# UC Berkeley

UC Berkeley Previously Published Works

Title

Corrigendum to "The long-run impact of bombing Vietnam" [J. Dev. Econ. 96 (2011) 1—15/1]

Permalink

Authors

Miguel, Edward
Roland, Gérard

Publication Date

2023-09-01

DOI

Copyright Information

Peer reviewed

# Corrigendum to "The long-run impact of bombing Vietnam" [J. Dev. Econ. 96 (2011) 1–15/1]

Edward Miguel [a],[*], Gérard Roland [b]

[a] Department of Economics, University of California, Berkeley and NBER, United States
[b] Department of Economics, University of California, Berkeley, and CEPR, United States

The authors regret errors in transforming district and province locations from one coordinate system to another. The authors are indebted to Joan Barceló, Toan Luu Duc Huynh, and Edmund Malesky for bringing these errors to our attention. This note documents the errors and provides corrected text, tables, and figures, and we have also created replication statistical code reflecting these updates.

Concretely, the coordinate transformation for data points presented in the published article mistakenly assumed an incorrect projection system rather than appropriately converting from UTM, Zone 48N (the original projection system of the data points for provinces and districts) to latitude and longitude coordinates on the WGS84 reference ellipsoid. This error resulted in location points being off by approximately $2°$ latitude north of their actual location. See Appendix A of this corrigendum for the location of districts (Panel A) and provinces (Panel B) in the original published paper versus the corrected version. This error also affected the classification of two provinces (namely, Hue and Quang Tri) and 17 districts as belonging to South Vietnam, which we have also corrected in what follows in the construction of the South Vietnam indicator variable.

A regression of the corrected instrumental variable measure at the district level, $|Latitude_{corrected} - 17°N|$, on the IV used in the original published paper $|Latitude_{original} - 17°N|$, in a specification that also includes a constant term and the original indicator for former South Vietnam, yields a coefficient estimate of $\hat{\beta} = 0.901$ (SE = 0.005), indicating that they are highly correlated. See Appendix B for a more detailed output of this regression. As a result, in the updated econometric analysis, the regression coefficient estimates and standard errors change only modestly.

In all, the substantive findings of the original published article remain largely unchanged. Below we present the corrected tables and figures and all relevant instances in the main text that needed to be updated. The authors think it is important to promptly correct the scientific record and sincerely apologize for our error. The authors would like to apologize for any inconvenience caused.

## 1. Corrections to the article text

Correcting the errors noted above leads to the following changes to the article text, as well as to the tables and figure listed below.

Main paper, pp. 8, subsection 4.1. *Impacts on poverty and consumption expenditures*:

(Original) Total U.S. bombing intensity is negatively and marginally statistically significantly related to the 1999 poverty rate at both the province level (Table 4, regression 1) and the district level (regression 2) in OLS regressions.[…] In terms of other factors, areas that had higher population density in 1960–61 have significantly less poverty in 1999 as expected, as does South Vietnam as a whole on average, while high altitude areas have considerably more poverty (regressions 1 and 2). […] The district-level effect remains negative and is even more statistically significant in specifications that include province fixed effects (Table 4, regression 3) and exclude Quang Tri (regression 4). Overall, the OLS specifications provide suggestive evidence that U.S. bombing if anything moderately reduced later poverty, but estimates are only marginally significant and not particularly robust.

(Corrected) Total U.S. bombing intensity is negatively but not statistically significantly related to the 1999 poverty rate at both the province level (Table 4, regression 1) and the district level (regression 2) in OLS regressions. […] In terms of other factors, areas that had higher population density in 1960–61 have significantly less poverty in 1999 as expected, while high altitude areas have considerably more poverty (regressions 1 and 2). […] The district-level effect remains negative and is statistically significant in specifications that include province fixed effects (Table 4, regression 3) and exclude Quang Tri (regression 4). Overall, the OLS specifications provide suggestive evidence that U.S. bombing if anything moderately reduced later poverty, but estimates are only sometimes significant and not particularly robust.

Main paper, pp. 8, subsection 4.1. Impacts on poverty and

*E. Miguel and G. Roland*

consumption expenditures:

(Original) Using this distance as an instrumental variable for bombing intensity in our preferred specification, the relationship between bombing intensity is positive but not statistically significant (regression 6): the coefficient estimate on total bombing intensity is 0.00026 (standard error 0.00042) […] The average effect in this sense is (32.3) * (0.00026) = 0.008. This is a very small average effect, an increase in the poverty rate by less than one percentage point and it is not statistically significant. In terms of how precise this estimate is, the 95% confidence interval ranges from $0.00026 - 2 * 0.00042 = 0.00058$, up to $0.00026 + 2 * 0.00042 = 0.0011$. Thus again considering the effect of going from zero bombing up to the average intensity of 32.3, the 95% confidence band of estimates is $(32.3) * (-0.00058) = -0.019$ to $(32.3) * (0.0011) = 0.035$. In other words, plausible average effects range from a 1.9 percentage point reduction in poverty up to a 3.5 percentage point increase in poverty on a base poverty rate of 41%, a reasonably tight range. The analogous exercise using the OLS estimate (Table 4, regression 2) yields a point estimate of $(32.2) * (-0.00040) = -0.013$, a 1.3 percentage point reduction in poverty (going from zero bombing up to average bombing intensity), and a 95% confidence interval from a $-2.7$ percentage point decrease in poverty up to a $+0.1$ percentage point increase, again a narrow range of estimates around zero.

