education in Greece have averaged at about 6 percent (Montenegro and Patrinos 2021), while the global average rate of return to schooling is 8 to 10 percent (Psacharopoulos and Patrinos 2018).

One event that occurred and which could be useful for understanding the returns to education is the Greek civil war. This led to a devastating economic situation and during the war expenditures on education declined considerably. School attendance declined and outcomes were lowered for a generation. We contribute to the empirical literature on returns to education. We show that the true returns are higher than previously thought, using the civil war as an instrument.

A variety of empirical studies have used changes in supply as instruments in instrumental variables (IV) estimations of the returns to schooling. The main finding is that such estimates of returns to schooling are typically larger than ordinary least squares (OLS) estimates. Card (2001) interprets this finding as suggesting that the marginal returns among the low-education subgroups (which are typically affected by supply changes) tend to be relatively high, reflecting their high marginal costs of schooling rather than low ability.

## 2 The Greek Civil War

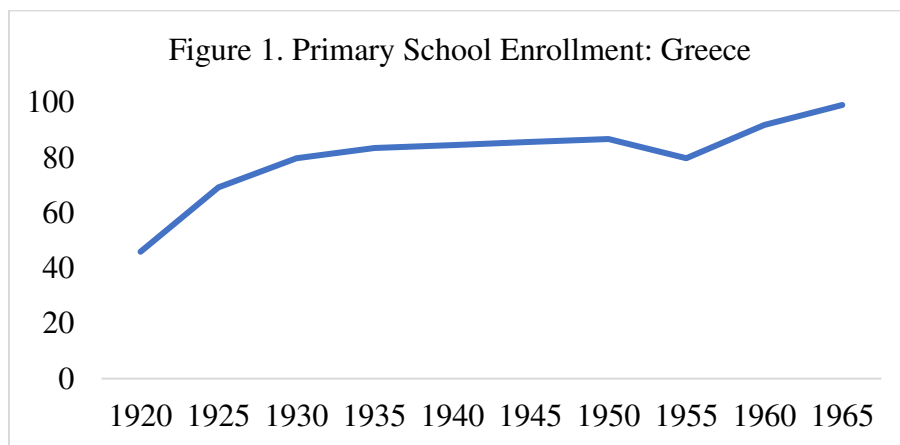
War has been known to cause much damage to humankind, both directly in terms of human lives and indirectly through its harmful economic and social effects. However, there are relatively few studies on the impacts of war on labor market outcomes. Moreover, most of the few existing studies focus on developed countries, such as Ichino and Winter-Ebmer (2004) for Austria and Germany, and Arrazola and de Hevia (2006) for Spain. Here we focus on using the civil war as an instrument to estimate the returns to schooling.

The instruments used by Ichino and Winter-Ebmer (2004) to estimate the loss of earnings suffered by people who received less schooling because of World War II seem to serve well the purpose of estimating the upper limit of the range of returns to schooling in Germany. This is the local average treatment effect (LATE) framework of Angrist et al. (1996). Note that given the instrument, in this case the treatment is defined as a reduction of schooling. We further conjecture that none of the other groups is likely to be affected by this instrument.

Ichino and Winter-Ebmer (2004) estimate the average return to education for those individuals who had to reduce their educational investments in human capital due to World War II. As instruments they use a 1930-1939 birth cohort indicator. These returns are also interpreted as measures for the long-run educational costs of the war (Pfeiffer and Pohlmeier 2011). In Spain, civil war produces higher returns in IV than OLS (Arrazola et al. 2003; Arrazola and De Hevia 2006, 2008).

Greece is the only European country which actually fought a full-blown civil war after the

German occupation, a civil war with two opposing armies – the left-wing Democratic Army of Greece and the Greek National Army. This was a war that lasted officially for three years: 1946–1949 (Van Boeschoten 2005: 39.). Using neoclassical growth-accounting, the economic cost of the conflict is estimated to surpass an annual GDP, in line with similar findings in contemporary civil wars (Christodoulakis 2016). The Greek Civil War led to a significant reduction in schooling between 1950 and 1955 (Figure 1).



Source: Lee and Lee 2016

### 3 Data and Sample

We use the Greek 1977 Special Wages and Salaries Survey, a specially designed survey administered by National Statistical Service of Greece to a random stratified sample of 8,756 wage and salary earners in 12 cities. This is the same survey used by Psacharopoulos (1982).

