

Operation Allied Force: Unintended Consequences of NATO 1999 Bombing on Children's Outcomes

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Goal of the Paper

The goal of this paper is to estimate the causal effect of the NATO's Operation Allied Force bombing of Serbia in 1999 on children's outcomes. We examine *in utero* effect on children both in terms of short-term outcomes (birthweight), as well as long-term outcomes (grades of 15-year-old pupils).

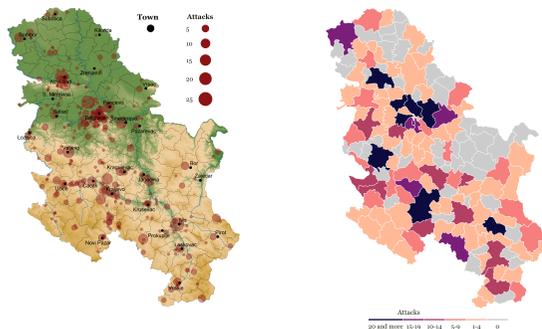
Data Sources

Outcomes

- Birth records from the Statistical Office of the Republic of Serbia (SoRS), 1997-2003.
- Final examination data set from the Serbian Ministry of Education (SMoE), 2012-2016.

Bombing - Primary Data

- The NATO bombing of Serbia, from March 24 to June 10, 1999 (78 days) was the largest air campaign in Europe since the bombing of Britain and Germany in WWII.
- Information on bombed municipalities, intensity, and duration comes from a dataset which was assembled using information from then pro-opposition newspapers (Glas Javnosti, Večernje Novosti, NIN, Vreme), reports from the Human Rights Watch, and the Database on casualties of the Humanitarian Law Centre (HLC) in Belgrade.
- Bombing was dispersed across the country with the highest concentration of attacks in large cities such as Belgrade, Niš, Novi Sad and Kraljevo.



(a) Attacks by Target

(b) Number of Attacks

Methodology & Mechanisms

- The main specification compares children who were in utero during the NATO bombing (born between July 10 and October 15, 1999) (*treatment group*) with children born in the months June to October, 1998 (*control group 1*) and children born in the months June to October 2000 (*control group 2*).
- The main transmission mechanism is *in utero* environment of both mother and the child due to the prenatal maternal stress.

1. Main Specification

$$y_i = \beta_0 + \beta_1 I(\text{in_utero}_i) + \phi X_i + \gamma_{\text{mob}} + \delta_{\text{yob}} + \tau_{\text{muni}} + \epsilon_i$$

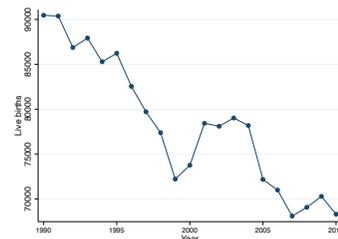
2. Alternative Specification: Intensity of Bombing

$$y_i = \beta_0 + \beta_1 I(\text{in_utero}_i) + \beta_2 I(\text{bombed_mun}) + \beta_3 I(\text{in_utero}_i) \times I(\text{bombed_mun}) + \phi X_i + \gamma_{\text{mob}} + \delta_{\text{yob}} + \tau_{\text{muni}} + \epsilon_i$$

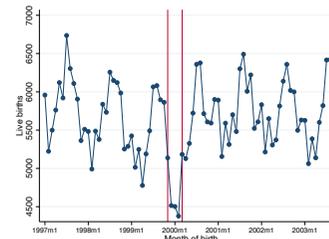
- *Outcomes*: birthweight, 8th year grades in mathematics, language and behavior.
- *In-utero*: a dummy whether the child was *in utero* = only children who were in the womb throughout the period of bombing.
- *Bombed-mun*: a dummy whether the municipality was bombed.
- *Controls* (depending on the data source/outcome): gender, birth order, whether the child was born in a hospital, parents' socio-demographic characteristics, month of birth, year of birth and the municipality or school fixed effects.

Descriptive Figures: Live Births

- In the period 1990-2010, the annual number of live births in Serbia had an overall declining trend.
- The months when the bombing took place, least children were conceived (postponed childbearing, men drafted).



(a) Live Births by Year



(b) Live Births by Month

Main Estimation Results: Grades

	Marks in the 8th grade		
	Serbian (1)	Mathematics (2)	Behaviour (3)
Panel A: Control 1: Year -1			
In utero (=1)	-0.022* (0.013)	-0.032** (0.013)	0.005 (0.005)
Observations	55598	55598	55598
R-squared	0.170	0.103	0.068
Panel B: Control 2: Year +1			
In utero (=1)	-0.022* (0.013)	-0.028** (0.013)	-0.005 (0.004)
Observations	55435	55435	55435
R-squared	0.177	0.110	0.069
Controls ^a	X	X	X
Month of birth FE	X	X	X
School FE	X	X	X

Standard errors clustered at municipality level in parentheses: * significant at 10%, ** significant at 5%, *** significant at 1%.

^a Female

Summary of the Results

- Short-term outcomes: *Preliminary results* show that affected children had lower birthweight. There are no differences in results between boys and girls. The effect of bombing was stronger in Belgrade than in the rest of the country. (Note: Due to COVID-19, we are facing delays in running the latest specifications at the SoRS secure lab. TBD January 2021.)
- Long-term outcomes: Affected children had lower grades in Serbian language and mathematics (around 0.02SD); no effect is found for behaviour. There are no differences in results between boys and girls. The negative effect of being in utero during bombing is largely driven by children in Belgrade.
- Intensity of bombing: No evidence that the intensity of bombing has a differential effect on either short-term or long-term outcomes.

Paper Contributions & Policy Recommendations

- Paper contributes to the literature on short- and long-term effects of conflicts ('disaster literature') (Almond et al., 2018).
- Governments need to intervene and design policies to alleviate the negative effects on children in the aftermath of large-scale disasters.

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