Appendix Material

**A1. Additional Summary Statistics on Violence**

**Attacks and Fatalities**

*Iraqi Civilian Fatalities*

Our primary source for data on violent civilian fatalities comes from the IraqBodyCount.org (IBC) website. The principal researchers are Hamit Dardagan and John Sloboda. It is important to note upfront that the website is partisan—that is, anti war. However their methodology is conservative and seeks to provide an accurate lower bound for the number of violent civilian deaths reported. The data were downloaded from <http://www.iraqbodycount.org/database/>.

Once there are two news sources reporting an incident, two measures are constructed, *reportedminimum* and *reportedmaximum*. If multiple numbers are reported, the lowest is entered as *reportedminimum*. This can be zero if “zero deaths” is reported. However, a wording like “unable to confirm any violent civilian deaths” is not a report of zero deaths and thus is not entered in either column. Moreover, when the report does not mention civilians specifically, this number is entered in the *reportedmaximum* variable but zero is entered into the *reportedminimum* variable unless the proportion of violent civilian deaths is given or a similar detail is given.) If a “family” is reported killed, this is entered as three deaths.

*Violence against Coalition Forces*

The Empirical Studies of Conflict project compiled data on key violent outcomes: SIGACT-III data on attacks against Coalition Forces. This data was provided to us in aggregated form at the district-month level. These data include the month and year, whether the attack was during day or night, and district of attack.

*Commander’s Emergency Response Program Data* The data on reconstruction spending comes from a database used by Coalition Forces in Iraq which provides project-level data on CERP projects. It is important to note that the database does not cover all reconstruction spending in Iraq, only data from the CERP program—it does not include data on spending from non-military US government sources or private reconstruction efforts. The database includes data on the dates the project began and ended, the total cost of the project, the CERP sub-sector (a legal authority for funding based on a collection of authorized project types, such as Electricity, Education, or Water & Sanitation), and the military division-level area of responsibility in which the project was located.



Appendix Figure 1. Autocorrelation in Attacks

Notes: Military Incidents are defined as any significant action against Coalition Forces. Data on military incidents based on SIGACTS database provided by the Princeton Empirical Study of Conflict Project (Berman, Felter, Shapiro, 2008). Dependent variables are scaled to be per 10,000 inhabitants with population estimates based on World Food Program Household Survey (2007).

Appendix Table 1. Attacks by type of attack and Province

|  |  |  |  |
| --- | --- | --- | --- |
|   | Attacks with Civilian Fatalities | Total Civilian Fatalities | Attacks on Coalition Forces |
| Panel A: Attacks and Fatalities by Type and Time of Attack |
| Total | 0.41 | 1.73 | 26.08 |
| Car Bombs | 0.026 | 0.147 | -- |
| Roadside Bombs | 0.049 | 0.989 | -- |
| Suicide Bombs | 0.026 | 0.291 | -- |
| Other Bombs | 0.013 | 0.042 |  |
|  |  |  |  |
| Drive-by Shooting | 0.017 | 0.027 |  |
| Small Arms Fire | 0.192 | 0.608 |  |
| Indirect Fire | 0.029 | 0.082 |  |
|  |  |  |  |
| Execution | 0.057 | 0.35 |  |
| Torture | 0.013 | 0.06 |  |
|  |  |  |  |
| Daytime Incidents |  |  | 22.47 |
| Nightime Incidents |  |  | 35.03 |
| Panel B: Attacks by Province |
| Anbar | 1.121 | 4.570 | 48.263 |
| Babil | 0.818 | 2.564 | 4.077 |
| Baghdad | 0.389 | 0.389 | 1.556 |
| Basrah | 1.420 | 2.797 | 6.913 |
| Diyala | 0.772 | 2.606 | 27.305 |
| Erbil | 10.568 | 75.748 | 11.074 |
| Kerbala | 0.730 | 1.104 | 0.711 |
| Missan | 0.265 | 0.756 | 1.205 |
| Muthanna | 2.321 | 8.096 | 33.915 |
| Najaf | 0.165 | 2.470 | 0.268 |
| Ninewa | 0.555 | 3.007 | 0.876 |
| Qadissiya | 2.048 | 4.331 | 21.674 |
| Salah Al-Din | 0.717 | 1.285 | 1.757 |
| Sulaymaniyah | 1.213 | 6.675 | 10.355 |
| Tameen | 1.541 | 4.166 | 4.606 |
| Thi-Qar | 0.469 | 2.346 | 1.747 |
| Wassit | 2.020 | 5.941 | 39.844 |

**A2. Additional Information on Military Rotations**

The major concern for our exclusion restriction comes from the possibility that particular division headquarters are moved from one area to another based on current or anticipated violence levels. However, division headquarters movements were planned well in advance with the CENTCOM Force Requirements Enhanced Database (FRED) and it is virtually impossible to change the planned movement of a division headquarters with even a few months’ notice. Provided that there is not autocorrelation in violence levels over periods longer than the time required to reassign, the movement of a division headquarters, and the reshaping of division AORs once they arrive is small, the assignment of division headquarters to areas cannot be correlated with contemporaneous violence. Appendix Figure 1 demonstrates that the autocorrelation in violence is not long enough to assign divisions based on unit characteristics or preferences. This evidence supports our assumption that force rotations are independent of other determinants of violence.