(Corrected) Using this distance as an instrumental variable for bombing intensity in our preferred specification, the relationship between bombing intensity is positive but not statistically significant (regression 6): the coefficient estimate on total bombing intensity is 0.000235 (standard error 0.000455). […] The average effect in this sense is (32.3) * (0.000235) = 0.008. This is a very small average effect, an increase in the poverty rate by less than one percentage point and it is not statistically significant. In terms of how precise this estimate is, the 95% confidence interval ranges from $0.000235 - 2 * 0.000455 = -0.000675$, up to $0.000235 + 2 * 0.000455 = 0.00114$. Thus again considering the effect of going from zero bombing up to the average intensity of 32.3, the 95% confidence band of estimates is $(32.3) * (-0.000675) = -0.0218$ to $(32.3) * (0.00114) = 0.0369$. In other words, plausible average effects range from a 2.18 percentage point reduction in poverty up to a 3.69 percentage point increase in poverty on a base poverty rate of 41%, a reasonably tight range. The analogous exercise using the OLS estimate (Table 4, regression 2) yields a point estimate of $(32.2) * (-0.000298) = -0.0096$, a 0.96 percentage point reduction in poverty (going from zero bombing up to average bombing intensity), and a 95% confidence interval from a $-2.6$ percentage point decrease in poverty up to a $+0.67$ percentage point increase, again a narrow range of estimates around zero.

Main paper, pp. 9, subsection *4.1. Impacts on poverty and consumption expenditures*:

(Original) In contrast, all three specifications indicate that more heavily bombed provinces were somewhat poorer in 1992/93 (Table 6, Panel B), although effects are not significant at traditional

confidence levels. We find that provinces that experienced more intense U.S. bombing had significantly faster per capita consumption growth between 1992/93 and 2002 (Table 6, Panel C), and this effect is significant at 95% confidence.

(Corrected) In contrast, all three specifications indicate that more heavily bombed provinces were somewhat poorer in 1992/93 (Table 6, Panel B), and effects are significant at traditional confidence levels in the full sample. We find that provinces that experienced more intense U.S. bombing had significantly faster per capita consumption growth between 1992/93 and 2002 (Table 6, Panel C), and this effect is significant at 95% confidence in the full sample.

Main paper, pp.10, subsection *4.2. Impacts on physical infrastructure and human capital*:

- (Original) There is a positive relationship between U.S. bombing intensity and 1999 access to electricity across the standard set of province and district specifications (Table 7, Panel A), and coefficient estimates are statistically significant at 95% confidence in six of seven specifications. The relationship is weaker when province fixed effects are included as controls (regression 3), but the point estimate on U.S. bombing remains positive and marginally statistically significant even in that case.

- (Corrected) There is a positive relationship between U.S. bombing intensity and 1999 access to electricity across the standard set of province and district specifications (Table 7, Panel A), and coefficient estimates are statistically significant at 90% confidence in three of six specifications. The relationship is similar when province fixed effects are included as controls (regression 3), and the point estimate on U.S. bombing remains positive and marginally statistically significant even in that case.

Main paper, pp.10, subsection 4.2. Impacts on physical infrastructure and human capital:

- (Original) For one thing, more heavily bombed provinces have higher membership in war veterans' associations – in a specification analogous to Table 6 regression 1, the point estimate is 0.00022, standard error 0.00011 – and there is suggestive, though not always significant, evidence that 2002 disability rates are somewhat higher (regressions not shown), perhaps in part due to war and landmine/ UXO injuries.

- (Corrected) For one thing, more heavily bombed provinces have higher membership in war veterans' associations – in a specification analogous to Table 6 regression 1, the point estimate is 0.00074, standard error 0.00010 – and there is evidence that 2002 disability rates are somewhat higher (regressions not shown), perhaps in part due to war and landmine/UXO injuries.

Main paper, pp.10, subsection *4.3. Impacts on population density*:

- (Original) Province population density in 1999 is not significantly related to total U.S. bombing intensity (Table 8, regression 1), with a

point estimate of 0.13 and standard error 0.49. Provinces that had high population densities in 1960–61 also tend to have high density in 1999 (the point estimate on 1960–61 density is 0.89, standard error 0.19) as expected, and former South Vietnam has somewhat higher 1999 population density overall, although that effect is only marginally significant. In this province level specification, the effect of a change from zero up to average province level U.S. bombing intensity is (30.6) x (0.13) = 4.0 additional people per $km^2$, a miniscule effect of less than 0.01 of a standard deviation in 1999 province population density, with a tight 95% confidence range from $-26$ to $+34$ people per $km^2$.

