# Online Appendices for "Did 3G Make Afghan Insurgents Fight More Effectively? A Disaggregated Study"

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Mehmet Erdem Arslan

Gendarmerie and Coast Guard Academy, Türkiye

mehmeterdemarslan@outlook.com

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# A Detailed results for H2 (IED attacks)

| | Results | | | | | Before matching | | | | | | After matching | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time[days] | Space[km] | Effect Size | p.value | adj.$R^2$ | control | treat. | L1 | %CS | %SO | %MO | control | treat. | L1 | %CS | %SO | %MO |
| 1 | 30.00 | 4.00 | 0.33 | 0.32 | 0.00 | 339 | 157 | 0.67 | 14.40 | 0.77 | 0.14 | 69 | 69 | 0.06 | 66.70 | 0.51 | 0.29 |
| 2 | 30.00 | 8.00 | 0.34 | 0.63 | -0.01 | 339 | 157 | 0.73 | 10.50 | 0.82 | 0.24 | 59 | 59 | 0.07 | 75.00 | 0.60 | 0.44 |
| 3 | 30.00 | 12.00 | 1.43 | 0.08 | 0.02 | 339 | 157 | 0.74 | 9.40 | 0.84 | 0.27 | 61 | 61 | 0.10 | 53.80 | 0.66 | 0.52 |
| 4 | 30.00 | 16.00 | 3.84 | 0.00 | 0.09 | 339 | 157 | 0.76 | 9.50 | 0.85 | 0.29 | 57 | 57 | 0.12 | 60.00 | 0.67 | 0.54 |
| 5 | 30.00 | 20.00 | 4.19 | 0.00 | 0.11 | 339 | 157 | 0.76 | 9.40 | 0.85 | 0.29 | 43 | 43 | 0.14 | 55.60 | 0.68 | 0.55 |
| 6 | 45.00 | 4.00 | 1.56 | 0.00 | 0.06 | 339 | 157 | 0.67 | 14.30 | 0.78 | 0.16 | 71 | 71 | 0.07 | 69.20 | 0.54 | 0.31 |
| 7 | 45.00 | 8.00 | 0.80 | 0.39 | -0.00 | 339 | 157 | 0.74 | 11.10 | 0.84 | 0.26 | 54 | 54 | 0.04 | 90.90 | 0.65 | 0.46 |
| 8 | 45.00 | 12.00 | 1.80 | 0.13 | 0.01 | 339 | 157 | 0.76 | 9.40 | 0.86 | 0.31 | 60 | 60 | 0.12 | 72.70 | 0.73 | 0.54 |
| 9 | 45.00 | 16.00 | 4.42 | 0.00 | 0.08 | 339 | 157 | 0.78 | 9.30 | 0.87 | 0.32 | 55 | 55 | 0.04 | 88.90 | 0.75 | 0.55 |
| 10 | 45.00 | 20.00 | 5.22 | 0.00 | 0.09 | 339 | 157 | 0.77 | 9.30 | 0.87 | 0.33 | 59 | 59 | 0.14 | 58.30 | 0.75 | 0.57 |
| 11 | 60.00 | 4.00 | 0.84 | 0.16 | 0.01 | 339 | 157 | 0.68 | 15.10 | 0.81 | 0.17 | 58 | 58 | 0.03 | 90.90 | 0.56 | 0.33 |
| 12 | 60.00 | 8.00 | 1.57 | 0.16 | 0.01 | 339 | 157 | 0.75 | 11.10 | 0.86 | 0.28 | 58 | 58 | 0.05 | 76.90 | 0.68 | 0.48 |
| 13 | 60.00 | 12.00 | 2.60 | 0.08 | 0.02 | 339 | 157 | 0.77 | 10.00 | 0.88 | 0.32 | 53 | 53 | 0.13 | 80.00 | 0.75 | 0.55 |
| 14 | 60.00 | 16.00 | 3.76 | 0.02 | 0.04 | 339 | 157 | 0.78 | 10.00 | 0.88 | 0.33 | 54 | 54 | 0.17 | 72.70 | 0.77 | 0.57 |
| 15 | 60.00 | 20.00 | 2.55 | 0.19 | 0.01 | 339 | 157 | 0.80 | 9.00 | 0.89 | 0.34 | 53 | 53 | 0.19 | 58.30 | 0.77 | 0.59 |
| 16 | 75.00 | 4.00 | 1.25 | 0.09 | 0.02 | 337 | 146 | 0.69 | 13.60 | 0.82 | 0.22 | 55 | 55 | 0.07 | 69.20 | 0.59 | 0.36 |
| 17 | 75.00 | 8.00 | 2.13 | 0.14 | 0.01 | 337 | 146 | 0.76 | 10.50 | 0.87 | 0.31 | 46 | 46 | 0.07 | 81.80 | 0.70 | 0.52 |
| 18 | 75.00 | 12.00 | 7.27 | 0.00 | 0.16 | 337 | 146 | 0.77 | 11.00 | 0.89 | 0.33 | 41 | 41 | 0.05 | 85.70 | 0.76 | 0.58 |
| 19 | 75.00 | 16.00 | 6.27 | 0.00 | 0.09 | 337 | 146 | 0.77 | 10.70 | 0.89 | 0.33 | 48 | 48 | 0.10 | 60.00 | 0.78 | 0.60 |
| 20 | 75.00 | 20.00 | 5.62 | 0.02 | 0.05 | 337 | 146 | 0.77 | 10.60 | 0.89 | 0.35 | 47 | 47 | 0.11 | 41.70 | 0.79 | 0.62 |
| 21 | 90.00 | 4.00 | 1.60 | 0.02 | 0.04 | 336 | 146 | 0.69 | 14.20 | 0.84 | 0.28 | 53 | 53 | 0.04 | 90.90 | 0.64 | 0.42 |
| 22 | 90.00 | 8.00 | 3.04 | 0.03 | 0.04 | 336 | 146 | 0.75 | 10.30 | 0.88 | 0.38 | 49 | 49 | 0.06 | 66.70 | 0.74 | 0.56 |
| 23 | 90.00 | 12.00 | 5.06 | 0.00 | 0.08 | 336 | 146 | 0.75 | 10.60 | 0.89 | 0.40 | 47 | 47 | 0.17 | 87.50 | 0.77 | 0.62 |
| 24 | 90.00 | 16.00 | 3.49 | 0.09 | 0.02 | 336 | 146 | 0.78 | 10.40 | 0.90 | 0.41 | 51 | 51 | 0.16 | 42.90 | 0.79 | 0.62 |
| 25 | 90.00 | 20.00 | 5.38 | 0.03 | 0.03 | 336 | 146 | 0.78 | 10.40 | 0.90 | 0.43 | 58 | 58 | 0.15 | 81.80 | 0.79 | 0.68 |

Results are presented on the left-hand side, with the sizes of spatio-temporal units used in estimation. Summary statistics of the sample before and after matching are presented on the middle and right-hand side, respectively. The *L1* distance metric and the common support summarise the similarity of the distribution of covariates between the treatment and control units. %CS: percentage of common support, %SO: percentage of same overlap, %MO: percentage of mixed overlap.

Table A1: Overview of the Matched Wake Analysis Results with IED Attacks as the Dependent Variable

# B Regression Results using GTD events

| | DV: N. of Terrorist Attacks (*log*) | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Intercept | | 0.033*** | | | 0.033*** | |
| | | (0.004) | | | (0.004) | |
| 2G Coverage$_{t-1}$ | −0.013 | 0.034 | 0.011 | 0.021 | 0.035 | 0.039 |
| | (0.034) | (0.035) | (0.034) | (0.038) | (0.037) | (0.036) |
| 3G Coverage$_{t-1}$ | 0.323*** | 0.418*** | 0.189** | 0.097 | −0.033 | −0.015 |
| | (0.061) | (0.08) | (0.071) | (0.113) | (0.112) | (0.105) |
| Troop presence$_{t-1}$ | 0.222*** | 0.242*** | 0.202*** | 0.233*** | 0.215*** | 0.205*** |
| | (0.046) | (0.011) | (0.042) | (0.048) | (0.013) | (0.044) |
| *log* Attacks$_{t-1}$ | | 0.408*** | | | 0.403*** | |
| | | (0.006) | | | (0.006) | |
| 2G$_{t-1}$ × Troops$_{t-1}$ | | | | −0.093 | 0.062 | −0.057 |
| | | | | (0.081) | (0.042) | (0.072) |
| 3G$_{t-1}$ × Troops$_{t-1}$ | | | | 0.331* | 0.565*** | 0.318** |
| | | | | (0.134) | (0.11) | (0.119) |
| $\rho$ (Spatial lag of DV) | | 0.402*** | 0.588*** | | 0.415*** | 0.589*** |
| | | (0.015) | (0.018) | | (0.015) | (0.018) |
| $\theta_{2G}$ (Spatial lag of | | −0.103* | −0.063 | | −0.095* | −0.065 |
| 2G Coverage) | | (0.042) | (0.041) | | (0.042) | (0.041) |
| $\theta_{3G}$ (Spatial lag of | | 0.119 | 0.137 | | 0.128 | 0.134 |
| 3G Coverage) | | (0.101) | (0.094) | | (0.101) | (0.094) |
| $\lambda$ (Spatial error parameter) | | −0.25*** | −0.497*** | | −0.268*** | −0.498*** |
| | | (0.023) | (0.029) | | (0.024) | (0.029) |
| District (Wuleswali) FE | ✓ | | ✓ | ✓ | | ✓ |
| Quarter-year FE | ✓ | | ✓ | ✓ | | ✓ |
| $t_{\beta_{3G}>\beta_{2G}}$ | 4.267 | 3.853 | 1.97 | 2.362 | 3.717 | 2.341 |
| AIC | | 21913.92 | | | 21872.13 | |
| Log Likelihood | | −10949.96 | | | −10927.07 | |
| Num. of obs. | 16716 | 16716 | 16716 | 16716 | 16716 | 16716 |
| Num. of spatial units | 398 | 398 | 398 | 398 | 398 | 398 |
| Num. of time periods | 42 | 42 | 42 | 42 | 42 | 42 |

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$. Standard errors are in parentheses.
Spatial units are secondary level administrative units (Wuleswali).