Appendix Table 2. Number of District Weeks Held by Each US Armed Forces Division

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 101 AB | 11 ACR | 1 AD | 1 CD | 1 SB | 25 ID | 3 ID | 3 SB | 42 ID | 4 ID | 82 AD | 1 MEF | 2 MEF |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Abu Ghraib | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 111 | 101 |
| Ain Al-Tamur | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Akre | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Adhamiya | 0 | 0 | 13 | 101 | 0 | 0 | 48 | 0 | 0 | 59 | 0 | 0 | 0 |
| Al-Ba'aj | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Al-Daur | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Falluja | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 111 | 101 |
| Al-Faris | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Al-Hai | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 |
| Al-Hamdaniya | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Hashimiya | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Hatra | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Al-Hawiga | 43 | 0 | 29 | 48 | 0 | 57 | 0 | 0 | 39 | 5 | 0 | 0 | 0 |
| Hilla | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Al-Hindiya | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Al-Ka'im | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 111 | 101 |
| Kadhimiya | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 111 | 101 |
| Al-Khalis | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Kufa | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Kut | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 |
| Al-Mada'in | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Al-Mahawil | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Mahmudiya | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Al-Manathera | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Mosul | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Al-Muqdadiya | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Al-Musayab | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Al-Na'maniya | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 |
| Najaf | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Ramadi | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 111 | 101 |
| Al-Rutba | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 111 | 101 |
| Al-Shikhan | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Al-Shirqat | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Al-Suwaira | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amedi | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Ana | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 111 | 101 |
| Ba'quba | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Badra | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 |
| Baiji | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Balad | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Baladrooz | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Chamchamal | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Choman | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Daquq | 43 | 0 | 29 | 48 | 0 | 57 | 0 | 0 | 39 | 5 | 0 | 0 | 0 |
| Darbandihkan | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Dahuk | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Erbil | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Haditha | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 111 | 101 |
| Heet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 111 | 101 |
| Kalar | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Kerbala | 0 | 0 | 0 | 22 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 | 0 |
| Khanaqin | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Kifri | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Kirkuk | 43 | 0 | 29 | 48 | 0 | 57 | 0 | 0 | 39 | 5 | 0 | 0 | 0 |
| Koisnjaq | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Makhmur | 43 | 0 | 29 | 48 | 0 | 57 | 0 | 0 | 39 | 5 | 0 | 0 | 0 |
| Mergasur | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Samarra | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Shaqlawa | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Shekhan | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Sinjar | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Soran | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Sulaymaniya | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |
| Sumel | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Telafar | 40 | 48 | 25 | 0 | 17 | 56 | 0 | 35 | 0 | 0 | 0 | 0 | 0 |
| Tikrit | 44 | 0 | 25 | 48 | 0 | 56 | 0 | 0 | 39 | 9 | 0 | 0 | 0 |

**A3. Single Instrument Robustness**

Identification comes from the change in project spending over time, for a given division. This difference may arise because of the changes in funding allocation over time. Our claim is that different divisions or commanders at the division level may have different preference for labor vs. capital intensive spending projects. Units with labor specific preferences may increase either proportionally or greater than proportionally the fraction of labor intensive projects in the areas in which they control. In contrast, divisional units with non-labor specific preferences may reduce the fraction of labor intensive projects in their areas of control. Using changes in the total available funds as well as rotation patterns of the divisions we can estimate a first stage of fraction of labor intensive projects on units. To do this in the most flexible specification we estimate a three-way interaction between each unit *u* in some district *j,* during period of high funding where then we have a vector of *u* instruments:

 (A1)

To provide greater intuition on this instrument, we can use a simple specification with a single unit:

 (A2)

In the first stage equation (5), *infantry* is an indicator variable that is 1 if an infantry unit is in charge of district *j* during period of high funding *t*. The fixed effects then include a district specific effect (δj), a time specific effect (τt) and a unit specific effect (μu).

Using the predicted fraction of labor intensive projects we can then estimate the second stage regression akin to equation (4) but replacing fixed effects for the more explicit covariate controls.

