Appendix to "Security Transitions"

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A Spillover Controls

We bring a new spatial econometric tool to the broader conflict literature in economics and political science, helping researchers account for latent dependency in the spillovers of violence across space. Existing approaches require the researcher to pre-specify the dependence structure (e.g., physical proximity) and are insufficient in the presence of autocorrelation driven by factors unknown to the researcher (see, for example, Berman et al., 2017; Mueller et al., 2017; Ferrara and Harari, 2018). This is likely the case when studying conflict dynamics, where the use of violence may be linked across locations through factors beyond physical distance. We instead extend the framework by de Paula et al. (2019) to learn about the pattern of spillovers from within the data itself, applying it to a context where potential biases from conflict displacement could be significant.

We write the Equation (4) in a more concise notation by collecting the $w_{i,j}$ in a $N \times N$ matrix W. In our case, i represents a district; hence, $w_{i,j}$ is stated as $w_{d,j}$ in the manuscript for ease of interpretation. Matrix W is often known as the spatial, neighboring or adjacency matrix. We also stack the other elements to write the model

$$y_t = \alpha + \beta_t + \rho W y_t + \gamma \text{Handover}_t + \delta W \cdot \text{Handover}_t + \eta \times t + \epsilon_t \tag{A1}$$

where y_t, α, β_t, Handover_t and ϵ_t are, respectively, the column-vector of outcomes, district fixed effects, regional command time trends, $\text{Handover}_{d,t}$ treatment indicators and error term, for all regions and districts at a given point in time.

A few special cases of Equation (A1) are of interest. First, if $\delta = \rho = 0$ there are no spillover effects and the specification above boils down to Equation (1). Second, setting only $\rho = 0$ leads to spillover specification with controls for exogenous effects. We offer both the versions with $\rho = 0$ and freely estimated without restrictions, such as typical in models of social interactions (Blume et al., 2015). It is worth also mentioning that if either ρ or δ are not equal to zero, than identification of the treatment effects through the standard difference-in-differences in model (1) might be compromised as untreated units suffer from spillovers from the treated ones, and the comparison between treated and control no longer accounts for the treatment (transition) effects (SUTVA violation). This is particularly relevant as, throughout the exercise, our interest is in evaluating the robustness of the estimates of γ with respect to alternative formulations of the spillover effects.

The choice of the set of weights $w_{i,j}$ attracts particular prominence in our context because it reflects the extent to which the insurgents are able to displace across districts. This is the case for example, in Mueller et al. (2017), Ferrara and Harari (2018) where $w_{i,j}$ depends on some inverse function of distance; or in Berman et al. (2017) where it reflects ethnic control of mines in Africa. In turn, this would translate into specific assumptions on the mechanism that underpins conflict displacement. This is particularly limiting as it is not ex-ante clear how the insurgency displaces in space. In reality, insurgent activity is potentially highly mobile, and the transition to ANSF might have induced a strategic reallocation of insurgent activity to districts elsewhere. Furthermore, it would be in their interest to obfuscate their displacement strategy, so as not to make their movements predictable by the occupying forces. In such case, the weights can hardly be assumed to be ex-ante known by the empiricist.

We both pre-specifying W according to various measures of distance and, to overcome the issue that the patterns of spatial dispersion are not necessarily observed, we also opt to recover it from the data. To do so, we apply the method in de Paula et al. (2019) which allows us to fully and flexibly recover the network matrix W from the panel data. The method provides a high-dimensional technique to deal with a large number of parameters. Furthermore, the authors show that W and the parameters ρ, γ and δ are globally identified. The purpose of this Section is to review and provide an adaptation of their methodology.

The method in de Paula et al. (2019) postulates that W, ρ, γ and δ are globally identified under the assumption of the variation in the composition of reference groups to identify the spatial effects. Such type of assumptions which originate from the network asymmetry have been shown to overcome the "reflection problem" as first postulated by Manski (1993). In line with de Paula et al. (2019), we additionally require the following standard regularization conditions: *(i)* no district affects itself, and so the main diagonal of W is equal to zero, $W_{ii} = 0$ for every $i = 1, \ldots, N$, ruling out a trivial solution to the model; *(ii)* the row-sums of W are smaller than one in absolute value, $\sum_{j=1}^{N} |W_{ij}| \leqslant 1$ for every $i = 1, \ldots, N$ and $|\rho| < 1$, ensuring that the system of equations is stationary in the spatial sense and the inverse of $(I - \rho W y_t)$ is well defined; *(iii)* there is one row i such that $\sum_{j=1}^{N} W_{ij} = 1$, which is a simple normalization; and, finally, *(iv)* the spatial effects do not cancel each other out, $\rho\gamma + \delta \neq 0$. We apply the method on the residualized y_t and x_t after projecting on the space generated by the fixed effects. We make use of moment conditions given by the orthogonality between Handover_t and the error term to formulate moment conditions $g_{NT}(\theta)$ where the full set of structural parameters is given by $\theta = (\rho, \gamma, \delta, w_{12}, \ldots, w_{N,N-1})$. The first step in the Adaptive Elastic Net GMM is the solution to

$$\tilde{\theta}(p) \;=\; (1 + p_2/T) \cdot \underset{\theta \in \mathcal{R}^K}{\arg\min} \left\{ g_{NT}(\theta)' g_{NT}(\theta) + p_1 \sum_{i,j=1, i\neq j}^{N} |w_{i,j}| + p_2 \sum_{i,j=1, i\neq j}^{N} w_{i,j}^2 \right\}$$

where K is the number of parameters to be estimated, equal to $N(N-1)+3$, and p_1 and p_2 are the non-negative penalization terms. The term $g_{NT}(\theta)' g_{NT}(\theta)$ is the GMM objective criteria. The first penalization term linearly increases the objective function for every $w_{i,j}$ estimated as non-zero. As the penalization increases, more elements $w_{i,j}$ are estimated as zeros. The second term penalizes for the sum of the square of the links between units. This term has been shown to provide a more stable solution to the problem.