- (Corrected) Province population density in 1999 is significantly related to total U.S. bombing intensity (Table 8, regression 1), with a point estimate of $-0.75$ and standard error 0.35. Provinces that had high population densities in 1960–61 also tend to have high density in 1999 (the point estimate on 1960–61 density is 0.89, standard error 0.19) as expected, and former South Vietnam has somewhat higher 1999 population density overall, and that effect is significant at 95 percent confidence. In this province level specification, the effect of a change from zero up to average province level U.S. bombing intensity is (30.6) x ($-0.75$) = 22.95 fewer people per $km^2$, a small effect of less than 0.05 of a standard deviation in 1999 province population density, with a relatively tight 95% confidence range from $-44.37$ to $-1.53$ people per $km^2$.

Main paper, pp.12, subsection 4.3. Impacts on population density:

- (Original) We next trace out effects on population density over time from 1985 to 2000 using Vietnamese Statistical Yearbook data, and find no effect of bombing intensity on population density in 1985 (Table 9, Panel A). We also find no effects on province population density growth rates from 1985 to 2000 (Panel B). So unlike for consumption, there is no evidence of "catch-up" population growth. Moreover, as was the case for 1999 population, there is no statistically significant effect of U.S. bombing on province population in any year from 1985 to 2000 (results not shown). […] Using the 1997/8 VLSS, U.S. bombing intensity does not have a consistent effect on the proportion of individuals not born in their current village of residence (Table 9, Panel C) although the point estimate is positive and marginally statistically significant in one specification (regression 2). The leading interpretation of the data is that most households displaced by the war simply returned to their home areas shortly after conflict had ended.

- (Corrected) We next trace out effects on population density over time from 1985 to 2000 using Vietnamese Statistical Yearbook data, and find no robust effect of bombing intensity on population density in 1985 (Table 9, Panel A). We also find no effects on province population density growth rates from 1985 to 2000 (Panel B). So unlike for consumption, there is no evidence of "catch-up" population growth. Moreover, as was the case for 1999 population, there are only small effects of U.S. bombing on province population across all years from 1985 to 2000 (results not shown). […] Using the 1997/8 VLSS, U.S. bombing intensity does not have a consistent effect on the proportion of individuals not born in their current village of residence (Table 9, Panel C). The leading interpretation of the data is that most households displaced by the war simply returned to their home areas shortly after conflict had ended.

Main paper, pp.12, subsection *4.3 Impacts on population density*:

- (Original) There is similarly no statistically significant effect of bombing on 1999 district population density in several other samples and specifications, including in former North Vietnam and South Vietnam, in rural areas (districts with baseline population density less than 200 per $km^2$), when province fixed effects are included, and using alternative measures of bombing intensity (regressions not shown). The estimated effect of bombing is sometimes positive for urban areas but the result is not robust (not shown).

- (Corrected) There is similarly no statistically significant effect of bombing on 1999 district population density in several other samples and specifications, including in former South Vietnam, in rural areas (districts with baseline population density less than 200 per $km^2$), when province fixed effects are included, and using alternative measures of bombing intensity (regressions not shown). The estimated effect of bombing is sometimes positive and statistically significant in former North Vietnam and in urban areas.

Main paper, pp.13, section 5. Discussion: why no long-run local economic impacts?:

- (Original) Although we lack district-level investment data, government yearbooks contain information on total state investment by province during 1976–1985. For 1985 alone we are able to construct per capita state investment figures (complete province population data is only available for 1985), and we find that more heavily bombed provinces did in fact receive somewhat more investment (in millions of 1985 Dong per capita): in a specification analogous to Table 6, column 1, the point estimate on total U.S. bombing intensity is 0.0113 (s.e. 0.0071, regression not shown), and this effect is nearly significant at 90% confidence. This is a large effect: going from zero to average province level bombing intensity leads to an increase of 1.5 standard deviations in state investment.

- (Corrected) Although we lack district-level investment data, government yearbooks contain information on total state investment by province during 1976–1985. For 1985 alone we are able to construct per capita state investment figures (complete province population data is only available for 1985), and we find that more heavily bombed provinces did in fact receive somewhat more investment (in millions of 1985 Dong per capita): in a specification analogous to Table 6, column 1, the point estimate on total U.S. bombing intensity is 0.004 (s.e. 0.006, regression not shown), though it is relatively small and not statistically significant.