Table B2: Spatial and TWFE Regression Results with GTD data (All attacks)

| | DV: N. of IED Attacks† (*log*) | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Intercept | | 0.021*** | | | 0.022*** | |
| | | (0.003) | | | (0.003) | |
| 2G Coverage$_{t-1}$ | 0.042 | 0.039 | 0.054* | 0.079** | 0.033 | 0.09*** |
| | (0.025) | (0.026) | (0.026) | (0.027) | (0.028) | (0.028) |
| 3G Coverage$_{t-1}$ | 0.382*** | 0.455*** | 0.248*** | 0.181* | −0.001 | 0.046 |
| | (0.044) | (0.059) | (0.055) | (0.082) | (0.083) | (0.081) |
| Troop presence$_{t-1}$ | 0.131*** | 0.224*** | 0.137*** | 0.149*** | 0.192*** | 0.153*** |
| | (0.034) | (0.008) | (0.032) | (0.035) | (0.009) | (0.033) |
| *log* Attacks$_{t-1}$ | | 0.359*** | | | 0.35*** | |
| | | (0.007) | | | (0.007) | |
| 2G$_{t-1}$ × Troops$_{t-1}$ | | | | −0.136* | 0.089** | −0.121* |
| | | | | (0.059) | (0.031) | (0.055) |
| 3G$_{t-1}$ × Troops$_{t-1}$ | | | | 0.31*** | 0.558*** | 0.325*** |
| | | | | (0.097) | (0.082) | (0.09) |
| $\rho$ (Spatial lag of DV) | | 0.32*** | 0.451*** | | 0.345*** | 0.452*** |
| | | (0.017) | (0.028) | | (0.017) | (0.027) |
| $\theta_{2G}$ (Spatial lag of | | −0.067* | −0.065* | | −0.058 | −0.068* |
| 2G Coverage) | | (0.031) | (0.031) | | (0.031) | (0.031) |
| $\theta_{3G}$ (Spatial lag of | | 0.072 | 0.147* | | 0.082 | 0.146* |
| 3G Coverage) | | (0.075) | (0.071) | | (0.075) | (0.071) |
| $\lambda$ (Spatial error parameter) | | −0.207*** | −0.385*** | | −0.237*** | −0.387*** |
| | | (0.025) | (0.038) | | (0.025) | (0.038) |
| District (Wuleswali) FE | ✓ | | ✓ | ✓ | | ✓ |
| Quarter-year FE | ✓ | | ✓ | ✓ | | ✓ |
| $t_{\beta_{3G}>\beta_{2G}}$ | 5.955 | 5.556 | 2.815 | 3.425 | 4.673 | 3.684 |
| AIC | | 11898.82 | | | 11809.54 | |
| Log Likelihood | | −5942.412 | | | −5895.77 | |
| Num. of obs. | 16716 | 16716 | 16716 | 16716 | 16716 | 16716 |
| Num. of spatial units | 398 | 398 | 398 | 398 | 398 | 398 |
| Num. of time periods | 42 | 42 | 42 | 42 | 42 | 42 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$. Standard errors are in parentheses.
Spatial units are secondary level administrative units (Wuleswali).
† Number of IED attacks is a subset of GTD events where the primary attack type is 'Bombing/Explosion' and the primary weapon type is 'Explosives.'

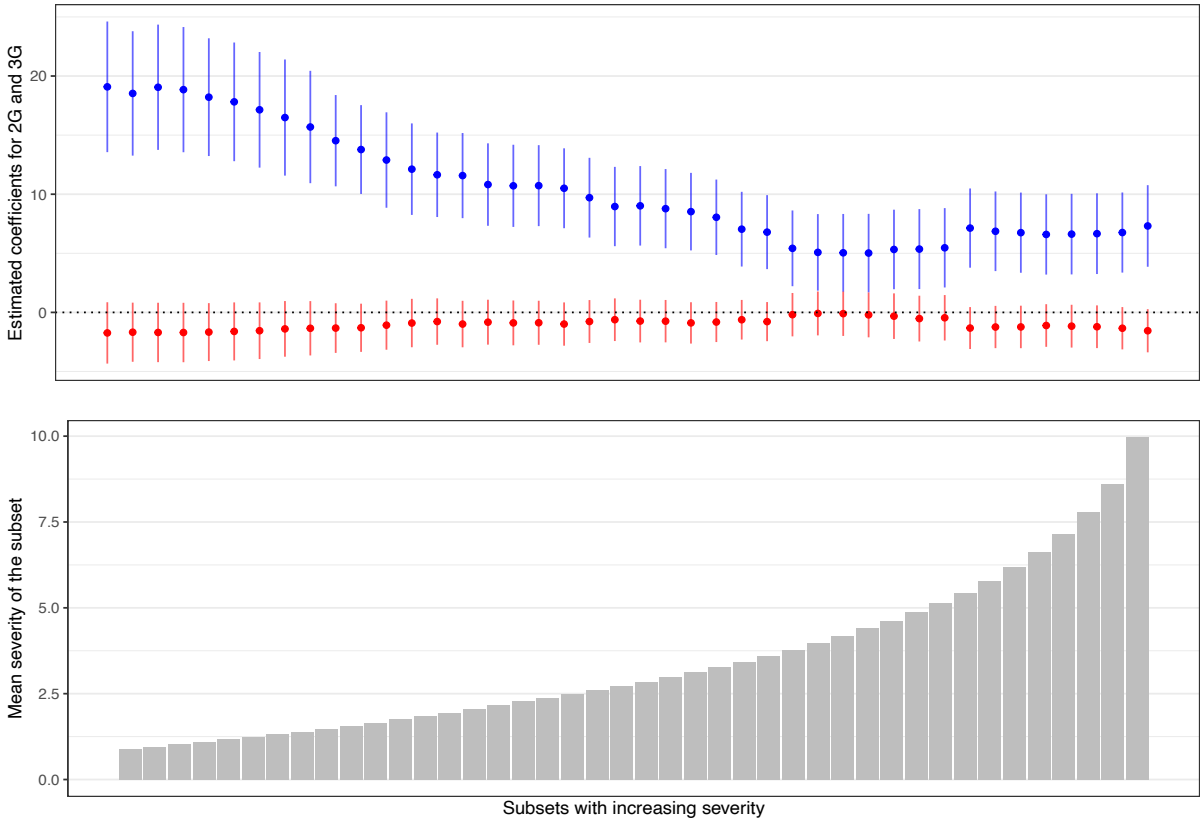
Table B3: Spatial and TWFE Regression Results with GTD data (IED attacks)

# C Test of Potential Reporting Bias in GTD Between 2G and 3G Network Coverage

To further increase confidence in the results, I perform a diagnosis test based on a potential implication of the existence of reporting bias, following Weidmann (2016). The intuition behind this test is the proposition that the more severe events (i.e., with more casualties) are likely to be reported regardless of the coverage available, therefore, less susceptible to reporting bias. On the contrary, less severe events are more likely to be reported in areas with coverage. If GTD suffers from reporting bias, I expect that 3G coverage would have no (or smaller) effect when I analyse events with high severity. To carry out the test, I ordered the events in 2018 by increasing severity.[14] Using a sliding window covering half of the events (N=886), starting from the least severe, I estimated a spatial general nesting model with variables of 2G and 3G network coverage and repeated this process moving the window 20 events upward each time. The results are plotted in Figure C1, with the coefficient estimates and confidence intervals of the 3G network variable shown in blue and the 2G network variable shown in red, while below histogram shows the mean severity of events in each subset corresponding to the estimates. In line with the results of Weidmann (2016), we see a downward trend in the 3G network coefficient as the mean severity increases in the subset, which is expected in a media-based event dataset. However, the decreasing trend gradually vanishes, and the estimates of the coefficient of 3G remain similar in almost half of the subsets with high severity, showing that the existing reporting bias in the data is not large enough to overturn the results. Indeed, with the subset of the most severe events, the coefficient value is approximately 7 and statistically significant. Considering the high values obtained with the subsets of less severe events, the results in the main analyses may represent an average effect. The original 'sliding window' test conducted in Weidmann (2016) estimates the effect of the 2G network alone and finds that the effect diminishes as the mean severity increases. However, the replication here increases confidence in the findings that the impact of the

[14]The year here is chosen arbitrarily to rule out temporal dependencies in the subset.

3G network is profound and robust.




The coefficient estimates and 95% confidence intervals are in *red* for 2G network variable and are in *blue* for 3G network variable. Below panel shows the mean severity of events in each subset.