Finally, it has been shown that the solution to the first step alone would bias the estimates towards zero. To alleviate this problem, the estimates from the first step are refined in the adaptive stage,

$$\tilde{\theta}(p) \;=\; (1 + p_2/T) \cdot \underset{\theta \in \mathcal{R}^K}{\arg\min} \left\{ g_{NT}(\theta)' g_{NT}(\theta) + p_1^* \sum_{i,j=1, i\neq j}^{N} \frac{|w_{i,j}|}{|\tilde{w}_{i,j}|^{-k}} + p_2 \sum_{i,j=1, i\neq j}^{N} w_{i,j}^2 \right\}$$

where typically $k = 2.5$, and the full set of penalization parameters (p_1, p_1^*, p_2) is chosen by BIC.

The results of the analysis are presented in Tables A4 and A5. The first column shows the results of Equation (A1) without spillover controls, thus equal to the difference-in-differences and IV specifications. Columns (2)-(7) present the results of the specification with exogenous effects and for various pre-conditioned distance matrices W. These assume that the spillover affect neighbor districts, neighbor or neighbor-of-neighbor districts, neighbor province, distance below 250km and 500km and driving distance below 500km. Columns (8)-(10) apply the method in de Paula et al. (2019), restricting the interaction of districts beyond 500km and 1000km driving distance to zero. Column (10) includes endogenous effects. In both tables, and across most specifications, we find that the main treatment effects – the security handover in Table A4, and troop withdrawal in Table A5 – remain robust to the inclusion of spillover controls.

B Distant Gridcell Pair Matching

In an attempt to relax the identification assumption that underlies our main district level difference-in-differences approach, we change the unit of analysis to 10×10 km gridcells. The choice of 10 x 10 km gridcells is appealing as this resolution is the basis of the geo-coordinate standard used by NATO militaries for locating points on the earth. This is only possible for the SIGACTS data, as the ANQAR survey data is reported at the district level. In the resulting high-resolution dataset, we construct pairs of matched gridcells. We rely on purely geographical characteristics of gridcells measured at baseline, such as: grid level population (as of 2008), elevation, distance to nearest asphalt road, distance to nearest road, and distance to the nearest airport. In addition we use land cover data and construct the share of grid cells covered by different land cover type across sixteen land cover classes using the detailed 500m pixel resolution MODIS product (Channan et al., 2014). We proceed by constructing these matched pairs sequentially sampling without replacement: we first find matches for grid cells in the first transition waves by sampling from cells in later waves, only retaining matched pairs that are sufficiently similar with a propensity score difference of less than 0.001.[1] Our main estimating sample is chosen such that matched pairs are at least 200km apart (we call these distant matched pairs). This strategy allows us to rule out displacement effects, which could affect estimates relying on close matched pairs.

The estimating specification for the distant matched panel difference-in-differences is as follows:

$$y_{i,p,d,t} = \alpha_i + \beta_{p,t} + \gamma \times \text{Handover}_{d,t} + \eta_d \times t + \epsilon_{i,p,d,t} \tag{A2}$$

As before, the level of analysis is gridcell i, that is part of a matched pair p located in district d, and month t. We include matched-pair specific time fixed effects $\beta_{p,t}$. These are very demanding, as for every matched pair, we allow conflict to be on a different trajectory common only to the cells that form the matched pair. This zooms in to any time-varying changes that are specific to the matched-pair and accounts for any non-linear trends specific to the propensity score. As in earlier specifications, $\text{Handover}_{d,t}$ switches on when ANSF takes over from ISAF. Since the distant matched pair panel is very granular (both in terms of time and geography), we use dummy variables as outcomes capturing the incidence of a conflict event within a given gridcell-month as a more meaningful measure of conflict activity. The crucial identifying assumption remains that there are common trends in conflict levels across observationally similar distant matched grid cells in the different transition phases. Table A9 shows that we achieve improved balance on conflict characteristics compared to the district level when resorting to the distant matched pair analysis, yet, some important baseline differences still exist. As with the district-level difference-in-differences strategy, event studies around the transition dates (in Figure A3) and the estimation of pre-treatment effects (in Panel B of Figure A4) provide evidence in support of the common trend assumption. Results for the gridcell analysis are presented in Table A10, along with event study graphs in Figure A3. The gridcell-level outcomes show reductions in

[1]This approach could result in a decay in match quality for later transition rounds, as the set of available grid cells for matching becomes smaller. It turns out that the average estimated propensity score does not systematically differ between early versus late transition rounds.

violence that are larger although it should be kept in mind that this is at the extensive margin of our violence outcomes.

C Supplemental discussion of mechanisms

C.1 Complementarities in war fighting

In the main text, we highlight several types of complementarities. In this section, we expand on the discussion of the main text and link our argument to the existing literature on insurgent tactics.

Complementarities could arise because ISAF monitors the ANSF and provides military support after local forces take operational command. In particular, we might expect that foreign forces would offer additional evaluation of Afghan forces (leading to improved conduct assessments), provide additional material support in terms of development assistance, and be marginally more likely to respond to violent events that trigger combat support following the security handover. We could find no clear evidence of these types of complementarities — shifts in monitoring, aid delivery, or war fighting support (see Tables 6 and A12). In the text, we also present a brief sketch of a distinct complementarity: an unobserved shock to state capacity occurred just after each local transition announcement and reversed after foreign withdrawal. Here we provide some additional context and references. A shock of this type might be a large shift in the stock of weapons available to Afghan forces, which were depleted by the time coalition forces exit. Another shock might be coordinated crackdowns during the transition period, possibly boosted by the combined troop levels of ANSF and ISAF. However, shocks of this type would have observable implications for the levels and composition of insurgent attacks. Theoretical accounts, most importantly Powell (2007) and Bueno de Mesquita (2013), suggest insurgents should substitute conventional, labor-intensive combat (e.g., direct fire engagements) for guerrilla style attacks (e.g., IEDs) when faced with capacity shocks. Empirical findings from a variety of contexts yield evidence consistent with such a tactical shift (Iyengar et al., 2011; Wood, 2014; Wright, 2016; Vanden Eynde, 2018). In our setting, we would expect a shock to the Taliban's capacity to induce a downward shift in direct fire and an increase in roadside bomb deployment. We find no evidence of such a composition shift (see Tables 1 4). Instead, conventional and guerrilla attacks each decline during the first phase of the transition and jointly increase after the actual closure of bases. This pattern is more consistent with a strategic choice by the Taliban to reduce all types of violence after the transition, and to step up violence after the troop withdrawal. Overall, we find the complementarity mechanism lacks a compelling empirical foundation.