## 2. Corrected Tables and Figures

**Table 2**

Summary statistics — economic, demographic, climatic, and geographic data (Corrected).

| | Mean | S.D. | Min. | Max. | Obs. |
|---|---|---|---|---|---|
| *Panel A: district-level data* | | | | | |
| District poverty rate, 1999 | 0.41 | 0.20 | 0.03 | 0.94 | 584 |
| Population density, 1999 | 1658.60 | 5845.96 | 10.29 | 52,382 | 584 |
| District electricity, 1999 | 0.71 | 0.27 | 0.08 | 1.00 | 584 |
| District literacy rate, 1999 | 0.88 | 0.11 | 0.24 | 0.99 | 584 |
| Prop. of land area 250–500 m | 0.11 | 0.19 | 0.00 | 1.00 | 584 |
| Prop. of land area 500–1000 m | 0.11 | 0.21 | 0.00 | 1.00 | 584 |
| Prop. of land area over 1000 m | 0.03 | 0.11 | 0.00 | 1.00 | 584 |
| District land area (km$^2$) | 528.96 | 512.61 | 4.00 | 3230 | 584 |
| Average precipitation (cm) | 154.62 | 30.06 | 84.19 | 281.99 | 584 |
| Average temperature (C°) | 24.33 | 1.85 | 19.36 | 27.26 | 584 |
| Former South Vietnam | 0.52 | 0.50 | 0.00 | 1.00 | 584 |
| Latitude (°N) | 16.24 | 4.69 | 8.77 | 22.95 | 584 |
| \|Latitude – 17 °N\| | 4.38 | 1.83 | 0.06 | 8.23 | 584 |
| | | | | | |
| *Panel B: province-level data* | | | | | |
| Population Density 1960–61 | 244.28 | 437.02 | 12.20 | 2867.95 | 55 |
| Population density, 1985 | 401.26 | 532.52 | 33.55 | 3195.76 | 53 |
| Population density, 1999 | 464.76 | 540.05 | 62.40 | 2907.79 | 55 |
| Change in population density, 1985–2000 | 77.65 | 154.45 | −439.35 | 745.09 | 53 |
| Proportion not born in current village, 1997/98 | 0.26 | 0.23 | 0.00 | 1.00 | 55 |
| Per capita consumption expenditures, 1992/93 (in 1998 Dong) | 1831.11 | 590.64 | 996.59 | 3546.23 | 55 |
| Per capita consumption expenditures, 2002 (in 1998 Dong) | 3084.01 | 1006.53 | 2040.22 | 7505.44 | 55 |
| Growth in per capita consumption expenditures 1992/93–2002 | 0.74 | 0.38 | −0.08 | 1.67 | 55 |
| Latitude (°N) | 15.96 | 4.90 | 9.05 | 22.77 | 55 |
| \|Latitude – 17 °N\| | 4.58 | 1.94 | 0.26 | 7.95 | 55 |

Notes: The summary statistics are not weighted by population. District latitude is assessed at the district centroid, and province latitude is assessed at the province centroid.

**Table 3**

Predicting bombing intensity (Corrected).

Dependent variable: Total U.S. bombs, missiles, and rockets per km$^2$

| | (1) | (2) | (3) |
|---|---|---|---|
| \|Latitude – 17 °N\| | −16.3631** | −19.3006*** | −12.4666*** |
| | (6.1452) | (6.3206) | (2.9493) |
| Population density (province) 1960–61 | −0.0042 | −0.0041** | −0.0034** |
| | (0.0088) | (0.0019) | (0.0014) |
| Former South Vietnam | 83.2283 | 65.9207 | −20.2087 |
| | (74.8929) | (77.8927) | (29.2723) |
| Prop. of land area 250–500 m | 30.8843 | −50.9780* | −23.5190 |
| | (34.2958) | (28.2938) | (14.4384) |
| Prop. of land area 500–1000 m | −99.7159 | −39.2024 | −9.4050 |
| | (75.0346) | (29.1258) | (17.2700) |
| Prop. of land area over 1000 m | 140.4853 | −33.0505 | −19.5154 |
| | (85.2871) | (30.2379) | (19.4278) |
| Average precipitation (cm) | 0.0028 | −0.0351 | 0.1735* |
| | (0.2126) | (0.2117) | (0.0870) |
| Average temperature (C°) | 14.6956 | −2.4767 | −1.0338 |
| | (9.3888) | (4.7953) | (3.7580) |
| Latitude (°N) | 7.7494 | 2.7160 | −4.9626 |
| | (8.1105) | (7.4958) | (3.2334) |
| District soil controls | No | Yes | Yes |
| Exclude Quang Tri province | No | No | Yes |
| Observations | 55 | 584 | 576 |
| R$^2$ | 0.4812 | 0.3108 | 0.2562 |
| Mean (S.D.) dependent variable | 30.62 | 32.29 | 27.12 |
| | (51.66) | (68.45) | (50.64) |

*Notes*: Ordinary least squares (OLS) regressions, Robust Huber–White standard errors in parentheses. Significant at 90(*), 95(**), and 99(***) percent confidence. Disturbance terms are clustered at the province level in regressions 2–6. The district soil type controls include the proportion of district land in 18 different soil categories. The omitted altitude category is 0–250 m.