Figure C1: Testing potential reporting bias, adapted from Weidmann (2016)

# D Detailed Results of Placebo Tests

| | Results | | | | | Before matching | | | | | | After matching | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time[days] | Space[km] | Effect Size | p.value | adj.$R^2$ | control | treat. | L1 | %CS | %SO | %MO | control | treat. | L1 | %CS | %SO | %MO |
| 1 | 30.00 | 4.00 | -0.33 | 0.44 | -0.00 | 339 | 165 | 0.68 | 16.20 | 0.77 | 0.15 | 52 | 52 | 0.10 | 46.20 | 0.50 | 0.19 |
| 2 | 30.00 | 8.00 | -0.44 | 0.60 | -0.01 | 339 | 165 | 0.73 | 12.10 | 0.82 | 0.22 | 48 | 48 | 0.06 | 66.70 | 0.60 | 0.25 |
| 3 | 30.00 | 12.00 | -1.38 | 0.28 | 0.00 | 339 | 165 | 0.74 | 11.80 | 0.84 | 0.26 | 34 | 34 | 0.06 | 66.70 | 0.65 | 0.28 |
| 4 | 30.00 | 16.00 | -0.90 | 0.53 | -0.01 | 339 | 165 | 0.77 | 10.80 | 0.84 | 0.26 | 40 | 40 | 0.05 | 50.00 | 0.67 | 0.28 |
| 5 | 30.00 | 20.00 | -1.73 | 0.23 | 0.01 | 339 | 165 | 0.78 | 9.60 | 0.84 | 0.28 | 41 | 41 | 0.05 | 50.00 | 0.67 | 0.29 |
| 6 | 45.00 | 4.00 | 0.30 | 0.58 | -0.01 | 339 | 165 | 0.68 | 16.20 | 0.78 | 0.22 | 56 | 56 | 0.07 | 50.00 | 0.53 | 0.21 |
| 7 | 45.00 | 8.00 | -2.94 | 0.01 | 0.07 | 339 | 165 | 0.75 | 11.90 | 0.84 | 0.28 | 47 | 47 | 0.11 | 53.80 | 0.64 | 0.30 |
| 8 | 45.00 | 12.00 | -1.67 | 0.40 | -0.01 | 339 | 165 | 0.76 | 10.80 | 0.86 | 0.32 | 27 | 27 | 0.07 | 50.00 | 0.72 | 0.33 |
| 9 | 45.00 | 16.00 | 0.31 | 0.90 | -0.02 | 339 | 165 | 0.78 | 9.00 | 0.87 | 0.33 | 26 | 26 | 0.12 | 57.10 | 0.74 | 0.33 |
| 10 | 45.00 | 20.00 | 0.66 | 0.84 | -0.02 | 339 | 165 | 0.78 | 8.80 | 0.87 | 0.36 | 29 | 29 | 0.07 | 50.00 | 0.74 | 0.34 |
| 11 | 60.00 | 4.00 | -0.32 | 0.65 | -0.01 | 339 | 165 | 0.68 | 16.20 | 0.80 | 0.23 | 53 | 53 | 0.06 | 55.60 | 0.56 | 0.23 |
| 12 | 60.00 | 8.00 | -0.67 | 0.65 | -0.01 | 339 | 165 | 0.75 | 11.00 | 0.86 | 0.30 | 42 | 42 | 0.07 | 66.70 | 0.67 | 0.33 |
| 13 | 60.00 | 12.00 | -5.48 | 0.03 | 0.06 | 339 | 165 | 0.78 | 9.80 | 0.88 | 0.34 | 29 | 29 | 0.10 | 57.10 | 0.74 | 0.36 |
| 14 | 60.00 | 16.00 | -3.57 | 0.31 | 0.00 | 339 | 165 | 0.80 | 8.70 | 0.88 | 0.35 | 23 | 23 | 0.17 | 50.00 | 0.76 | 0.36 |
| 15 | 60.00 | 20.00 | 1.85 | 0.68 | -0.02 | 339 | 165 | 0.80 | 8.70 | 0.89 | 0.38 | 20 | 20 | 0.30 | 50.00 | 0.77 | 0.37 |
| 16 | 75.00 | 4.00 | -0.52 | 0.60 | -0.01 | 337 | 165 | 0.69 | 15.20 | 0.82 | 0.25 | 44 | 44 | 0.09 | 54.50 | 0.57 | 0.26 |
| 17 | 75.00 | 8.00 | -6.21 | 0.00 | 0.12 | 337 | 165 | 0.77 | 10.30 | 0.87 | 0.31 | 39 | 39 | 0.10 | 55.60 | 0.69 | 0.35 |
| 18 | 75.00 | 12.00 | -8.72 | 0.01 | 0.11 | 337 | 165 | 0.80 | 8.90 | 0.88 | 0.34 | 25 | 25 | 0.12 | 50.00 | 0.75 | 0.38 |
| 19 | 75.00 | 16.00 | -0.46 | 0.92 | -0.02 | 337 | 165 | 0.80 | 8.80 | 0.89 | 0.35 | 24 | 24 | 0.17 | 50.00 | 0.77 | 0.38 |
| 20 | 75.00 | 20.00 | -6.14 | 0.39 | -0.01 | 337 | 165 | 0.81 | 7.00 | 0.89 | 0.38 | 14 | 14 | 0.21 | 42.90 | 0.78 | 0.38 |
| 21 | 90.00 | 4.00 | -0.15 | 0.87 | -0.01 | 336 | 165 | 0.68 | 14.80 | 0.83 | 0.46 | 40 | 40 | 0.10 | 45.50 | 0.61 | 0.32 |
| 22 | 90.00 | 8.00 | -6.56 | 0.00 | 0.12 | 336 | 165 | 0.79 | 9.00 | 0.87 | 0.57 | 41 | 41 | 0.10 | 58.30 | 0.72 | 0.37 |
| 23 | 90.00 | 12.00 | -11.00 | 0.01 | 0.12 | 336 | 165 | 0.80 | 9.20 | 0.89 | 0.65 | 24 | 24 | 0.17 | 60.00 | 0.76 | 0.39 |
| 24 | 90.00 | 16.00 | 4.81 | 0.46 | -0.01 | 336 | 165 | 0.77 | 8.90 | 0.90 | 0.66 | 21 | 21 | 0.24 | 50.00 | 0.78 | 0.40 |
| 25 | 90.00 | 20.00 | -10.91 | 0.04 | 0.08 | 336 | 165 | 0.78 | 8.70 | 0.90 | 0.69 | 22 | 22 | 0.23 | 62.50 | 0.78 | 0.40 |

Dependent variable: Number of attacks by insurgents. Results are presented on the left-hand side, with the sizes of spatio-temporal units used in estimation. Summary statistics of the sample before and after matching are presented on the middle and right-hand side, respectively. *L1* distance metric and the common support summarise the similarity of the distribution of covariates between the treatment and control units. %CS: percentage of common support, %SO: percentage of same overlap, %MO: percentage of mixed overlap.

Table D4: Overview of the Placebo Test for *H1*: Installations of 3G Towers 3 Months Before the Original Date (Matched Wake Analysis)

| | Results | | | | | Before matching | | | | | | After matching | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time[days] | Space[km] | Effect Size | p.value | adj.$R^2$ | control | treat. | L1 | %CS | %SO | %MO | control | treat. | L1 | %CS | %SO | %MO |
| 1 | 30.00 | 4.00 | 0.78 | 0.07 | 0.02 | 339 | 165 | 0.66 | 16.30 | 0.77 | 0.09 | 58 | 58 | 0.07 | 66.70 | 0.50 | 0.08 |
| 2 | 30.00 | 8.00 | -1.62 | 0.04 | 0.04 | 339 | 165 | 0.71 | 12.20 | 0.82 | 0.15 | 45 | 45 | 0.07 | 62.50 | 0.60 | 0.14 |
| 3 | 30.00 | 12.00 | -4.30 | 0.00 | 0.15 | 339 | 165 | 0.72 | 12.00 | 0.84 | 0.18 | 40 | 40 | 0.07 | 62.50 | 0.65 | 0.17 |
| 4 | 30.00 | 16.00 | -2.10 | 0.14 | 0.01 | 339 | 165 | 0.74 | 11.90 | 0.84 | 0.19 | 49 | 49 | 0.06 | 77.80 | 0.67 | 0.17 |
| 5 | 30.00 | 20.00 | -3.10 | 0.07 | 0.03 | 339 | 165 | 0.74 | 11.70 | 0.84 | 0.19 | 42 | 42 | 0.07 | 66.70 | 0.67 | 0.20 |
| 6 | 45.00 | 4.00 | 0.25 | 0.57 | -0.01 | 339 | 165 | 0.66 | 16.30 | 0.78 | 0.10 | 61 | 61 | 0.07 | 61.50 | 0.53 | 0.10 |
| 7 | 45.00 | 8.00 | -3.74 | 0.00 | 0.14 | 339 | 165 | 0.73 | 12.00 | 0.84 | 0.17 | 47 | 47 | 0.09 | 61.50 | 0.64 | 0.19 |
| 8 | 45.00 | 12.00 | -4.95 | 0.00 | 0.10 | 339 | 165 | 0.73 | 11.90 | 0.86 | 0.20 | 56 | 56 | 0.05 | 80.00 | 0.72 | 0.21 |
| 9 | 45.00 | 16.00 | -5.27 | 0.00 | 0.08 | 339 | 165 | 0.75 | 10.90 | 0.87 | 0.21 | 51 | 51 | 0.06 | 77.80 | 0.74 | 0.23 |
| 10 | 45.00 | 20.00 | -4.34 | 0.05 | 0.04 | 339 | 165 | 0.76 | 10.70 | 0.87 | 0.21 | 41 | 41 | 0.12 | 55.60 | 0.74 | 0.25 |
| 11 | 60.00 | 4.00 | -0.65 | 0.28 | 0.00 | 339 | 165 | 0.67 | 15.20 | 0.80 | 0.12 | 51 | 51 | 0.08 | 46.20 | 0.56 | 0.15 |
| 12 | 60.00 | 8.00 | -4.35 | 0.00 | 0.16 | 339 | 165 | 0.73 | 11.10 | 0.86 | 0.20 | 52 | 52 | 0.08 | 81.80 | 0.67 | 0.24 |
| 13 | 60.00 | 12.00 | -5.61 | 0.00 | 0.08 | 339 | 165 | 0.75 | 10.80 | 0.88 | 0.23 | 46 | 46 | 0.22 | 63.60 | 0.74 | 0.27 |
| 14 | 60.00 | 16.00 | -12.61 | 0.00 | 0.29 | 339 | 165 | 0.78 | 9.80 | 0.88 | 0.24 | 41 | 41 | 0.05 | 66.70 | 0.76 | 0.30 |
| 15 | 60.00 | 20.00 | -7.08 | 0.03 | 0.05 | 339 | 165 | 0.77 | 9.50 | 0.89 | 0.25 | 39 | 39 | 0.13 | 66.70 | 0.77 | 0.34 |
| 16 | 75.00 | 4.00 | 0.90 | 0.30 | 0.00 | 337 | 165 | 0.68 | 14.30 | 0.82 | 0.15 | 39 | 39 | 0.10 | 54.50 | 0.57 | 0.19 |
| 17 | 75.00 | 8.00 | -5.27 | 0.00 | 0.09 | 337 | 165 | 0.75 | 10.40 | 0.87 | 0.21 | 48 | 48 | 0.08 | 77.80 | 0.69 | 0.27 |
| 18 | 75.00 | 12.00 | -7.47 | 0.01 | 0.10 | 337 | 165 | 0.76 | 9.90 | 0.88 | 0.24 | 32 | 32 | 0.09 | 62.50 | 0.75 | 0.30 |
| 19 | 75.00 | 16.00 | -9.96 | 0.01 | 0.09 | 337 | 165 | 0.77 | 8.80 | 0.89 | 0.26 | 27 | 27 | 0.04 | 66.70 | 0.77 | 0.32 |
| 20 | 75.00 | 20.00 | -8.74 | 0.03 | 0.06 | 337 | 165 | 0.77 | 6.80 | 0.89 | 0.26 | 34 | 34 | 0.03 | 80.00 | 0.78 | 0.36 |
| 21 | 90.00 | 4.00 | -0.00 | 1.00 | -0.02 | 336 | 165 | 0.68 | 13.90 | 0.83 | 0.20 | 28 | 28 | 0.07 | 62.50 | 0.61 | 0.21 |
| 22 | 90.00 | 8.00 | -3.92 | 0.02 | 0.04 | 336 | 165 | 0.76 | 10.70 | 0.87 | 0.25 | 59 | 59 | 0.12 | 69.20 | 0.72 | 0.29 |
| 23 | 90.00 | 12.00 | -4.02 | 0.16 | 0.01 | 336 | 165 | 0.77 | 9.40 | 0.89 | 0.28 | 42 | 42 | 0.07 | 87.50 | 0.76 | 0.32 |
| 24 | 90.00 | 16.00 | -4.13 | 0.34 | -0.00 | 336 | 165 | 0.77 | 7.70 | 0.90 | 0.30 | 38 | 38 | 0.10 | 50.00 | 0.78 | 0.33 |
| 25 | 90.00 | 20.00 | -7.00 | 0.15 | 0.01 | 336 | 165 | 0.77 | 7.50 | 0.90 | 0.30 | 38 | 38 | 0.16 | 55.60 | 0.78 | 0.37 |