C.2 Lying Low

The central role of the simple model presented in the text is to situate the conflict patterns we observe in a formalized framework. In this section, we introduce qualitative evidence regarding the information about the relative capacity of ANSF and Taliban forces available to ISAF forces during the security transition. This evidence addresses one of the central assumptions of our simple formalization of the lying low mechanism: the relative capacity of Afghan combatants—ANSF and Taliban—was uncertain during the security transition. A summary of this evidence is included in the main text, but this section provides a more detailed discussion. We also discuss the relevance of this mechanism in other settings.

C.2.1 Monitoring Relative Capacity

Despite significant resources allocated to monitoring and assessing ANSF forces, this effort was hampered by several factors. Taliban troop force level estimates were very inconsistent at a macro-scale and likely unreliable at the local level (district).[2] Prior to the security transition, Afghan military and expert estimates of Taliban troop levels ranged from 2,000 to 40,000. Following the security transition, US military assessments have suggested the Taliban maintains between 20,000 and 60,000 troops (Sopko, 2019). In 2018, a US official suggested estimating Taliban troop levels is a "fool's errand."[3] Assessing Taliban strength is also complicated by a dearth of credible intelligence about Taliban resources (Giustozzi, 2019). Anticipating what weaponry and

[2]See `https://bit.ly/3nvEMJG`.

[3]See `https://nbcnews.to/3lDCzLt`.

force projection the Taliban could deploy in a given fighting season was challenging as the sources of Taliban taxation were varied and difficult to monitor and assess in real time (Buddenberg and Byrd, 2006; Peters, 2009; Mansfield, 2016). In addition to difficulties in tracking Taliban strength, attrition in local security forces made force level monitoring difficult. The Special Inspector General For Afghanistan Reconstruction (SIGAR) 'Lessons Learned' assessment of the transition highlighted several important challenges. From 2004 to 2014, attrition rates hovered between 25% and 33% (SIGAR, 2017, 81, 156). Assessing training, preparation, and armaments was even more difficult due to corruption and self-serving trainer assessments (SIGAR, 2017, 84-85, 171):

> Corrupt behavior was shown to affect force strength numbers via high attrition rates, and to further perpetuate criminal behaviors, such as pay-for-play schemes; the theft of fuel, supplies, and commodities; and narcotics collusion... DOD forecasts and targets for force readiness were largely based on the U.S. military's capacity for recruitment and training, and not based on battlefield performance and other factors corroding the force. Issues such as ghost soldiers, corruption, and high levels of attrition were more critical than training capacity to measure true [ANSF] capabilities.

More broadly, establishing the relative fighting capacity of ANSF and Taliban troops at a local level was complicated by subjective force preparation standards (SIGAR, 2017, 170). These standards—rating definition levels (RDLs)—changed during the transition in a manner that kept assessments from being backwards compatible (SIGAR, 2013, 89). At the same time, there was a shift during the transition from evaluating battalions, which would have been over one or more districts, to brigades ('kandak'), which serve one or more provinces. This change, from the Commander's Unit Assessment Tool (CUAT) to the Regional Command ANSF Assessment Report (RASR), reduced actionable field assessments from the original 827 national army and police units to 85 unit reports (SIGAR, 2013, 90). This "new assessment system not only incorrectly measured [ANSF] capabilities, it masked fundamental weaknesses in the [ANSF] institutional framework that the United States and coalition ignored or minimized" (SIGAR, 2017, 85). These factors significantly reduced the amount of high quality district-specific information about local ANSF preparedness to engage with Taliban forces available to ISAF forces (SIGAR, 2017, 171):

> Because U.S. military plans for [ANSF] readiness were created in an environment of politically constrained timelines—and because these plans consistently underestimated the resilience of the Afghan insurgency and overestimated [ANSF] capabilities—the [ANSF] was ill-prepared to deal with deteriorating security after the drawdown of U.S. combat forces.

C.2.2 Other Examples

The lying low mechanism we describe is plausibly relevant in a range of other contexts. The number of active occupations globally is substantial and is most directly linked to this mechanism if and when foreign forces transition security assistance to local actors. It is also relevant in non-occupation contexts where peacekeeping forces are present and international organizations are assessing the viability of a timetable for shifting basic functions, including policing and public goods delivery, to local actors on one or both sides of the conflict.

The underlying signalling game is also relevant in non-counterinsurgency settings, including the drawdown of NATO forces around the globe. As international actors pull back, they assess the durability of political or economic institutions when confronted by regional or global rivals. These rivals may strategically manipulate signals of institutional resilience until those actors have completely withdrawn and the costs of reconstituting alliance commitments is large.

A similar logic is present when governments develop and field anti-corruption programs. Illicit actors, recognizing the type and duration of the government's intervention, may strategically manipulate perceptions of programming effectiveness. This is particularly relevant if the program is a short-run trial, like a randomized controlled field experiment, used to guide broader reforms. The corrupt network would have an incentive to manipulate inferences by responding strategically to treatment if it is known. This is related to the strategic response described in Cruz et al. (2020), where mayoral candidates, aware of a field experiment in the Philippines, used vote buying to offset the anticipated effects of an informational campaign about use of municipal development funds.[4]

[4] We thank an anonymous reviewer for highlighting these points.