**Table 4**
Local bombing impacts on estimated 1999 poverty rate (Corrected).

| Dependent variable: estimated poverty rate, 1999 | | | | | | |
|---|---|---|---|---|---|---|
| | (OLS) | | | | | (IV-2SLS) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Total U.S. bombs, missiles, and rockets per km2 | −0.000250 | −0.000298 | −0.000648*** | −0.000774*** | | 0.000235 |
| | (0.000540) | (0.000253) | (0.000122) | (0.000156) | | (0.000455) |
| (Population density 1960–61)($\div$ 100) | −0.0102*** | −0.0022** | | −0.0023** | −0.0021** | −0.0020* |
| | (0.0022) | (0.0010) | | (0.0010) | (0.0010) | (0.0011) |
| Former South Vietnam | −0.140288 | 0.030023 | | −0.044844 | −0.007401 | −0.022872 |
| | (0.095126) | (0.076568) | | (0.079892) | (0.070536) | (0.079833) |
| Prop. of land area 250–500 m | 0.264612** | 0.310343*** | 0.181842*** | 0.314804*** | 0.324323*** | 0.336287*** |
| | (0.126925) | (0.070743) | (0.066811) | (0.069487) | (0.070237) | (0.076423) |
| Prop. of land area 500–1000 m | 0.299613 | 0.231053*** | 0.157402** | 0.249817*** | 0.234743*** | 0.243944*** |
| | (0.181211) | (0.054860) | (0.061680) | (0.053813) | (0.055179) | (0.059095) |
| Prop. of land area over 1000 m | 0.595521** | −0.080289 | −0.000644 | −0.080352 | −0.066026 | −0.058270 |
| | (0.255775) | (0.110248) | (0.158676) | (0.109868) | (0.116552) | (0.115031) |
| Average precipitation (cm) | 0.000248 | 0.000809** | 0.000602 | 0.001063*** | 0.000605 | 0.000613 |
| | (0.000504) | (0.000337) | (0.000456) | (0.000329) | (0.000379) | (0.000377) |
| Average temperature (C°) | 0.027265 | −0.013687 | −0.034139 | −0.013600 | −0.015007 | −0.014426 |
| | (0.030136) | (0.020341) | (0.021554) | (0.019958) | (0.020049) | (0.020231) |
| Latitude (°N) | 0.003696 | 0.011137 | 0.042083 | 0.002919 | 0.006319 | 0.005682 |
| | (0.014738) | (0.010110) | (0.028486) | (0.010269) | (0.008700) | (0.008720) |
| $\vert$ Latitude – 17 °$N$ $\vert$ | | | | | −0.004530 | |
| | | | | | (0.008725) | |
| District soil controls | No | Yes | Yes | Yes | Yes | Yes |
| Province fixed effects | No | No | Yes | No | No | No |
| Exclude Quang Tri province | No | No | No | Yes | No | No |
| Observations | 55 | 584 | 584 | 576 | 584 | 584 |
| R² | 0.670 | 0.594 | 0.794 | 0.622 | 0.586 | 0.568 |
| Mean (S.D.) dependent variable | 0.393 (0.157) | 0.409 (0.199) | 0.409 (0.199) | 0.408 (0.199) | 0.409 (0.199) | 0.409 (0.199) |

*Notes:* Robust Huber–White standard errors in parentheses. Significant at 90(*), 95(**), and 99(***) percent confidence. Disturbance terms are clustered at the province level in regressions 2–7. The district soil type controls include the proportion of district land in 18 different soil categories. The omitted altitude category is 0–250 m. The instrumental variable in regression 6 is $\vert$ Latitude – 17 °N $\vert$ .

E. Miguel and G. Roland
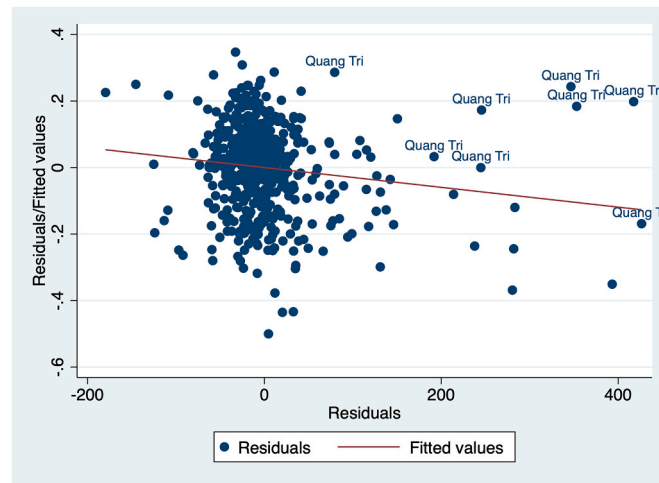
**Fig. 2.** 1999 estimated district poverty rate vs. total U.S. bombs, missiles, and rockets per km$^2$ in the district (conditional on 1960–61 province population density, South Vietnam indicator, district average temperature, average precipitation, elevation, soil controls, and latitude).