Dependent variable: Number of attacks by insurgents. Results are presented on the left-hand side, with the sizes of spatio-temporal units used in estimation. Summary statistics of the sample before and after matching are presented on the middle and right-hand side, respectively. *L1* distance metric and the common support summarise the similarity of the distribution of covariates between the treatment and control units. %CS: percentage of common support, %SO: percentage of same overlap, %MO: percentage of mixed overlap.

Table D5: Overview of the Placebo Test for *H1*: Installations of 3G Towers 6 Months Before the Original Date (Matched Wake Analysis)

| | Results | | | | | Before matching | | | | | | After matching | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time[days] | Space[km] | Effect Size | p.value | adj.$R^2$ | control | treat. | L1 | %CS | %SO | %MO | control | treat. | L1 | %CS | %SO | %MO |
| 1 | 30.00 | 4.00 | -0.33 | 0.34 | -0.00 | 339 | 165 | 0.68 | 16.20 | 0.77 | 0.15 | 58 | 58 | 0.09 | 50.00 | 0.50 | 0.19 |
| 2 | 30.00 | 8.00 | -0.28 | 0.74 | -0.01 | 339 | 165 | 0.73 | 12.10 | 0.82 | 0.22 | 43 | 43 | 0.09 | 33.30 | 0.60 | 0.25 |
| 3 | 30.00 | 12.00 | -0.76 | 0.45 | -0.01 | 339 | 165 | 0.74 | 11.80 | 0.84 | 0.26 | 41 | 41 | 0.10 | 42.90 | 0.65 | 0.28 |
| 4 | 30.00 | 16.00 | -1.09 | 0.41 | -0.00 | 339 | 165 | 0.76 | 11.80 | 0.84 | 0.26 | 33 | 33 | 0.15 | 42.90 | 0.67 | 0.28 |
| 5 | 30.00 | 20.00 | -0.87 | 0.54 | -0.01 | 339 | 165 | 0.77 | 10.90 | 0.84 | 0.28 | 30 | 30 | 0.07 | 50.00 | 0.67 | 0.29 |
| 6 | 45.00 | 4.00 | -0.08 | 0.85 | -0.01 | 339 | 165 | 0.68 | 16.20 | 0.78 | 0.22 | 59 | 59 | 0.09 | 50.00 | 0.53 | 0.21 |
| 7 | 45.00 | 8.00 | -0.49 | 0.72 | -0.01 | 339 | 165 | 0.75 | 12.00 | 0.84 | 0.28 | 37 | 37 | 0.08 | 42.90 | 0.64 | 0.30 |
| 8 | 45.00 | 12.00 | -0.71 | 0.69 | -0.02 | 339 | 165 | 0.76 | 10.90 | 0.86 | 0.32 | 28 | 28 | 0.07 | 57.10 | 0.72 | 0.33 |
| 9 | 45.00 | 16.00 | -2.16 | 0.29 | 0.00 | 339 | 165 | 0.78 | 9.90 | 0.87 | 0.33 | 31 | 31 | 0.03 | 66.70 | 0.74 | 0.33 |
| 10 | 45.00 | 20.00 | -2.67 | 0.20 | 0.01 | 339 | 165 | 0.78 | 9.20 | 0.87 | 0.36 | 30 | 30 | 0.10 | 50.00 | 0.74 | 0.34 |
| 11 | 60.00 | 4.00 | -0.88 | 0.13 | 0.01 | 339 | 165 | 0.68 | 16.00 | 0.80 | 0.23 | 49 | 49 | 0.06 | 66.70 | 0.56 | 0.23 |
| 12 | 60.00 | 8.00 | -3.10 | 0.02 | 0.05 | 339 | 165 | 0.77 | 11.10 | 0.86 | 0.30 | 39 | 39 | 0.05 | 66.70 | 0.67 | 0.33 |
| 13 | 60.00 | 12.00 | -8.61 | 0.00 | 0.29 | 339 | 165 | 0.78 | 9.90 | 0.88 | 0.34 | 31 | 31 | 0.07 | 66.70 | 0.74 | 0.36 |
| 14 | 60.00 | 16.00 | -10.04 | 0.00 | 0.30 | 339 | 165 | 0.80 | 9.00 | 0.88 | 0.35 | 27 | 27 | 0.00 | 100.00 | 0.76 | 0.36 |
| 15 | 60.00 | 20.00 | -9.05 | 0.01 | 0.15 | 339 | 165 | 0.80 | 9.00 | 0.89 | 0.38 | 20 | 20 | 0.00 | 100.00 | 0.77 | 0.37 |
| 16 | 75.00 | 4.00 | -2.10 | 0.00 | 0.07 | 337 | 165 | 0.69 | 15.20 | 0.82 | 0.25 | 50 | 50 | 0.10 | 57.10 | 0.57 | 0.26 |
| 17 | 75.00 | 8.00 | -6.38 | 0.00 | 0.22 | 337 | 165 | 0.77 | 10.30 | 0.87 | 0.31 | 32 | 32 | 0.09 | 50.00 | 0.69 | 0.35 |
| 18 | 75.00 | 12.00 | -9.28 | 0.00 | 0.21 | 337 | 165 | 0.80 | 9.00 | 0.88 | 0.34 | 25 | 25 | 0.04 | 66.70 | 0.75 | 0.38 |
| 19 | 75.00 | 16.00 | -10.17 | 0.00 | 0.22 | 337 | 165 | 0.81 | 9.60 | 0.89 | 0.35 | 29 | 29 | 0.10 | 37.50 | 0.77 | 0.38 |
| 20 | 75.00 | 20.00 | -8.84 | 0.02 | 0.11 | 337 | 165 | 0.79 | 8.80 | 0.89 | 0.38 | 19 | 19 | 0.05 | 60.00 | 0.78 | 0.38 |
| 21 | 90.00 | 4.00 | -0.83 | 0.34 | -0.00 | 336 | 165 | 0.69 | 14.70 | 0.83 | 0.46 | 47 | 47 | 0.13 | 46.70 | 0.61 | 0.32 |
| 22 | 90.00 | 8.00 | -4.00 | 0.02 | 0.09 | 336 | 165 | 0.78 | 9.30 | 0.87 | 0.57 | 27 | 27 | 0.11 | 62.50 | 0.72 | 0.37 |
| 23 | 90.00 | 12.00 | -13.00 | 0.00 | 0.35 | 336 | 165 | 0.80 | 9.40 | 0.89 | 0.65 | 25 | 25 | 0.12 | 80.00 | 0.76 | 0.39 |
| 24 | 90.00 | 16.00 | -10.30 | 0.00 | 0.18 | 336 | 165 | 0.78 | 9.90 | 0.90 | 0.66 | 23 | 23 | 0.04 | 71.40 | 0.78 | 0.40 |
| 25 | 90.00 | 20.00 | -1.93 | 0.70 | -0.03 | 336 | 165 | 0.76 | 9.70 | 0.90 | 0.69 | 14 | 14 | 0.29 | 66.70 | 0.78 | 0.40 |

Dependent variable: Number of IED attacks by insurgents. Results are presented on the left-hand side, with the sizes of spatio-temporal units used in estimation. Summary statistics of the sample before and after matching are presented on the middle and right-hand side, respectively. *L1* distance metric and the common support summarise the similarity of the distribution of covariates between the treatment and control units. %CS: percentage of common support, %SO: percentage of same overlap, %MO: percentage of mixed overlap.