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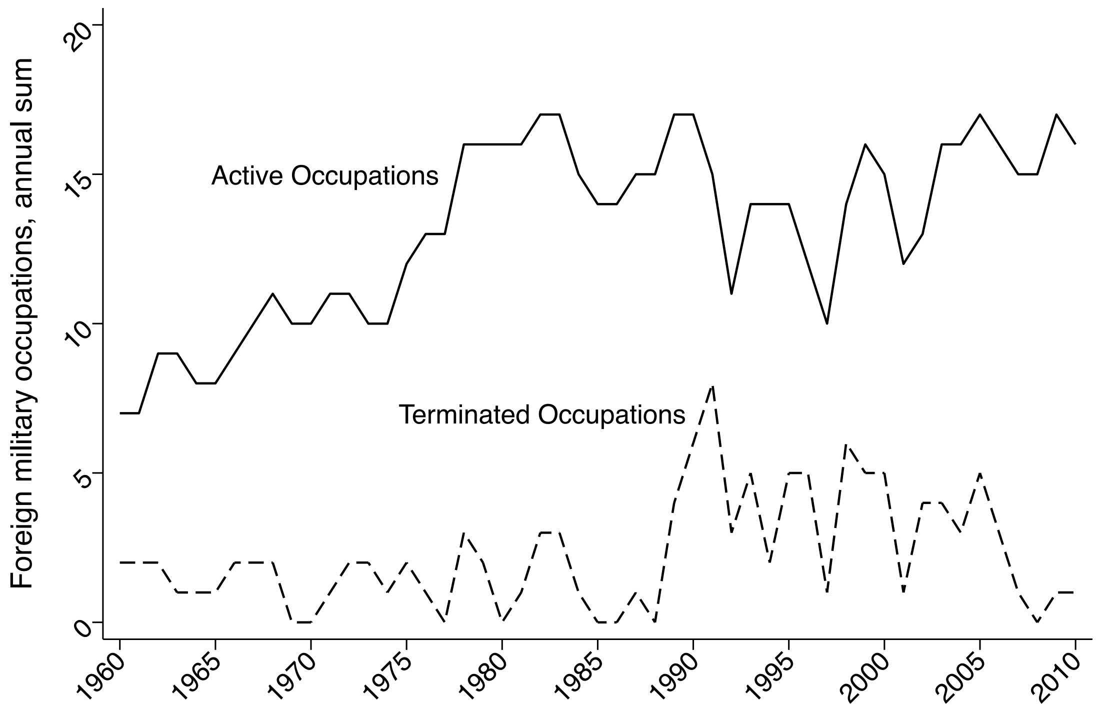
Supplemental Figures and Tables

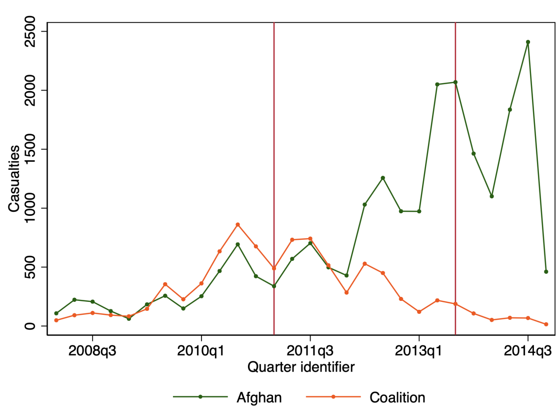
Figure A1: Trends in foreign military occupations and intervention terminations between 1960 and 2010.



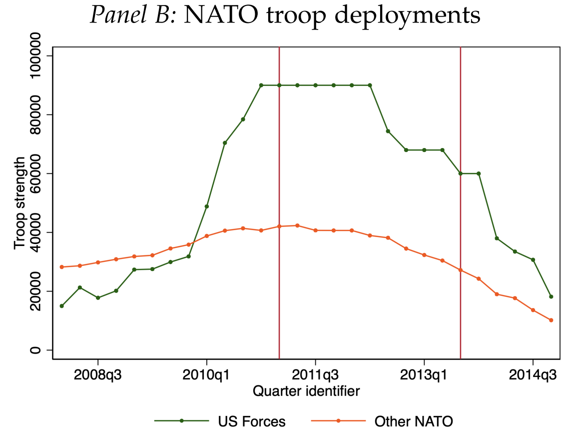
Notes: annual counts of military occupations globally are noted with a solid black line; military occupation terminations are noted with a dashed line. Data on occupations is drawn from Collard-Wexler (2013).

Figure A2: Events with casualties reported in SIGACTS over time and NATO troop strength.

Panel A: Events with casualties

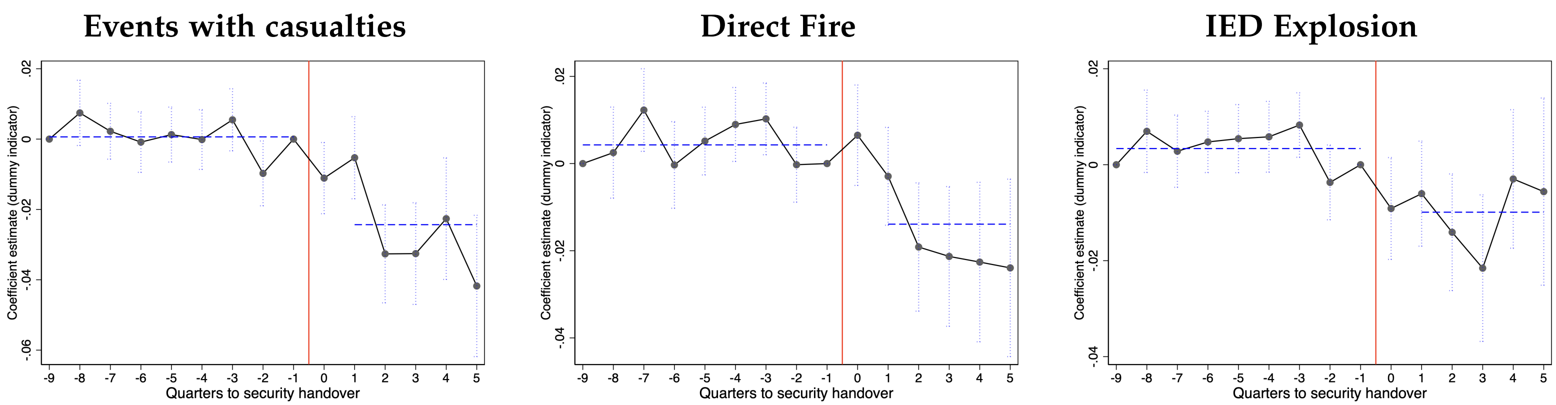


Panel B: NATO troop deployments



Notes: The left figure presents the overall number of SIGACTS events with casualties for Afghan- or Coalition forces. The right figure presents average monthly NATO and US troop deployments.