**Table 5**

Local bombing impacts on estimated 1999 poverty rate — alternative specifications (Corrected).

| Dependent variable: estimated poverty rate, 1999 | | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Ex-North Vietnam | Ex-South Vietnam | Rural: 1960-1 pop. density <200 per km$^2$ | Urban: 1960-1 pop. density ≥200 per km$^2$ | All Vietnam | All Vietnam |
| Total U.S. bombs, missiles, and rockets per km$^2$ | −0.0011193*** | 0.0001548 | −0.0001452 | −0.0008815*** | −0.0011437*** | |
| | (0.0001569) | (0.000156) | (0.0002160) | (0.0001695) | (0.0003442) | |
| (Total U.S. bombs, missiles, and rockets per km$^2$)$^2$ ÷ 100 | | | | | 0.00022*** | |
| | | | | | (0.00006) | |
| Total U.S. bombs, missiles, and rockets per km$^2$ (top 10% districts) | | | | | | −0.0180392 |
| | | | | | | (0.0275911) |
| District demographic, geographic, soil controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 300 | 284 | 409 | 175 | 584 | 584 |
| R$^2$ | 0.743 | 0.665 | 0.596 | 0.653 | 0.608 | 0.586 |
| Mean (S.D.) dependent variable | 0.459 (0.198) | 0.363 (0.189) | 0.461 (0.194) | 0.289 (0.156) | 0.409 (0.199) | 0.409 (0.199) |

*Notes:* Ordinary least squares (OLS) regressions. Robust Huber–White standard errors in parentheses. Significant at 90(*), 95(**), and 99(***) percent confidence. Disturbance terms are clustered at the province level. District demographic and geographic controls include Population density (province) 1960–61, Former South Vietnam, Proportion of land area 250–500 m, Proportion of land area 500–1000 m, Proportion of land area over 1000 m, Average precipitation (cm), Average temperature (Celsius), and Latitude (°N). The district soil type controls include the proportion of district land in 18 different soil categories. The omitted altitude category is 0–250 m.

**Table 6**

Local war impacts on consumption expenditures and growth (VLSS data) (Corrected).

| | (OLS) | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| **Panel A: dependent variable: 2002 per capita consumption expenditures** | | | |
| Total U.S. bombs, missiles, and rockets per km$^2$ | −0.29749 | 3.39907 | |
| | (1.73641) | (2.85469) | |
| $\mid$ Latitude − 17 $^\circ$N $\mid$ | | | 28.25049 |
| | | | (57.17141) |
| Exclude Quang Tri province | No | Yes | No |
| Observations | 55 | 54 | 55 |
| R$^2$ | 0.611 | 0.622 | 0.612 |
| Mean (S.D.) dependent variable | 3084 (1006.53) | 3091.81 (1014.29) | 3084 (1006.53) |
| | | | |
| **Panel B: 1992–93 per capita consumption expenditures** | | | |
| Total U.S. bombs, missiles, and rockets per km$^2$ | −2.78847*** | −2.91725 | |
| | (0.75) | (2.02567) | |
| $\mid$ Latitude − 17 $^\circ$N $\mid$ | | | 73.72532 |
| | | | (43.7463) |
| Exclude Quang Tri province | No | Yes | No |
| Observations | 55 | 54 | 55 |
| R$^2$ | 0.459 | 0.438 | 0.443 |
| Mean (S.D.) dependent variable | 1831.11 (590.64) | 1846.57 (584.86) | 1831.11 (590.64) |
| | | | |
| **Panel C: Growth in consumption, 1992/93-2002** | | | |
| Total U.S. bombs, missiles, and rockets per km$^2$ | 0.00313*** | 0.00374* | |
| | (0.00059) | (0.00168) | |
| $\mid$ Latitude − 17 $^\circ N$ $\mid$ | | | −0.06641* |
| | | | (0.03015) |
| Exclude Quang Tri province | No | Yes | No |
| Observations | 55 | 54 | 55 |
| R$^2$ | 0.470 | 0.407 | 0.397 |
| Mean (S.D.) dependent variable | 0.740 (0.384) | 0.723 (0.366) | 0.740 (0.384) |

*Notes*: Robust Huber–White standard errors in parentheses. Significant at 90(*), 95(**), and 99(***) percent confidence. All regressions contain controls (not shown) for Population density (province) 1960–61, Former South Vietnam, Proportion of land area 250–500 m, Proportion of land area 500–1000 m, Proportion of land area over 1000 m, Average precipitation (cm), Average temperature (Celsius), and Latitude ($^\circ$N). The omitted altitude category is 0–250 m.

**Table 7**

Local war impacts on physical infrastructure and human capital (Corrected).

