

The long-term causal effect of U.S. bombing missions on economic development: Evidence from the Ho Chi Minh Trail and Xieng Khouang Province in Lao P.D.R.

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Abstract

This study investigates the long-term causal effect of heavy U.S. bombing missions during the Vietnam War on later economic development in Lao P.D.R. The empirical strategy relies on an instrumental variables approach. We exploit the distance between the centroid of village-level administrative boundaries and heavily bombed targets—the Ho Chi Minh Trail in the case of southern Laos and Xieng Khouang province in the case of northern Laos—as an instrument for the intensity of U.S. bombing missions. We use the three rounds of average nighttime light strength data (1992, 2005, and 2013), and two rounds of population density data (1990 and 2005) as the outcome variables. The estimation results show no robust effect of U.S. bombing missions on economic development in the long term. Meanwhile, we find that the results do not necessarily support the conditional convergence hypothesis within a country, although this result could be Lao-specific.

Keywords: Conflict Damage, Economic Development, Conditional Convergence Hypothesis, Lao P.D.R.
JEL Codes: O1, P5, H7

Introduction

- Laos is one of the most intensely bombed countries per capita in history; during the mid of the Vietnam War, 1964–1973.
- To examine the bombing effect, we take advantage of the historical fact that the U.S. army dropped a vast number of bombs on the communist supply lines, called the Ho Chi Minh Trail (HCMT, Figure 1, Panel B), and Xieng Khouang province (Figure 1, Panel C).
- Relevant papers verified the effect of wars on economic development include Davis and Weinstein (2002) and Miguel and Roland (2011).

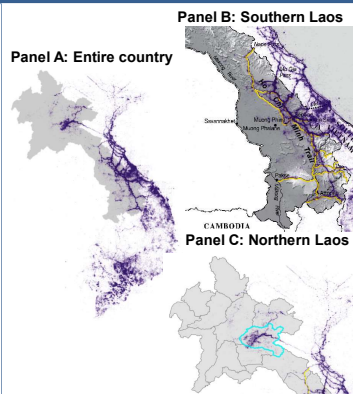


Figure 1. Distributions of US bombing missions. Source: Author's compilation based on THOR Vietnam bombing operations and CartoGIS Services, College of Asia and the Pacific, The Australian National University.

Question 1: This study first asks if the bombing missions during the secret war affected later economic growth in Laos.

Question 2: This study additionally asks if conditional within-country economic convergence existed after the war.

- **Three theories** have attempted to explain the relationship between external shocks, including bombings during wars, and subsequent long-term economic growth: **the neoclassical growth, creative destruction, and conflict trap theories.**
- However, there is no unified answer. Thus, the question of whether external shocks, including conflicts, affect long-run economic growth is ultimately an empirical one (Cavallo et al., 2013).

Identification Strategy

WRT Question 1:

- We use instrumental variables to mitigate non-randomness and measurement errors in the bombing dispersion—the distance between the centroid of village-level administrative boundaries and heavily bombed targets (the Ho Chi Minh Trail in the case of southern Laos and Xieng Khouang province in the case of northern Laos).

$$NIGHTSLIGHTS_{it,1992,2005,2013} \text{ or } POPULATION_{it,1990,2005} = \alpha + \beta BOMBS_{t,1965-1975} + \gamma PRE_BOMBING_POPULATION_{it,1950} + \delta OTHER_CONTROLS_{it} + \eta_d + \varepsilon_{it} \quad (1)$$

WRT Question 2:

- We conduct growth regressions to test the conditional convergence hypothesis. Glaeser et al. (1995) show that income and population growth move together.

$$POPULATION_GROWTH_RATE_{i,1980-2005} = \theta + \theta BOMBS_{t,1965-1975} + \pi PRE_BOMBING_POPULATION_{i,1950} + \sigma OTHER_CONTROLS_{it} + \tau_d + \omega_{it} \quad (2)$$

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Selected Estimation Results

	Panel A: Villages in Southern Laos				
	Dependent variable: Log average nighttime lights intensity per km ²				
	1992		2005		2013
(1) OLS	(2) IV2SLS	(3) IV2SLS	(4) IV2SLS	(5) IV2SLS	
Log total U.S. bombs per km ²	-0.013 (0.013)	-0.009 (0.067)	-0.047 (0.074)	0.182 (0.239)	1.044* (0.539)
Log population in 1950 per km ²	0.398** (0.178)		0.407** (0.183)	0.516** (0.204)	0.589** (0.240)
Other control variables	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes
S.E. clustered at district level	Yes	Yes	Yes	Yes	Yes
Observations	4191	4191	4191	4191	4191
R-squared	0.438	-	-	-	-
First-stage F-statistic	-	10.0	9.8	17.7	17.5
IV at the first-stage significant?	-	1%	1%	1%	1%

Table 1: Long-term impacts of bombing missions on average nighttime lights intensity in 1992, 2005, and 2013. Note: Yamada and Yamada (2019) includes other estimation results in the case of northern Laos, local bombing impacts on the population density in 1990 and 2005, and the robustness tests excluding villages the Ho Chi Minh Trail passed through and within Xieng Khouang province. Those results are consistent to the one in Table 1.

- In general, the results of the instrumental variables approach show that there is no robust relationship between bombing missions and long-term economic development as proxied by nighttime intensity.
- Bombing intensity in regression 5 is positive and statistically significant at the 10 percent level in southern Laos in 2013, which may reflect the positive spillover effect of the HCMT as a transportation network that fostered later economic development in southern Laos.
- The estimation results (i) using the population density as a dependent variable, (ii) the case of northern Laos, and (iii) the robustness tests excluding villages the Ho Chi Minh Trail passed through and within Xieng Khouang province all support the results in Table 1.

	Population growth rate, 1980-2005			
	Panel A: Southern Laos			
	All villages		Villages excluding those the HCMT passed through	
(1) OLS	(2) IV2SLS	(3) OLS	(4) IV2SLS	
Log total U.S. bombs per km ²	-0.014*** (0.005)	0.021 (0.016)	-0.012** (0.005)	0.048 (0.037)
Log population in 1950 per km ²	-0.033* (0.019)	0.010 (0.014)	-0.037* (0.019)	-0.001 (0.017)
Other control variables	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
S.E. clustered at district level	Yes	Yes	Yes	Yes
Observations	4189	4189	3837	3837
R-squared	0.116	-	0.114	-
First-stage F-statistic	-	17.8	-	14.2
IV at the first-stage significant?	-	1%	-	5%

Table 2: Growth regressions using the population density growth rate, 1980-2005. Note: Please also see the estimation result in northern Laos in Yamada and Yamada (2019).

- Conditional regional economic convergence hypothesis within a country does not necessarily hold in the case of Laos after the substantial destruction of war.
- We believe that the existence of UXOs, contaminating up to 25 percent of the villages and 14 out of 17 provinces in Laos (NRA, 2015), has hampered business and the introduction of new investments into the local economy, resulted in an unbalanced distribution of capital and labor in post-war Laos—a part of reason there is no regional convergence within the country of Laos.

Conclusions

- There is no lasting long-run impact of the U.S. bombing missions on economic outcomes in the case of Laos at the semi-macro level. Having said that, a large number of UXOs remain in the country. Meanwhile, we find that the results do not necessarily support the conditional convergence hypothesis within a country, although this result could be Lao-specific.
- The presence of UXOs is an ongoing critical issue, as they continue to kill and injure many people every year. Clearance of UXOs would be needed to help improve socio-economic development for the future of Laos.

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