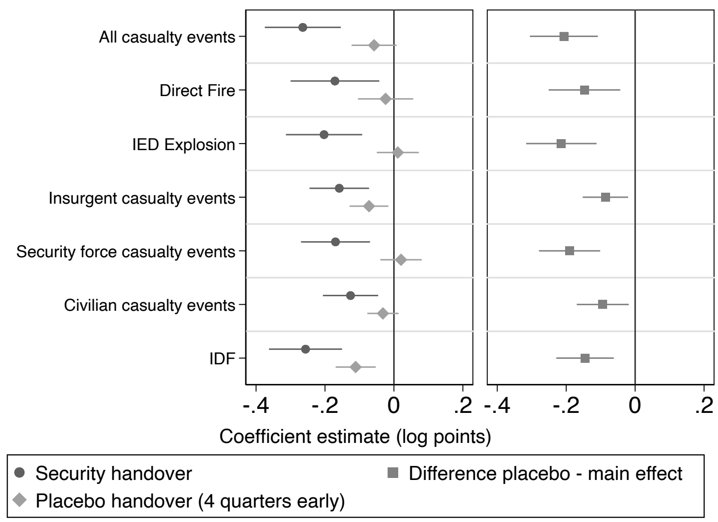
Figure A3: Event Studies around the Security transfer to Afghan National Security Forces (SIGACTS) - Gridcell level



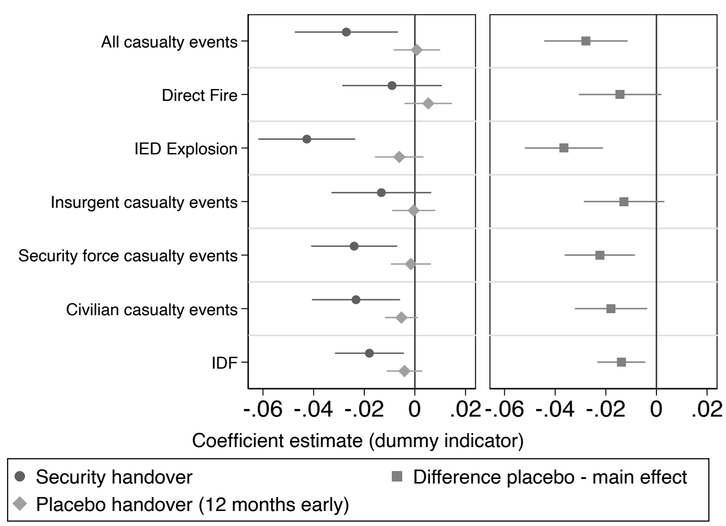
Notes: Event studies around the "Security handover" to the Afghan National Security Forces. Coefficients on "time to Security handover" are shown with 90% confidence intervals. The models are analogous to column (1) in Table A10, but include quarterly dummies for the time to treatment to maintain consistency with the main analysis. The regressions include gridcell fixed effects and match pair $\times$ time fixed effects. Outcomes are measured as binary indicators.

Figure A4: Security handover and Conflict (SIGACTS) - Placebo timing

Panel A: District level

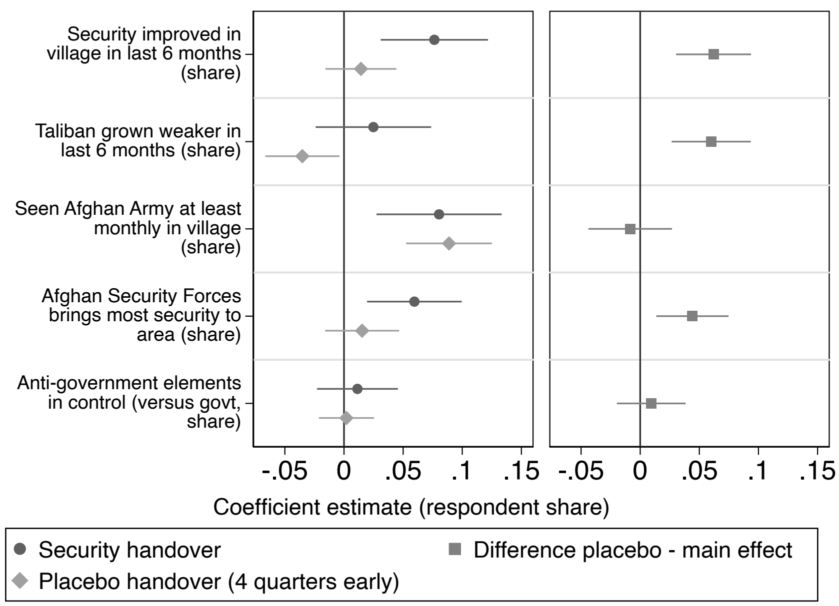


Panel B: Gridcell level



Notes: Coefficients and 90% confidence intervals on "Security handover" and "Security handover (4 quarters early)". We add the forwarded "Security Handover" indicator (by 4 quarters or 12 months) to a model that is analogous to column (1) in Table 4 for Panel A, and the corresponding specification at the gridcell level for Panel B. In the left panel, the forwarded indicator becomes zero after the treatment. In the right panel it remains equal to one, so that we estimate the difference between the placebo effect and the treatment effect. The dependent variable is subject to a Log(x+1) transformation at the district level in Panel A. The outcome is expressed as a binary indicator at the gridcell level in Panel B. Standard errors are clustered at the district level.