| | (OLS) | | | | | (IV-2SLS) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Panel A: Proportion of households with access to electricity, 1999 | | | | | | |
| Total U.S. bombs, missiles, and rockets per km$^2$ | 0.00069 | 0.00024 | 0.00025 | 0.00043* | | 0.00178* |
| | (0.00063) | (0.00014) | (0.00016) | (0.00017) | | (0.00082) |
| \|Latitude – 17 °N\| | | | | | −0.03435** | |
| | | | | | (0.01058) | |
| District soil controls | No | Yes | Yes | Yes | Yes | Yes |
| Province fixed effects | No | No | Yes | No | No | No |
| Exclude Quang Tri province | No | No | No | Yes | No | No |
| Observations | 55 | 584 | 584 | 576 | 584 | 584 |
| R$^2$ | 0.558 | 0.565 | 0.748 | 0.567 | 0.578 | 0.446 |
| Mean (S.D.) dependent variable | 0.719 | 0.708 | 0.708 | 0.708 | 0.708 | 0.708 |
| | (0.209) | (0.268) | (0.268) | (0.268) | (0.268) | (0.268) |
| Panel B: Proportion of literate respondents, 1999 | | | | | | |
| Total U.S. bombs, missiles, and rockets per km$^2$ | 0.00002 | 0.00005 | 0.00009 | 0.00012* | | 0.00058 |
| | (0.00012) | (0.00005) | (0.00006) | (0.00005) | | (0.00036) |
| \|Latitude – 17° $N$\| | | | | | −0.01112* | |
| | | | | | (0.00516) | |
| District soil controls | No | Yes | Yes | Yes | Yes | Yes |
| Province fixed effects | No | No | Yes | No | No | No |
| Exclude Quang Tri province | No | No | No | Yes | No | No |
| Observations | 55 | 584 | 584 | 576 | 584 | 584 |
| R$^2$ | 0.644 | 0.590 | 0.752 | 0.592 | 0.599 | 0.510 |
| Mean (S.D.) dependent variable | 0.887 | 0.878 | 0.878 | 0.878 | 0.878 | 0.878 |
| | (0.069) | (0.112) | (0.112) | (0.112) | (0.112) | (0.112) |

*Notes:* Robust Huber–White standard errors in parentheses. Significant at 90(*), 95(**), and 99(***) percent confidence. Disturbance terms are clustered at the province level in regressions 2–6. All regressions include Population density (province) 1960–61, Former South Vietnam, Proportion of land area 250–500 m, Proportion of land area 500–1000 m, Proportion of land area over 1000 m, Average precipitation (cm), Average temperature (Celsius), and Latitude (°N). The district soil type controls include the proportion of district land in 18 different soil categories. The omitted altitude category is 0–250 m. The instrumental variable in regression 6 is \|Latitude – 17 °N\|.

*E. Miguel and G. Roland*

**Table 8**

Local bombing impacts on 1999 population density (Corrected).

| Dependent variable: population density, 1999 | | | (OLS) | | | (IV-2SLS) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Total U.S. bombs, missiles, and rockets per km$^2$ | −0.75** | 1.85 | 12.36 | 6.09 | | −11.91 |
| | (0.35) | (7.73) | (10.88) | (12.39) | | (16.86) |
| Population density (province) 1960–61 | 0.89*** | 0.67 | | 0.68 | 0.67 | 0.63 |
| | (0.19) | (0.42) | | (0.42) | (0.41) | (0.45) |
| Former South Vietnam | 368.63** | −926.56 | | −277.31 | −344.32 | 440.63 |
| | (156.32) | (1880.19) | | (2136.18) | (1585.80) | (1344.75) |
| Prop. of land area 250–500 m | −1330.28*** | −3701.47 | −1414.25 | −3783.64 | −3765.04 | −4372.06 |
| | (408.59) | (3022.08) | (1720.30) | (3009.96) | (2792.28) | (3504.99) |
| Prop. of land area 500–1000 m | −40.26 | −1905.07 | −1760.50 | −2086.93 | −1771.45 | −2238.25 |
| | (272.99) | (1634.09) | (1459.00) | (1617.56) | (1370.31) | (1856.43) |
| Prop. of land area over 1000 m | −1420.23*** | −978.78 | −116.30 | −981.04 | −1154.36 | −1547.91 |
| | (476.72) | (1949.47) | (1723.62) | (1985.98) | (1736.68) | (2146.05) |
| Average precipitation (cm) | −1.56*** | −19.28 | −9.88 | −21.55 | −13.80 | −14.22 |
| | (0.51) | (13.49) | (9.23) | (13.07) | (10.29) | (10.90) |
| Average temperature (C°) | −40.52 | 788.74 | 469.62 | 783.32 | 837.34 | 807.85 |
| | (48.67) | (858.66) | (373.60) | (861.41) | (901.79) | (867.26) |
| Latitude (°N) | 49.53** | −65.98 | −1460.34 | 4.36 | 42.66 | 75.00 |
| | (18.89) | (191.00) | (1001.40) | (214.60) | (135.10) | (137.61) |
| \|Latitude – 17 °N\| | | | | | 229.82 | |
| | | | | | (320.04) | |
| District soil controls | No | Yes | Yes | Yes | Yes | Yes |
| Province fixed effects | No | No | No | Yes | No | No |
| Exclude Quang Tri province | No | No | Yes | No | No | No |
| Observations | 55 | 584 | 584 | 576 | 584 | 584 |
| R$^2$ | 0.857 | 0.153 | 0.556 | 0.154 | 0.154 | 0.133 |
| Mean (S.D.) dependent variable | 464.76 | 1658.60 | 1658.60 | 1678.28 | 1658.60 | 1658.60 |
| | (540.05) | (5845.96) | (5845.96) | (5883.98) | (5845.96) | (5845.96) |

*Notes:* Robust Huber–White standard errors in parentheses. Significant at 90(*), 95(**), and 99(***) percent confidence. Disturbance terms are clustered at the province level in regressions 2–6. The district soil type controls include the proportion of district land in 18 different soil categories. The omitted altitude category is 0–250 m. The instrumental variable in regression 6 is \|Latitude – 17° N\|.