Table D6: Overview of the Placebo Test for *H2*: Installations of 3G Towers 3 Months Before the Original Date (Matched Wake Analysis)

| | Results | | | | | Before matching | | | | | | After matching | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time[days] | Space[km] | Effect Size | p.value | adj.$R^2$ | control | treat. | L1 | %CS | %SO | %MO | control | treat. | L1 | %CS | %SO | %MO |
| 1 | 30.00 | 4.00 | 0.05 | 0.88 | -0.01 | 339 | 165 | 0.66 | 16.30 | 0.77 | 0.09 | 64 | 64 | 0.05 | 80.00 | 0.50 | 0.08 |
| 2 | 30.00 | 8.00 | 0.30 | 0.63 | -0.01 | 339 | 165 | 0.71 | 12.20 | 0.82 | 0.15 | 46 | 46 | 0.09 | 63.60 | 0.60 | 0.14 |
| 3 | 30.00 | 12.00 | -2.02 | 0.02 | 0.04 | 339 | 165 | 0.72 | 12.00 | 0.84 | 0.18 | 51 | 51 | 0.08 | 60.00 | 0.65 | 0.17 |
| 4 | 30.00 | 16.00 | -1.72 | 0.16 | 0.01 | 339 | 165 | 0.74 | 12.10 | 0.84 | 0.19 | 36 | 36 | 0.06 | 85.70 | 0.67 | 0.17 |
| 5 | 30.00 | 20.00 | -1.36 | 0.22 | 0.01 | 339 | 165 | 0.74 | 12.10 | 0.84 | 0.19 | 33 | 33 | 0.09 | 62.50 | 0.67 | 0.20 |
| 6 | 45.00 | 4.00 | 0.20 | 0.60 | -0.01 | 339 | 165 | 0.66 | 16.30 | 0.78 | 0.10 | 60 | 60 | 0.05 | 71.40 | 0.53 | 0.10 |
| 7 | 45.00 | 8.00 | -1.38 | 0.12 | 0.02 | 339 | 165 | 0.73 | 12.10 | 0.84 | 0.17 | 39 | 39 | 0.10 | 75.00 | 0.64 | 0.19 |
| 8 | 45.00 | 12.00 | -2.29 | 0.12 | 0.02 | 339 | 165 | 0.73 | 12.00 | 0.86 | 0.20 | 35 | 35 | 0.14 | 66.70 | 0.72 | 0.21 |
| 9 | 45.00 | 16.00 | -1.18 | 0.46 | -0.01 | 339 | 165 | 0.76 | 11.10 | 0.87 | 0.21 | 40 | 40 | 0.12 | 60.00 | 0.74 | 0.23 |
| 10 | 45.00 | 20.00 | 0.06 | 0.97 | -0.01 | 339 | 165 | 0.75 | 11.20 | 0.87 | 0.21 | 36 | 36 | 0.06 | 50.00 | 0.74 | 0.25 |
| 11 | 60.00 | 4.00 | 0.35 | 0.53 | -0.01 | 339 | 165 | 0.68 | 15.10 | 0.80 | 0.12 | 54 | 54 | 0.09 | 46.70 | 0.56 | 0.15 |
| 12 | 60.00 | 8.00 | -0.47 | 0.73 | -0.02 | 339 | 165 | 0.74 | 11.20 | 0.86 | 0.20 | 30 | 30 | 0.07 | 75.00 | 0.67 | 0.24 |
| 13 | 60.00 | 12.00 | -3.69 | 0.05 | 0.04 | 339 | 165 | 0.77 | 10.10 | 0.88 | 0.23 | 35 | 35 | 0.09 | 75.00 | 0.74 | 0.27 |
| 14 | 60.00 | 16.00 | -5.71 | 0.01 | 0.11 | 339 | 165 | 0.78 | 10.00 | 0.88 | 0.24 | 31 | 31 | 0.07 | 57.10 | 0.76 | 0.30 |
| 15 | 60.00 | 20.00 | -6.28 | 0.02 | 0.07 | 339 | 165 | 0.77 | 9.80 | 0.89 | 0.25 | 29 | 29 | 0.07 | 66.70 | 0.77 | 0.34 |
| 16 | 75.00 | 4.00 | -0.02 | 0.97 | -0.01 | 337 | 165 | 0.68 | 14.30 | 0.82 | 0.15 | 41 | 41 | 0.05 | 76.90 | 0.57 | 0.19 |
| 17 | 75.00 | 8.00 | -4.14 | 0.00 | 0.12 | 337 | 165 | 0.75 | 10.40 | 0.87 | 0.21 | 42 | 42 | 0.05 | 77.80 | 0.69 | 0.27 |
| 18 | 75.00 | 12.00 | -1.93 | 0.35 | -0.00 | 337 | 165 | 0.77 | 10.00 | 0.88 | 0.24 | 30 | 30 | 0.07 | 66.70 | 0.75 | 0.30 |
| 19 | 75.00 | 16.00 | -6.22 | 0.01 | 0.11 | 337 | 165 | 0.77 | 9.70 | 0.89 | 0.26 | 27 | 27 | 0.15 | 62.50 | 0.77 | 0.32 |
| 20 | 75.00 | 20.00 | -9.41 | 0.00 | 0.23 | 337 | 165 | 0.76 | 8.50 | 0.89 | 0.26 | 27 | 27 | 0.07 | 57.10 | 0.78 | 0.36 |
| 21 | 90.00 | 4.00 | -0.41 | 0.72 | -0.02 | 336 | 165 | 0.68 | 13.80 | 0.83 | 0.20 | 29 | 29 | 0.07 | 77.80 | 0.61 | 0.21 |
| 22 | 90.00 | 8.00 | -3.50 | 0.06 | 0.04 | 336 | 165 | 0.76 | 10.20 | 0.87 | 0.25 | 34 | 34 | 0.06 | 85.70 | 0.72 | 0.29 |
| 23 | 90.00 | 12.00 | -7.27 | 0.01 | 0.14 | 336 | 165 | 0.79 | 9.50 | 0.89 | 0.28 | 22 | 22 | 0.04 | 83.30 | 0.76 | 0.32 |
| 24 | 90.00 | 16.00 | -8.82 | 0.00 | 0.20 | 336 | 165 | 0.76 | 9.40 | 0.90 | 0.30 | 28 | 28 | 0.32 | 55.60 | 0.78 | 0.33 |
| 25 | 90.00 | 20.00 | -11.48 | 0.00 | 0.24 | 336 | 165 | 0.74 | 9.20 | 0.90 | 0.30 | 29 | 29 | 0.34 | 55.60 | 0.78 | 0.37 |

Dependent variable: Number of IED attacks by insurgents. Results are presented on the left-hand side, with the sizes of spatio-temporal units used in estimation. Summary statistics of the sample before and after matching are presented on the middle and right-hand side, respectively. *L1* distance metric and the common support summarise the similarity of the distribution of covariates between the treatment and control units. %CS: percentage of common support, %SO: percentage of same overlap, %MO: percentage of mixed overlap.

Table D7: Overview of the Placebo Test for *H2*: Installations of 3G Towers 6 Months Before the Original Date (Matched Wake Analysis)

# E Heterogeneous Effects

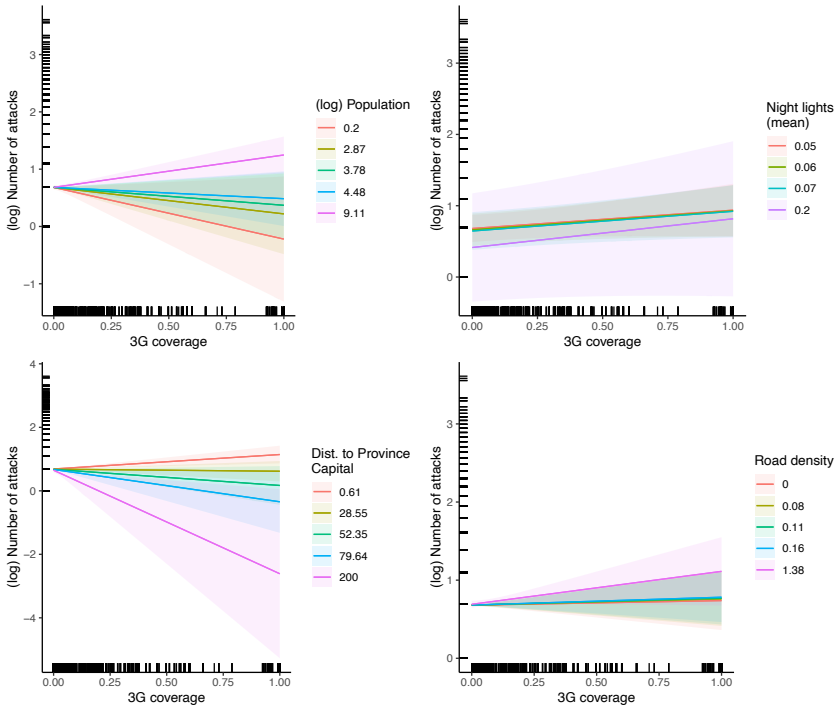



Figure E2: Heterogeneous effects. The plots show the effect of 3G by varying values of population, nighttime lights, distance to province capital and road density. The full model (spatial general nesting model with two–way fixed effects) is used for all plots.