 (A3)

In equation (5), γD, γT, γU represent fixed effects for district, week, and unit respectively. We can also estimate a reduced form using the single instrument from equation (5).

 (A4)

The estimates of γ1 and λ1 provide estimates for the aggregate effect of changes in wages (or labor demand) on production of violence (either attacks or deaths per attack). The theoretical framework used to derive these estimating equations has an additional set of predictions. If capital is fixed in the short term and thus insurgent groups cannot instantaneously adjust to use more capital intensive forms of violence, then estimating equation (6) or (7) for labor intensive forms of violence should produce a consistent estimate of the true elasticity of insurgency labor supply with respect to legal sector wages. Moreover, estimating equation (6) and (7) for capital intensive forms of violence production should produce *no* change in the number of attacks. Thus we have three main predictions (1) overall attacks should decline, although the magnitude of that decline is ambiguous; (2) conditional on a given level of attacks, the fraction of labor intensive forms of violence should decline, and (3) conditional on a given level of attacks, the fraction of capital intensive forms of violence should rise.



Non-”Labor-Preferring” Divisions

“Labor-Preferring” Divisions

Appendix Figure 2. Construction Project Spending by Military Division

Notes: Fraction of projects that are labor intensive are defined as projects with greater than 50% of total project expenditures spent on construction.

Appendix Table 3. First Stage Estimation with Single and Multiple Instruments

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|   | (1) | (2) | (3) | (4) | (5) | (6) |
|  | Fraction of projects which are Construction | Net New Construction Projects  | Total Labor Expenses |
| Dependent Variable Mean | 0.3715 | 3.4277 | 0.7742 |
| Panel A: Single Variable Instrument |
| *(Light Unitjd)\*(highfundst)* | 0.0318 | 0.0311 | 2.1729\* | 1.9851\* | 0.3337\*\* | 0.2212\* |
| (1 if light division is in charge of  | (0.0275) | (0.0264) | (1.3387) | (0.9305) | (0.1579) | (0.1261) |
| an area in High funding periods) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| *Light Unit*  | 0.0456 | 0.0457 | -0.2970 | 0.7471\*\* | 0.1189 | 0.1110\* |
| (Units with few armoured vehicles) | (0.0287) | (0.0283) | (0.7043) | (0.3202) | (0.0964) | (0.0562) |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| *Expenditures*  |  | 0.0088\*\*\* |  |  |  | 0.6388\*\*\* |
| (Total spending on all CERP Projects) |  | (0.0018) |  |  |  | (0.1142) |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Expenditures on CERP |  | 0.0001 |  |  |  | 0.0736 |
| Projects)\*(Light Unit) |  | (0.0019) |  |  |  | (0.0671) |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| *Net New Projects* |  | 0.0001 |  | 0.4031\*\*\* |  |  |
| (CERP Projects begun –  |  | (0.0003) |  | (0.0145) |  |  |
| CERP Projects ended) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| (*Net New Projects*) \* (*Light Unit*) |  | 0.0002 |  | -0.0035 |  |  |
|  |  | (0.0002) |  | (0.0079) |  |  |
| Panel B: Multiple Variable Instrument |
| F(1, 16) for excluded instrument | 0.01 | 0.10 | 4.24 | 20.91 | 11.57 | 17.22 |
| (p-value) | (0.9262) | (0.9441) | (0.0562) | (0.9971) | (0.9981) | (0.9983) |
|  |  |  |  |  |  |  |
| District Fixed-Effects | Y | Y | Y | Y | Y | Y |
| Month-Year Fixed Effects | Y | Y | Y | Y | Y | Y |
| Number of observations  | 43760 |

Notes: Standard errors reported parentheses clustered at the military division area-of-operation level. Coefficients marked with \*\* (\*, \*\*\*) are significant at the 0.05 (0.10, 0.01) level. A unit of observation is a district-month-year. District-month-years controlled by non-US forces (e.g. UK or Poland) are excluded from analysis. Dependent variable average flow of projects is the number of new projects begun in a district week. Fraction of projects that are labor intensive are defined as projects with greater than half of total project expenditure from construction. High funds periods are Sep 30, 2005-sep 29,2006; Dec 31, 2006-Sep 29 2007 and Sept 30, 2007-Jun 2008. Light Unit instrumental variable is 1 if the following units control a district: Light Divisions 101st Airborne Division 25th Infantry Division, 1st Infantry Division, 82nd Airborne Division 1st Stryker brigade, or 10th Mountain Division. Light Unit instrumental variable is 0 if the following units control a division: 3rd Infantry Division, 4th Infantry Division, 11th Armored Cavalry, 1st Armored Division. Multiple instrument specification includes an indicator variable for each of the listed units and an interaction term between each unit and the high funds periods.