**Table 9**
Local war impacts on other population characteristics.

| | (OLS) | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| **Panel A: dependent variable: population density, 1985** | | | |
| Total U.S. bombs, missiles, and rockets per km$^2$ | −0.83559* | −1.39672 | |
| | (0.39585) | (0.99029) | |
| $\lvert$ Latitude – 17 $^\circ N$ $\rvert$ | | | 10.89688 |
| | | | (13.94644) |
| Exclude Quang Tri province | No | Yes | No |
| Observations | 53 | 52 | 53 |
| R$^2$ | 0.735 | 0.734 | 0.731 |
| Mean (S.D.) dependent variable | 401.265 (532.52) | 407.096 (535.99) | 401.265 (532.52) |
| **Panel B: dependent variable: growth in population density, 1985 to 2000** | | | |
| Total U.S. bombs, missiles, and rockets per km$^2$ | 0.06148 | 0.13423 | |
| | (0.14346) | (0.33355) | |
| $\lvert$ Latitude – 17 $^\circ N$ $\rvert$ | | | 6.68912 |
| | | | (7.30686) |
| Exclude Quang Tri province | No | Yes | No |
| Observations | 53 | 52 | 53 |
| R$^2$ | 0.237 | 0.235 | 0.240 |
| Mean (S.D.) dependent variable | 77.65 (154.45) | 78.67 (155.78) | 77.65 (154.45) |
| **Panel C: dependent variable: 1997/98 proportion not born in current village** | | | |
| Total U.S. bombs, missiles, and rockets per km$^2$ | −0.00026 | 0.00120 | |
| | (0.00055) | (0.00091) | |
| $\lvert$ Latitude – 17 $^\circ N$ $\rvert$ | | | 0.00483 |
| | | | (0.01730) |
| Exclude Quang Tri province | No | Yes | No |
| Observations | 55 | 54 | 55 |
| R$^2$ | 0.396 | 0.417 | 0.394 |
| Mean (S.D.) dependent variable | 0.261 (0.228) | 0.266 (0.227) | 0.260 (0.228) |

*Notes:* Robust Huber–White standard errors in parentheses. Significant at 90(*), 95(**), and 99(***) percent confidence. All regressions contain controls for Population density (province) 1960–61, Former South Vietnam, Proportion of land area 250–500 m, Proportion of land area 500–1000 m, Proportion of land area over 1000 m, Average precipitation (cm), Average temperature (Celsius), and Latitude (°N). The omitted altitude category is 0–250 m.

## Appendix A. Geolocation of coordinates

Map of Vietnam
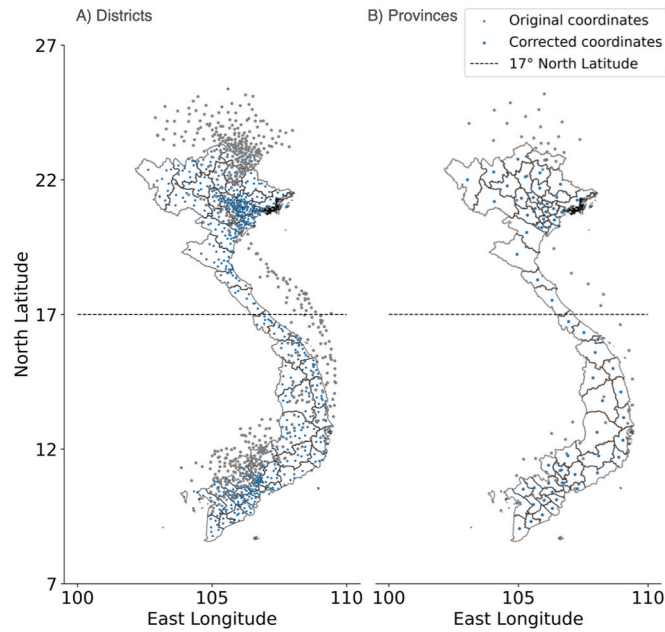


This figure shows the location of districts (A) and provinces (B) in the original published paper (in grey stars) versus the corrected version (in light blue circles).

## Appendix B. Correlation between original and corrected instrument variable

|  | $\|$ Latitude$_{corrected}$ - 17°N $\|$ |
|---|---|
| $\|$ Latitude$_{original}$ - 17°N $\|$ | 0.901*** (0.005) |
| Former South Vietnam$_{original}$ | 3.151*** (0.021) |
| Constant | −1.567*** (0.034) |
| Observations | 584 |
| $R^2$ | 0.984 |

## Further reading

Miguel, E., Roland, G., 2011. The long-run impact of bombing Vietnam. J. Dev. Econ. 96 (1), 1–15.