Figure A5: Security handover and Conflict (ANQAR) - Placebo timing



Notes: Coefficients and 90% confidence intervals on "Security handover" and "Security handover (4 quarters early)". We add the forwarded treatment indicator (by 4 quarters) to a model that is analogous to column (1) in Table 5. In the left panel, the forwarded indicator becomes zero after the treatment. In the right panel it remains equal to one, so that we estimate the difference between the placebo effect and the treatment effect. The dependent variable measures the share of respondents. Standard errors are clustered at the district level.

Table A1: Summary Statistics

	Mean (1)	Standard Deviation (2)	Observations (3)
Panel A: District-quarter level, SIGACTS			
All casualty events	5.256	16.175	10556
Direct Fire	10.341	44.962	10556
IED Explosion	3.258	10.778	10556
Panel B: District-quarter level, ANQAR			
Security improved in village in last 6 months (share)	0.321	0.221	8525
Taliban grown weaker in last 6 months (share)	0.432	0.235	7836
Seen Afghan Army at least monthly in village (share)	0.697	0.318	8310
Afghan Security Forces brings most security to area (share)	0.508	0.236	8524
Anti-government elements in control (versus govt, share)	0.189	0.227	8525
Panel C: District level			
Travel distance to military airport	18442	10235	377

Notes: Observations at the district-quarter level in Panel A (2008-2014) and B (2008-2016); and district-level level in Panel C. For ease of interpretation, we report Panel A in levels.

Table A2: Comparison of district level characteristics across different tranche phases

	T1	T2	T2-T1	T3	T3-T2	T4	T4-T3	T5	T5-T4
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Security improved in village in last 6 months (share)	0.288	0.291	0.002	0.216	-0.074	0.156	-0.060	0.138	-0.019
	(0.023)	(0.018)	(0.024)	(0.015)	(0.017)	(0.024)	(0.023)	(0.015)	(0.022)
All casualty events per capita	-3.341	-3.291	0.050	0.795	4.086	-2.102	-2.897	9.844	11.946
	(0.804)	(1.095)	(1.294)	(1.087)	(1.660)	(1.246)	(1.623)	(1.951)	(2.728)
Insurgent casualty events per capita	-1.005	-1.016	-0.011	-0.366	0.650	-0.871	-0.505	2.819	3.690
	(0.227)	(0.338)	(0.362)	(0.301)	(0.425)	(0.373)	(0.414)	(0.667)	(0.922)
Security force casualty events per capita	-1.582	-1.509	0.074	0.724	2.233	-0.840	-1.564	4.962	5.802
	(0.433)	(0.582)	(0.676)	(0.600)	(0.910)	(0.688)	(0.914)	(0.987)	(1.395)
Civilian casualty events per capita	-0.754	-0.767	-0.013	0.437	1.203	-0.391	-0.828	2.063	2.454
	(0.199)	(0.223)	(0.276)	(0.260)	(0.381)	(0.247)	(0.369)	(0.398)	(0.531)
Direct Fire per capita	-6.120	-4.156	1.964	-0.392	3.764	-4.310	-3.918	28.560	32.870
	(3.922)	(4.867)	(6.875)	(3.048)	(6.414)	(3.221)	(3.703)	(6.767)	(8.616)
Indirect Fire per capita	-3.540	-2.934	0.606	-0.133	2.801	0.845	0.978	14.739	13.894
	(0.735)	(0.858)	(0.547)	(0.837)	(0.811)	(1.285)	(1.355)	(2.821)	(3.450)
IED Explosion per capita	-3.011	-2.591	0.419	1.863	4.454	-0.107	-1.970	7.290	7.397
	(0.686)	(0.934)	(1.052)	(1.077)	(1.570)	(1.617)	(2.114)	(1.683)	(2.654)
Nightlights per capita	966.713	654.563	-312.149	346.644	-307.919	-121.050	-467.694	-58.441	62.609
	(360.962)	(169.503)	(408.304)	(95.910)	(209.364)	(42.551)	(117.045)	(48.004)	(56.095)
Opium Yield [HA] per capita	0.124	0.169	0.045	0.293	0.123	0.372	0.080	0.498	0.126
	(0.071)	(0.088)	(0.100)	(0.086)	(0.107)	(0.132)	(0.148)	(0.145)	(0.189)

Notes: The table reports coeffients on tranche dummies (and their differences) from a district by quarter-level regression with quarter fixed effects. The district-quarter level panel is restricted to the period before the tranche-specific security handover. As the tranche comparisons rely on cross-sectional variation, we measure the violence outcomes in per capita levels. Standard errors are clustered at the district level and presented in parentheses.

Table A3: Security transfer to Afghan National Security Forces and conflict (SIGACTS) - District level additional outcomes

	Log(x+1)						
	All Casualty Events	Direct Fire Attacks Attacks	IED Explosions	Insurgent Casualty Events	Security Force Casualty Events	Civilian Casualty Events	Indirect Fire Attacks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: District cell level – Security Transfer							
Security handover	-0.098	-0.066	-0.078	-0.047	-0.068	-0.023	-0.134
	(0.031)	(0.035)	(0.029)	(0.026)	(0.028)	(0.023)	(0.032)
Mean DV	0.920	1.145	0.686	0.398	0.647	0.404	0.518
Std Dev DV	1.137	1.319	0.984	0.725	0.932	0.677	0.892
Observations	10556	10556	10556	10556	10556	10556	10556
Number of Districts	377	377	377	377	377	377	377
Panel B: District level – Coalition troop withdrawal (IV)							
Troop withdrawal	0.666	0.572	0.773	0.264	0.707	0.452	0.029
	(0.308)	(0.327)	(0.305)	(0.199)	(0.278)	(0.231)	(0.244)
Security handover	-0.205	-0.146	-0.214	-0.084	-0.191	-0.093	-0.142
	(0.059)	(0.063)	(0.062)	(0.039)	(0.054)	(0.046)	(0.051)
Mean DV	0.920	1.145	0.686	0.398	0.647	0.404	0.518
Std Dev DV	1.137	1.319	0.984	0.725	0.932	0.677	0.892
Weak IV statistic	48.751	48.751	48.751	48.751	48.751	48.751	48.751
Observations	10556	10556	10556	10556	10556	10556	10556
Number of Districts	377	377	377	377	377	377	377

Notes: Regressions at the district-quarter level, covering the period 2008-2014. All regressions include district fixed effects, regional command × time fixed effects, and district-specific trends. The instrument used for "Troop withdrawal" is the interaction of the travel distance to the nearest military airport and an indicator for the post-2011 period. The IV control set includes distance to any airport × time fixed effects, and distance to province borders × time fixed effects. Outcomes are subject to a Log(x+1) transformation. The weak IV statistic is the Kleibergen-Paap rk Wald F-statistic. Standard errors are clustered at the district level and presented in parentheses.