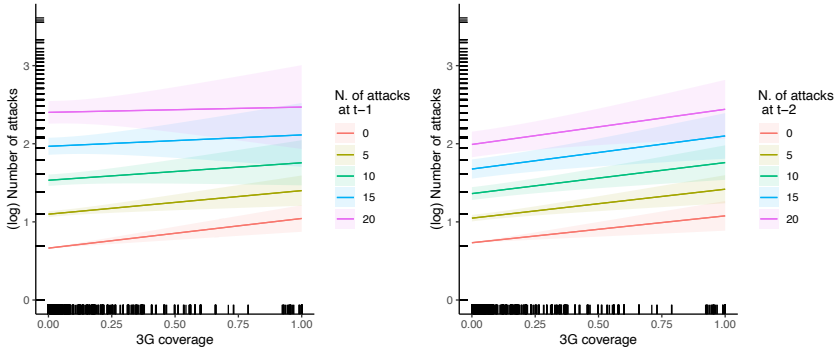


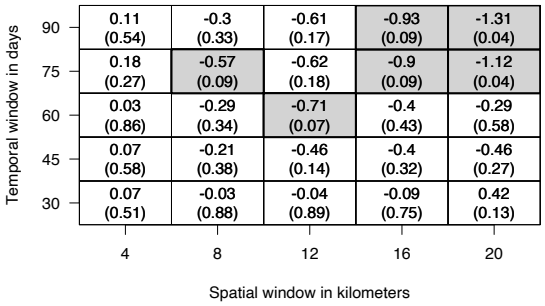

Figure E3: Heterogeneous effects by levels of existing violence. The plots show the effect of 3G by varying values of insurgent violence, lagged by one quarter for the left panel, and lagged by two quarters for the right panel. Spatial general nesting model with district fixed effects is used for all plots.

| | DV: N. of Attacks (log) | | | | | |
|---|---|---|---|---|---|---|
| | Population | Night Lights | Dist. to Prov.Cap. | Road Density | Ins. Viol. (t-1) | Ins. Viol. (t-2) |
| 2G Coverage$_{t-1}$ | 0.020 | 0.122 | 0.061 | −0.019 | 0.269*** | 0.291*** |
| | (0.243) | (0.155) | (0.099) | (0.092) | (0.058) | (0.062) |
| 3G Coverage$_{t-1}$ | −0.935 | 0.208 | 0.467** | 0.059 | 0.380*** | 0.344** |
| | (0.686) | (0.356) | (0.176) | (0.232) | (0.104) | (0.116) |
| 2G$_{t-1}$ × (log) Population | 0.001 | | | | | |
| | (0.044) | | | | | |
| 3G$_{t-1}$ × (log) Population | 0.165 | | | | | |
| | (0.091) | | | | | |
| Night lights (mean) | | −1.673 | | | | |
| | | (2.311) | | | | |
| 2G$_{t-1}$ × Night Lights | | −1.143 | | | | |
| | | (1.361) | | | | |
| 3G$_{t-1}$ × Night Lights | | 0.974 | | | | |
| | | (3.434) | | | | |
| 2G$_{t-1}$ × Dist. to | | | −0.002 | | | |
| Province Capital | | | (0.003) | | | |
| 3G$_{t-1}$ × Dist. to | | | −0.019* | | | |
| ProvinceCapital | | | (0.009) | | | |
| 2G$_{t-1}$ × Road Density | | | | 0.091 | | |
| | | | | (0.252) | | |
| 3G$_{t-1}$ × Road Density | | | | 0.263 | | |
| | | | | (0.308) | | |
| Attacks$_{t-1}$ | | | | | 0.091*** | |
| | | | | | (0.005) | |
| 2G$_{t-1}$ × Attacks$_{t-1}$ | | | | | −0.044** | |
| | | | | | (0.016) | |
| 3G$_{t-1}$ × Attacks$_{t-1}$ | | | | | −0.016 | |
| | | | | | (0.016) | |
| Attacks$_{t-2}$ | | | | | | 0.067*** |
| | | | | | | (0.006) |
| 2G$_{t-1}$ × Attacks$_{t-2}$ | | | | | | −0.042*** |
| | | | | | | (0.012) |
| 3G$_{t-1}$ × Attacks$_{t-2}$ | | | | | | 0.005 |
| | | | | | | (0.011) |
| District (Wuleswali) FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Quarter-year FE | ✓ | ✓ | ✓ | ✓ | | |
| Num. obs. | 13776 | 13776 | 13776 | 13776 | 13776 | 13448 |
| Num. groups: id | 328 | 328 | 328 | 328 | 328 | 328 |
| Num. groups: time | 42 | 42 | 42 | 42 | | |
| $R^2$ | 0.474 | 0.474 | 0.475 | 0.474 | 0.454 | 0.437 |
| Adj. $R^2$ | 0.460 | 0.459 | 0.460 | 0.459 | 0.441 | 0.423 |

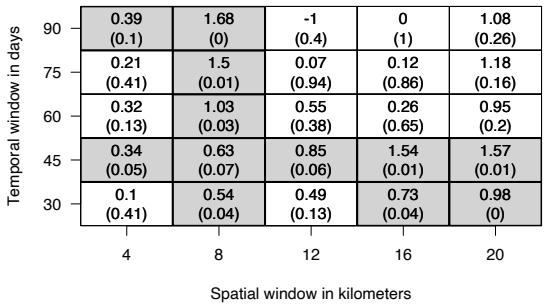
$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$. Standard errors are in parantheses.
For information on population, night lights, distance to province capital, and road density, data from Zhukov *et al.* (2019) are used. Population data is for the year 2000, and population, distance to province capital, and road density variables are time-invariant.

Table E8: Heterogeneous effects

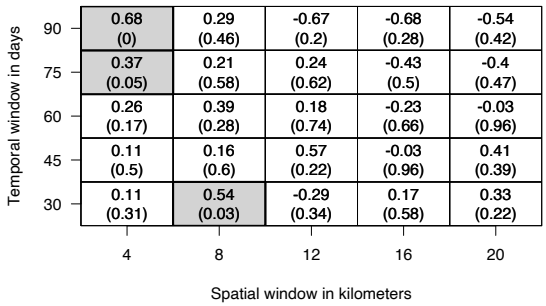
# F Effects of 3G on Attacks by Government Forces




Original treatment timing




Placebo: 3 Months




Placebo: 6 Months

Plots showing the treatment effect estimates of the 3G network on the number of attacks by government forces, with 2G as the control group. The plot above shows the main estimates, followed by placebo treatments of 3 months and 6 months before the true treatment timing below. $p$-values are shown in parentheses below each estimate. Statistically significant estimates at 0.1 level are shaded.

Figure F4: Effects of 3G Network on the Attacks by Government Forces (Matched Wake Analysis

| | Results | | | | | Placebo: 3 Months | | | Placebo: 6 Months | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time[days] | Space[km] | Effect Size | p.value | adj.$R^2$ | Effect Size | p.value | adj.$R^2$ | Effect Size | p.value | adj.$R^2$ |
| 1 | 30.00 | 4.00 | 0.07 | 0.51 | -0.00 | 0.10 | 0.41 | -0.00 | 0.11 | 0.31 | 0.00 |
| 2 | 30.00 | 8.00 | -0.03 | 0.88 | -0.01 | 0.54 | 0.04 | 0.04 | 0.54 | 0.03 | 0.04 |
| 3 | 30.00 | 12.00 | -0.04 | 0.89 | -0.01 | 0.49 | 0.13 | 0.02 | -0.29 | 0.34 | -0.00 |
| 4 | 30.00 | 16.00 | -0.09 | 0.75 | -0.01 | 0.73 | 0.04 | 0.04 | 0.17 | 0.58 | -0.01 |
| 5 | 30.00 | 20.00 | 0.42 | 0.13 | 0.01 | 0.98 | 0.00 | 0.10 | 0.33 | 0.22 | 0.00 |
| 6 | 45.00 | 4.00 | 0.07 | 0.58 | -0.01 | 0.34 | 0.05 | 0.02 | 0.11 | 0.50 | -0.00 |
| 7 | 45.00 | 8.00 | -0.21 | 0.38 | -0.00 | 0.63 | 0.07 | 0.03 | 0.16 | 0.60 | -0.01 |
| 8 | 45.00 | 12.00 | -0.46 | 0.14 | 0.01 | 0.85 | 0.06 | 0.04 | 0.57 | 0.22 | 0.01 |
| 9 | 45.00 | 16.00 | -0.40 | 0.32 | -0.00 | 1.54 | 0.01 | 0.11 | -0.03 | 0.96 | -0.02 |
| 10 | 45.00 | 20.00 | -0.46 | 0.27 | 0.00 | 1.57 | 0.01 | 0.15 | 0.41 | 0.39 | -0.00 |
| 11 | 60.00 | 4.00 | 0.03 | 0.86 | -0.01 | 0.32 | 0.13 | 0.01 | 0.26 | 0.17 | 0.01 |
| 12 | 60.00 | 8.00 | -0.29 | 0.34 | -0.00 | 1.03 | 0.03 | 0.06 | 0.39 | 0.28 | 0.00 |
| 13 | 60.00 | 12.00 | -0.71 | 0.07 | 0.02 | 0.55 | 0.38 | -0.01 | 0.18 | 0.74 | -0.02 |
| 14 | 60.00 | 16.00 | -0.40 | 0.43 | -0.00 | 0.26 | 0.65 | -0.02 | -0.23 | 0.66 | -0.01 |
| 15 | 60.00 | 20.00 | -0.29 | 0.58 | -0.01 | 0.95 | 0.20 | 0.02 | -0.03 | 0.96 | -0.02 |
| 16 | 75.00 | 4.00 | 0.18 | 0.27 | 0.00 | 0.21 | 0.41 | -0.00 | 0.37 | 0.05 | 0.03 |
| 17 | 75.00 | 8.00 | -0.57 | 0.09 | 0.02 | 1.50 | 0.01 | 0.11 | 0.21 | 0.58 | -0.01 |
| 18 | 75.00 | 12.00 | -0.62 | 0.18 | 0.01 | 0.07 | 0.94 | -0.04 | 0.24 | 0.62 | -0.02 |
| 19 | 75.00 | 16.00 | -0.90 | 0.09 | 0.02 | 0.12 | 0.86 | -0.03 | -0.43 | 0.50 | -0.01 |
| 20 | 75.00 | 20.00 | -1.12 | 0.04 | 0.04 | 1.18 | 0.16 | 0.03 | -0.40 | 0.47 | -0.01 |
| 21 | 90.00 | 4.00 | 0.11 | 0.54 | -0.00 | 0.39 | 0.10 | 0.02 | 0.68 | 0.00 | 0.11 |
| 22 | 90.00 | 8.00 | -0.30 | 0.33 | -0.00 | 1.68 | 0.00 | 0.15 | 0.29 | 0.46 | -0.01 |
| 23 | 90.00 | 12.00 | -0.61 | 0.17 | 0.01 | -1.00 | 0.40 | -0.01 | -0.67 | 0.20 | 0.01 |
| 24 | 90.00 | 16.00 | -0.93 | 0.09 | 0.02 | 0.00 | 1.00 | -0.07 | -0.68 | 0.28 | 0.00 |
| 25 | 90.00 | 20.00 | -1.31 | 0.04 | 0.04 | 1.08 | 0.26 | 0.01 | -0.54 | 0.42 | -0.01 |

Dependent variable: Number of attacks by government forces. Results are presented on the left-hand side, with the sizes of spatio-temporal units used in estimation. Placebo tests for 3 months and 6 months before the true treatment timing are presented on the middle and the right-hand side, respectively. Only interpretable estimates are presented. Note that far fewer spatio-temporal combinations produce significant results compared to rebel attacks, and positive estimates can still be seen in placebo tests, with the latter suggesting that the relationship is not clear.