### 4 Identification strategy: Instrumental variables

Given an instrument  $Z_i$ , the coefficient  $b_i$  in the general returns model is intended to capture the unique gain of each individual and has a population mean of  $b_0$  (Patrinos and Sakellariou 2006). Even in the homogeneous returns model, using IV estimation requires the instrument to meet the orthogonality constraints, meaning it must be uncorrelated with both the error term and ability. However, under the heterogeneous model, merely meeting the orthogonality requirements is insufficient. For the treated, it is necessary to make the additional and quite strong assumption that instrument  $Z$  is not associated with the person-specific return component. That is, it is necessary that people's decisions about going to school be unrelated to their individual-specific gains while still allowing for heterogeneous returns.  $B_i$  changes in the population when the return to schooling is a random variable and there is a distribution of causal effects, and different causal effects answer different questions. Under certain assumptions, the conventional IV estimates of returns to schooling relate to various treatment parameters and what policy questions IV estimation answers. Here we are estimating a local average treatment effect (LATE).

Given that the Greek civil war took place from 1946-1949, and the levels of schooling dropped precipitously in the 1950s, then we operationalize the instrument by setting it so that those

22 to 27 years of age, that is, who were 10 years of age during the civil war years, are deemed to be affected.

## 5 Empirical analysis

We estimate a LATE: the returns to schooling for a marginal student affected by the civil war. Our estimate of the returns to schooling in Greece in 1977, using the civil war as an instrument, is higher than the existing non-experimental returns to education estimates at the time. We use as dependent variable the log of annual earnings and include all workers, male and female. The ordinary least squares estimates use the standard Mincerian specification. The instrument in the instrumental variables (IV) regressions is the workers aged 22-27 years in 1977 dummy.

**Table 1. Returns to education: Greece, 1977**

Variable	OLS Earnings (1)	First stage Schooling (2)	IV-LATE Earnings (3)
Schooling	0.059 (48.8)		0.080 (10.3)
Experience	0.066 (41.9)	0.047 (3.2)	0.063 (32.6)
Experience-squared	-0.0011 (31.1)	-0.005 (15.5)	-0.0010 (15.8)
Civil war		-2.475 (5.6)	
Constant	10.591	14.131	10.323
F-test		231.3	725.05
[p-value]		0.000	0
Overidentification statistic			Exactly identified
R-square	0.352	0.330	0.330
N	8,756	8,756	8,756

Source: Labor market survey 1977

Notes: In each column the dependent variable is the log of annual earnings. The instrument in the IV regressions is the workers aged 22-27 years in 1977 dummy. OLS = ordinary least squares; LATE-IV = local average treatment effect (LATE) interpretation of instrumental variables (IV) techniques.

Numbers in parentheses are t-scores in the case of OLS and first stage, z-scores for the IV.

The results reported in Table 1 show the OLS estimates, followed by the first stage estimates and IV results in the third column. The first stage estimation results show that the civil war has a strong and negative effect on individuals' schooling outcomes. Overall, individuals affected by the war have, on average, 2.5 fewer years of schooling than their counterparts. The OLS estimates of the returns to schooling in 1977 were estimated as 5.8 percent (Psacharopoulos 1982) to 5.9 percent (Table 1). The IV estimate is 8.0 percent and 26 percent higher than the corresponding OLS estimator. These results can easily be reconciled with the idea of heterogeneous returns to education (Card 2001). Moreover, the LATE concept gives a meaning to these heterogeneous returns: the LATE measures exactly the returns for the group that changes treatment status because of the war. In our case, these are predominantly poor individuals, with

returns that are probably higher at the margin. It is expected that OLS estimates underestimate the returns to schooling (Card 1999). Since the IV estimate is unaffected by measurement error, they tend to be larger than OLS estimates. The instrument shifts the behavior of a subgroup of individuals for whom the returns to education are larger than average. In other words, the IV estimate is the effect of increasing education only for the population whose choice of the treatment was affected by the instrument, while the OLS estimate describes the average difference in earnings for those whose education differs by one year. Then IV estimates will be larger than OLS estimates because of heterogeneity in the studied population.

Our results are consistent with others who have used civil war as IV (see, for example, Ichino and Winter-Ebmer 2004; Arrazola and De Hevia 2006; Arrazola et al. 2003), and the many studies that use instruments to estimate the returns to schooling (Aryal et al. 2022; Harmon et al. 2003; Chletsos and Roupakias 2020 for Greece). But since we are using an instrument that means less schooling, then this suggests a high cost of war, along the lines of Ichino and Winter-Ebmer (2004). Summing up, we find that the indicator of war constraints to schooling result in somewhat higher returns to education for the respective group.

## **6 Concluding remarks**

Greece experienced a devastating civil war in 1946-1949. This led to many deaths, economic losses, and severe reductions in schooling expenditures and attendance. Using an instrumental variables approach, we estimate the 1977 returns to schooling, showing that for those affected by the civil war, the returns to schooling are higher than the corresponding least squares estimate. Our LATE estimate only applies to marginal students whose schooling was affected by the civil war. Our results are consistent with the literature. We find that the indicator of war constraints to schooling result in somewhat higher returns to education for the respective group. The LATE estimator is 8.0 percent and 26 percent higher than the corresponding least squares estimator.

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