Table A4: Security transfer to Afghan National Security Forces and conflict (SIGACTS data) - Spillover estimates

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
All Casualty Events	Security handover (γ)	-0.098	-0.119	-0.108	-0.156	-0.098	-0.095	-0.097	-0.116	-0.138	-0.088
Log(x+1)		(0.031)	(0.034)	(0.030)	(0.032)	(0.026)	(0.026)	(0.026)	(0.025)	(0.025)	(0.026)
	Exogenous effects (δ)		0.051	0.043	0.146	-0.037	0.600	-0.109	0.577	0.800	0.698
			(0.053)	(0.064)	(0.048)	(0.175)	(0.424)	(0.199)	(0.027)	(0.027)	(0.071)
	Endogenous effects (ρ)										0.180
											(0.256)
Direct Fire Attacks	Security handover (γ)	-0.066	-0.046	-0.036	-0.080	-0.063	-0.065	-0.064	-0.103	-0.075	-0.072
Log(x+1)		(0.035)	(0.036)	(0.032)	(0.035)	(0.028)	(0.028)	(0.028)	(0.027)	(0.027)	(0.028)
	Exogenous effects (δ)		-0.050	-0.130	0.035	-0.159	0.227	-0.184	0.687	1.018	0.565
			(0.058)	(0.069)	(0.052)	(0.189)	(0.458)	(0.215)	(0.029)	(0.030)	(0.068)
	Endogenous effects (ρ)										0.312
											(0.156)
IED Explosions	Security handover (γ)	-0.078	-0.098	-0.079	-0.112	-0.079	-0.079	-0.077	-0.127	-0.122	-0.078
Log(x+1)		(0.029)	(0.030)	(0.027)	(0.029)	(0.023)	(0.023)	(0.023)	(0.023)	(0.022)	(0.023)
	Exogenous effects (δ)		0.049	0.005	0.087	0.049	-0.213	-0.098	0.590	0.815	0.522
			(0.048)	(0.058)	(0.043)	(0.157)	(0.380)	(0.178)	(0.026)	(0.026)	(0.084)
	Endogenous effects (ρ)										0.121
											(0.433)
Number of districts		392	392	392	392	392	392	392	392	392	392
District time trend		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spillover specification		-	Neighbor dist.	Neighbor dist.^{2}	Neighbor prov.	Dist. < 250km	Dist. < 500km	Driving dist. < 500km	Flexible, zero beyond 500km	Flexible, zero beyond 1000km	Flexible, zero beyond 1000km
Edges that are supposed to be known		-	100%	100%	100%	100%	100%	100%	27.51%	17.35%	17.35%

Notes: Estimated from Equation (A1). Column (1): regressions at the district-quarter level, covering the period 2008-2014, including district and regional command x time fixed effects. Dependent variable is expressed as Log(x+1). Standard errors clustered at the district level and are presented in parentheses. Columns (2)-(7) are spatial panel regressions with spatial neighboring matrix assumed to be known and given, respectively, by neighboring districts, neighboring district squared, neighboring provices, geodesical distance smaller than 250km and 500km and driving distance smaller than 500km. Specifications reported in columns (8)-(10) have estimated and flexible spatial neighboring matrix, following de Paula et al. (2019), where weights between districts with driving distance beyond 500km and 1000k are assumed to be equal to zero, which corresponds to 27.51% and 17.35% of all weights.

Table A5: Coalition troop withdrawal and Conflict (SIGACTS data) - Spillover estimates

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
All Casualty Events	Troop withdrawal (γ)	0.616	1.368	1.457	0.732	0.763	0.533	0.611	0.458	0.632	0.606
Log(x+1)		(0.296)	(0.476)	(0.369)	(0.309)	(0.242)	(0.244)	(0.203)	(0.199)	(0.197)	(0.175)
	Exogenous effects (δ)		-0.980	-1.380	-0.191	-0.921	-1.612	0.239	3.897	4.653	2.416
			(0.561)	(0.508)	(0.386)	(0.846)	(2.669)	(1.213)	(0.223)	(0.221)	(0.338)
	Endogenous effects (ρ)										0.600
											(0.060)
Direct Fire Attacks	Troop withdrawal (γ)	0.495	0.022	0.732	0.372	0.677	0.339	0.533	0.509	0.445	0.251
Log(x+1)		(0.310)	(0.515)	(0.400)	(0.335)	(0.263)	(0.265)	(0.220)	(0.214)	(0.213)	(0.181)
	Exogenous effects (δ)		0.617	-0.389	0.202	-1.147	-3.011	-1.760	5.443	5.438	2.468
			(0.608)	(0.550)	(0.419)	(0.917)	(2.891)	(1.314)	(0.274)	(0.250)	(0.274)
	Endogenous effects (ρ)										0.650
											(0.050)
IED Explosions	Troop withdrawal (γ)	0.730	1.549	1.496	1.134	0.726	0.469	0.701	0.698	0.749	0.358
Log(x+1)		(0.287)	(0.428)	(0.332)	(0.278)	(0.218)	(0.220)	(0.183)	(0.178)	(0.178)	(0.152)
	Exogenous effects (δ)		-1.068	-1.258	-0.665	0.021	-5.012	1.310	3.622	3.722	1.228
			(0.505)	(0.456)	(0.347)	(0.761)	(2.399)	(1.090)	(0.204)	(0.193)	(0.235)
	Endogenous effects (ρ)										0.768
											(0.055)
Number of districts		392	392	392	392	392	392	392	392	392	392
Tranche x time FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spillover specification		-	Neighbor dist.	Neighbor dist.^{2}	Neighbor prov.	Dist. < 250km	Dist. < 500km	Driving dist. < 500km	Flexible, zero beyond 500km	Flexible, zero beyond 1000km	Flexible, zero beyond 1000km
Edges that are supposed to be known		-	100%	100%	100%	100%	100%	100%	27.51%	17.35%	17.35%