Table F9: Overview of the Results with Government Attacks as the Dependent Variable (Matched Wake Analysis)

# G Regression results with the alternative definition of multiple coordinated attacks

As an alternative measure of multiple simultaneous attacks, I code the number of individual events which are –potentially– a part of coordinated effort, by defining multiple simultaneous attacks as 'more than one violent event which all happens on the same day and in the same province' (Afghanistan has 34 provinces). Although it is possible to coordinate simultaneous attacks across the country (or within a larger region than a single province), I limit the operationalisation to province level, since within larger areas it is difficult to distinguish whether these attacks are unrelated. However, it is very likely that militants operating within a single province know each other's activities and coordinate, both due to operational necessity and the likelihood of being from the same clan or tribe. These are more likely to be present in the context of Afghanistan, considering the nature of the Taliban, which is characterised by horizontal structures that reflect the segmented Pashtun tribal society (Ruttig, 2010). Replication analyses produce results that are distinctly similar to those of Table 3 and presented in Table G10 below.

| | DV: N. of Coordinated Attacks (*log*) | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Intercept | | 0.01*** | | | 0.011*** | |
| | | (0.002) | | | (0.002) | |
| 2G Coverage$_{t-1}$ | −0.047 | −0.032 | −0.039 | 0.002 | −0.008 | 0.006 |
| | (0.026) | (0.025) | (0.026) | (0.029) | (0.026) | (0.028) |
| 3G Coverage$_{t-1}$ | 0.391*** | 0.499*** | 0.377*** | 0.045 | 0.083 | 0.06 |
| | (0.047) | (0.057) | (0.055) | (0.086) | (0.078) | (0.08) |
| Troop presence$_{t-1}$ | 0.084* | 0.132*** | 0.075* | 0.095** | 0.12*** | 0.083* |
| | (0.035) | (0.007) | (0.032) | (0.037) | (0.009) | (0.033) |
| *log* Attacks$_{t-1}$ | | 0.248*** | | | 0.243*** | |
| | | (0.006) | | | (0.006) | |
| 2G$_{t-1}$ × Troops$_{t-1}$ | | | | −0.114 | −0.023 | −0.1 |
| | | | | (0.062) | (0.03) | (0.055) |
| 3G$_{t-1}$ × Troops$_{t-1}$ | | | | 0.498*** | 0.563*** | 0.494*** |
| | | | | (0.103) | (0.078) | (0.091) |
| $\rho$ (Spatial lag of DV) | | 0.542*** | 0.594*** | | 0.555*** | 0.596*** |
| | | (0.015) | (0.018) | | (0.015) | (0.018) |
| $\theta_{2G}$ (Spatial lag of 2G) | | −0.028 | −0.001 | | −0.024 | −0.004 |
| | | (0.03) | (0.031) | | (0.03) | (0.031) |
| $\theta_{3G}$ (Spatial lag of 3G) | | −0.111 | −0.121 | | −0.101 | −0.125 |
| | | (0.072) | (0.071) | | (0.072) | (0.071) |
| $\lambda$ (Spatial error parameter) | | −0.39*** | −0.47*** | | −0.41*** | −0.474*** |
| | | (0.026) | (0.029) | | (0.026) | (0.029) |
| District (Wuleswali) FE | ✓ | | ✓ | ✓ | | ✓ |
| Quarter-year FE | ✓ | | ✓ | ✓ | | ✓ |
| $t_{\beta_{3G}>\beta_{2G}}$ | 7.274 | 7.459 | 6.021 | 4.474 | 6.099 | 4.878 |
| AIC | | 11923.04 | | | 11866.28 | |
| Log Likelihood | | −5954.518 | | | −5924.14 | |
| Num. of obs. | 16716 | 16716 | 16716 | 16716 | 16716 | 16716 |
| Num. of spatial units | 398 | 398 | 398 | 398 | 398 | 398 |
| Num. of time periods | 42 | 42 | 42 | 42 | 42 | 42 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$. Standard errors are in parentheses.
A balanced panel dataset with 16716 observations (398 districts × 42 quarters) is used in all models.

Table G10: Regression results with the alternative definition of multiple coordinated attacks

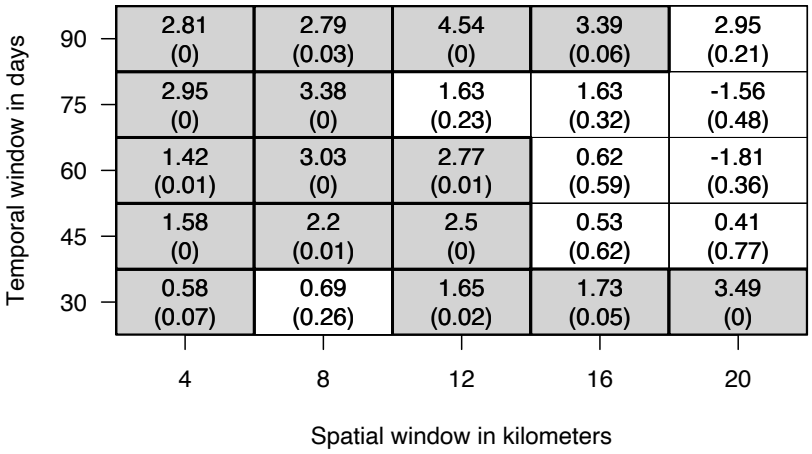
# H Regression results with binary values of 2G and 3G coverage

| | DV: N. of Attacks (*log*) | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Intercept | | 0.03*** | | | 0.036*** | |
| | | (0.004) | | | (0.004) | |
| 2G Coverage$_{t-1}$ (binary) | 0.03 | 0.04* | 0.03 | 0.029 | 0.022 | 0.026 |
| | (0.017) | (0.019) | (0.017) | (0.018) | (0.019) | (0.018) |
| 3G Coverage$_{t-1}$ (binary) | 0.034 | 0.063** | 0.044* | 0.01 | −0.019 | 0.026 |
| | (0.018) | (0.024) | (0.021) | (0.023) | (0.027) | (0.024) |
| Troop presence$_{t-1}$ | 0.228*** | 0.247*** | 0.207*** | 0.214*** | 0.181*** | 0.187*** |
| | (0.046) | (0.011) | (0.042) | (0.048) | (0.013) | (0.043) |
| *log* Attacks$_{t-1}$ | | 0.417*** | | | 0.408*** | |
| | | (0.006) | | | (0.006) | |
| 2G$_{t-1}$ × Troops$_{t-1}$ | | | | 0.014 | 0.1*** | 0.036 |
| | | | | (0.041) | (0.026) | (0.037) |
| 3G$_{t-1}$ × Troops$_{t-1}$ | | | | 0.063 | 0.195*** | 0.042 |
| | | | | (0.038) | (0.032) | (0.034) |
| $\rho$ (Spatial lag of DV) | | 0.382*** | 0.587*** | | 0.389*** | 0.588*** |
| | | (0.015) | (0.018) | | (0.015) | (0.018) |
| $\theta_{2G}$ (Spatial lag of 2G) | | −0.028 | −0.016 | | −0.025 | −0.015 |
| | | (0.024) | (0.023) | | (0.023) | (0.023) |
| $\theta_{2G}$ (Spatial lag of 3G) | | 0.017 | −0.027 | | 0.03 | −0.026 |
| | | (0.032) | (0.029) | | (0.032) | (0.029) |
| $\lambda$ (Spatial error parameter) | | −0.224*** | −0.495*** | | −0.233*** | −0.496*** |
| | | (0.024) | (0.029) | | (0.024) | (0.029) |
| District (Wuleswali) FE | ✓ | | ✓ | ✓ | | ✓ |
| Quarter-year FE | ✓ | | ✓ | ✓ | | ✓ |
| $t_{\beta_{3G}>\beta_{2G}}$ | 0.151 | 0.648 | 0.451 | 0.73 | 1.91 | 0.096 |
| AIC | | 21995.01 | | | 21907.11 | |
| Log Likelihood | | −10990.5 | | | −10944.56 | |
| Num. of obs. | 16716 | 16716 | 16716 | 16716 | 16716 | 16716 |
| Num. of spatial units | 398 | 398 | 398 | 398 | 398 | 398 |
| Num. of time periods | 42 | 42 | 42 | 42 | 42 | 42 |

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$. Standard errors are in parentheses.
A balanced panel dataset with 16716 observations (398 districts × 42 quarters) is used in all models.
Mean values for the 2G and 3G network coverage are used as cut-off values in the binary specification.

Table H11: Regression results using binary values for the 2G and 3G network coverage

# I Results including covariates in DD regression




Plots showing the treatment effect estimates from the difference-in-differences regression, with 2G as the control and 3G as the treatment group. $p$-values are shown in parentheses below each estimate. The dependent variable is the number of violent events by the insurgents. Statistically significant estimates at 0.1 level are shaded.

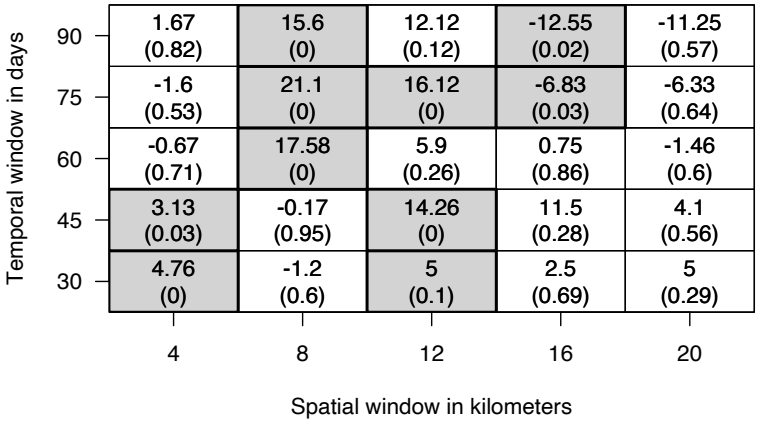
Figure I5: Results of matched wake analysis (with covariates included in DD regression)

| | Results | | | | | Before matching | | | | | | After matching | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time[days] | Space[km] | Effect Size | p.value | adj.$R^2$ | control | treat. | L1 | %CS | %SO | %MO | control | treat. | L1 | %CS | %SO | %MO |
| 1 | 30.00 | 4.00 | 0.58 | 0.07 | 0.49 | 339 | 157 | 0.67 | 14.40 | 0.77 | 0.14 | 152 | 152 | 0.49 | 18.60 | 0.51 | 0.29 |
| 2 | 30.00 | 8.00 | 0.69 | 0.26 | 0.58 | 339 | 157 | 0.73 | 10.50 | 0.82 | 0.24 | 139 | 139 | 0.51 | 20.30 | 0.60 | 0.44 |
| 3 | 30.00 | 12.00 | 1.65 | 0.02 | 0.59 | 339 | 157 | 0.74 | 9.40 | 0.84 | 0.27 | 129 | 129 | 0.50 | 18.60 | 0.66 | 0.52 |
| 4 | 30.00 | 16.00 | 1.73 | 0.05 | 0.74 | 339 | 157 | 0.76 | 9.40 | 0.85 | 0.29 | 116 | 116 | 0.47 | 17.90 | 0.67 | 0.54 |
| 5 | 30.00 | 20.00 | 3.49 | 0.00 | 0.79 | 339 | 157 | 0.77 | 9.20 | 0.85 | 0.29 | 119 | 119 | 0.54 | 16.40 | 0.68 | 0.55 |
| 6 | 45.00 | 4.00 | 1.58 | 0.00 | 0.46 | 339 | 157 | 0.67 | 14.30 | 0.78 | 0.16 | 140 | 140 | 0.44 | 18.30 | 0.54 | 0.31 |
| 7 | 45.00 | 8.00 | 2.20 | 0.01 | 0.43 | 339 | 157 | 0.74 | 11.10 | 0.84 | 0.26 | 133 | 133 | 0.49 | 20.00 | 0.65 | 0.46 |
| 8 | 45.00 | 12.00 | 2.50 | 0.00 | 0.47 | 339 | 157 | 0.76 | 9.40 | 0.86 | 0.31 | 148 | 148 | 0.54 | 15.20 | 0.73 | 0.54 |
| 9 | 45.00 | 16.00 | 0.53 | 0.62 | 0.58 | 339 | 157 | 0.77 | 9.00 | 0.87 | 0.32 | 125 | 125 | 0.56 | 15.60 | 0.75 | 0.55 |
| 10 | 45.00 | 20.00 | 0.41 | 0.77 | 0.79 | 339 | 157 | 0.78 | 9.10 | 0.87 | 0.33 | 129 | 129 | 0.51 | 15.60 | 0.75 | 0.57 |
| 11 | 60.00 | 4.00 | 1.42 | 0.01 | 0.53 | 339 | 157 | 0.68 | 14.20 | 0.81 | 0.17 | 119 | 119 | 0.49 | 18.60 | 0.56 | 0.33 |
| 12 | 60.00 | 8.00 | 3.03 | 0.00 | 0.48 | 339 | 157 | 0.74 | 11.00 | 0.86 | 0.28 | 134 | 134 | 0.48 | 19.00 | 0.68 | 0.48 |
| 13 | 60.00 | 12.00 | 2.77 | 0.01 | 0.56 | 339 | 157 | 0.78 | 9.10 | 0.88 | 0.32 | 121 | 121 | 0.55 | 15.80 | 0.75 | 0.55 |
| 14 | 60.00 | 16.00 | 0.62 | 0.59 | 0.64 | 339 | 157 | 0.78 | 9.80 | 0.88 | 0.33 | 147 | 147 | 0.60 | 17.10 | 0.77 | 0.57 |
| 15 | 60.00 | 20.00 | -1.81 | 0.36 | 0.71 | 339 | 157 | 0.80 | 8.80 | 0.89 | 0.34 | 140 | 140 | 0.59 | 14.30 | 0.77 | 0.59 |
| 16 | 75.00 | 4.00 | 2.95 | 0.00 | 0.47 | 337 | 146 | 0.69 | 13.50 | 0.82 | 0.22 | 110 | 110 | 0.49 | 17.90 | 0.59 | 0.36 |
| 17 | 75.00 | 8.00 | 3.38 | 0.00 | 0.50 | 337 | 146 | 0.76 | 9.50 | 0.87 | 0.31 | 130 | 130 | 0.48 | 18.00 | 0.70 | 0.52 |
| 18 | 75.00 | 12.00 | 1.63 | 0.23 | 0.51 | 337 | 146 | 0.77 | 9.20 | 0.89 | 0.33 | 115 | 115 | 0.44 | 18.50 | 0.76 | 0.58 |
| 19 | 75.00 | 16.00 | 1.63 | 0.32 | 0.60 | 337 | 146 | 0.77 | 9.80 | 0.89 | 0.33 | 129 | 129 | 0.59 | 16.90 | 0.78 | 0.60 |
| 20 | 75.00 | 20.00 | -1.56 | 0.48 | 0.73 | 337 | 146 | 0.78 | 8.60 | 0.89 | 0.35 | 137 | 137 | 0.58 | 14.50 | 0.79 | 0.62 |
| 21 | 90.00 | 4.00 | 2.81 | 0.00 | 0.54 | 336 | 146 | 0.69 | 13.10 | 0.84 | 0.28 | 124 | 124 | 0.55 | 14.80 | 0.64 | 0.42 |
| 22 | 90.00 | 8.00 | 2.79 | 0.03 | 0.45 | 336 | 146 | 0.75 | 10.20 | 0.88 | 0.38 | 123 | 123 | 0.50 | 20.00 | 0.74 | 0.56 |
| 23 | 90.00 | 12.00 | 4.54 | 0.00 | 0.47 | 336 | 146 | 0.75 | 9.00 | 0.89 | 0.40 | 131 | 131 | 0.55 | 20.70 | 0.77 | 0.62 |
| 24 | 90.00 | 16.00 | 3.39 | 0.06 | 0.55 | 336 | 146 | 0.77 | 9.60 | 0.90 | 0.41 | 141 | 141 | 0.61 | 17.60 | 0.79 | 0.62 |
| 25 | 90.00 | 20.00 | 2.95 | 0.21 | 0.63 | 336 | 146 | 0.78 | 9.40 | 0.90 | 0.43 | 133 | 133 | 0.57 | 16.40 | 0.79 | 0.68 |

Results are presented on the left-hand side, with the sizes of spatio-temporal units used in estimation. Summary statistics of the sample before and after matching are presented on the middle and the right-hand side, respectively. *L1* distance metric and the common support summarise the similarity of the distribution of covariates between the treatment and control units. %CS: percentage of common support, %SO: percentage of same overlap, %MO: percentage of mixed overlap.

Table I12: Overview of the Matched Wake Analysis Results (with covariates included in DD regression)

# J Results excluding Kabul City




Plots showing the treatment effect estimates from the difference-in-differences regression, with 2G as the control and 3G as the treatment group. $p$-values are shown in parentheses below each estimate. The dependent variable is the number of violent events by the insurgents. Statistically significant estimates at 0.1 level are shaded.

Figure J6: Results of matched wake analysis (excluding Kabul City)

# K Map of 2nd level administrative units (Wuleswali)

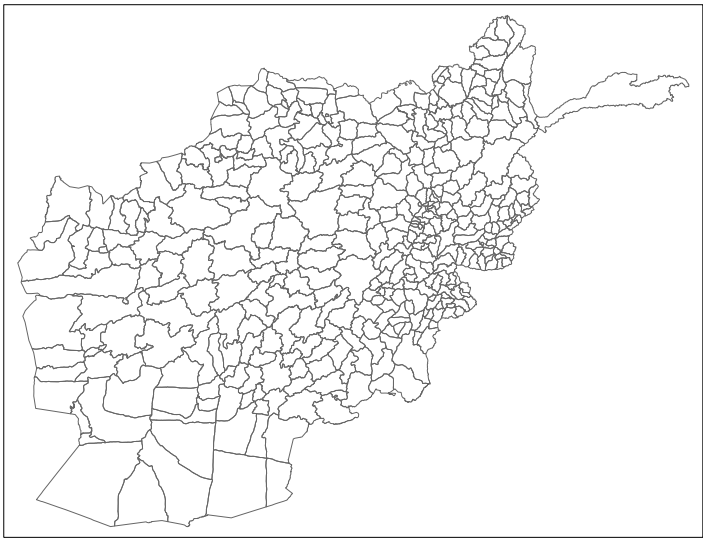


Figure K7: Map of 2nd Level Administrative Areas (Wuleswali)

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