Notes: Estimated from Equation (A1). Column (1): regressions at the district-quarter level, covering the period 2008-2014, including district and regional command x time fixed effects. Dependent variable is expressed as Log(x+1). Standard errors clustered at the district level and are presented in parentheses. Columns (2)-(7) are spatial panel regressions with spatial neighboring matrix assumed to be known and given, respectively, by neighboring districts, neighboring district squared, neighboring provices, geodesical distance smaller than 250km and 500km and driving distance smaller than 500km. Specifications reported in columns (8)-(10) have estimated and flexible spatial neighboring matrix, following de Paula et al. (2019), where weights between districts with driving distance beyond 500km and 1000k are assumed to be equal to zero, which corresponds to 27.51% and 17.35% of all weights.

Table A6: Security transfer to ANSF and conflict (SIGACTS) - Transformations

	All Casualty Events		Direct Fire Attacks		IED Explosions	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Log(x+1)						
Security handover	-0.138	-0.098	-0.134	-0.066	-0.074	-0.078
	(0.032)	(0.031)	(0.036)	(0.035)	(0.029)	(0.029)
Mean DV	0.920	0.920	1.145	1.145	0.686	0.686
Std Dev DV	1.137	1.137	1.319	1.319	0.984	0.984
Observations	10556	10556	10556	10556	10556	10556
Number of Districts	377	377	377	377	377	377
Panel B: Hyperbolic Sine transformation (asinh)						
Security handover	-0.177	-0.126	-0.162	-0.084	-0.094	-0.097
	(0.038)	(0.037)	(0.042)	(0.041)	(0.036)	(0.037)
Mean DV	1.151	1.151	1.414	1.414	0.864	0.864
Std Dev DV	1.384	1.384	1.571	1.571	1.210	1.210
Observations	10556	10556	10556	10556	10556	10556
Number of Districts	377	377	377	377	377	377
Panel C: Per capita violence levels (12-13 census)						
Security handover	-2.817	-1.131	-7.556	-2.446	-2.285	-2.064
	(0.991)	(0.993)	(2.238)	(1.925)	(0.681)	(0.697)
Mean DV	10.325	10.325	20.932	20.932	6.362	6.362
Std Dev DV	25.675	25.675	67.732	67.732	17.583	17.583
Observations	10556	10556	10556	10556	10556	10556
Number of Districts	377	377	377	377	377	377
Panel D: Per capita violence levels (remote sensing)						
Security handover	-2.897	-1.148	-7.619	-2.411	-2.295	-2.080
	(1.008)	(1.004)	(2.265)	(1.950)	(0.686)	(0.702)
Mean DV	10.380	10.380	21.096	21.096	6.374	6.374
Std Dev DV	25.818	25.818	66.078	66.078	17.520	17.520
Observations	10556	10556	10556	10556	10556	10556
Number of Districts	377	377	377	377	377	377
Panel E: Poisson						
Security handover	-0.108	-0.084	-0.198	-0.115	-0.148	-0.138
	(0.093)	(0.097)	(0.116)	(0.104)	(0.083)	(0.084)
Mean DV outcome	5.489	5.536	10.710	10.774	3.623	3.669
Std Dev DV	16.491	16.553	45.715	45.845	11.308	11.373
Observations	10108	10023	10192	10131	9492	9371
Number of Districts	361	360	364	363	339	336
District time trend	No	Yes	No	Yes	No	Yes

Notes: Regressions at the district-quarter level, covering the period 2008-2014. All regressions include district fixed effects and regional command × time fixed effects. The dependent variable is subject to the transformation specified in each panel. Panels A-D are estimated with OLS, panel E is based on a Poisson model. The number of observations (and districts) in the Poisson model does not include observations that are absorbed by the model parameters. Standard errors clustered at the district level and are presented in parentheses.

Table A7: Security transfer to ANSF and conflict (SIGACTS) - Transformations, dropping the 3 most violent districts

	All Casualty Events (1)	(2)	Direct Fire Attacks (3)	(4)	IED Explosions (5)	(6)
Panel A: Log(x+1)						
Security handover	-0.144	-0.103	-0.141	-0.073	-0.078	-0.081
	(0.032)	(0.031)	(0.036)	(0.035)	(0.030)	(0.030)
Mean DV	0.892	0.892	1.111	1.111	0.659	0.659
Std Dev DV	1.095	1.095	1.265	1.265	0.938	0.938
Observations	10472	10472	10472	10472	10472	10472
Number of Districts	374	374	374	374	374	374
Panel B: Hyperbolic Sine transformation (asinh)						
Security handover	-0.183	-0.131	-0.169	-0.091	-0.098	-0.100
	(0.039)	(0.038)	(0.042)	(0.041)	(0.037)	(0.037)
Mean DV	1.119	1.119	1.377	1.377	0.833	0.833
Std Dev DV	1.342	1.342	1.518	1.518	1.163	1.163
Observations	10472	10472	10472	10472	10472	10472
Number of Districts	374	374	374	374	374	374
Panel D: Per capita violence levels (12-13 census)						
Security handover	-3.227	-1.706	-7.648	-2.943	-2.296	-2.158
	(0.909)	(0.851)	(2.028)	(1.739)	(0.651)	(0.669)
Mean DV	9.295	9.295	18.054	18.054	5.706	5.706
Std Dev DV	20.844	20.844	51.036	51.036	15.023	15.023
Observations	10472	10472	10472	10472	10472	10472
Number of Districts	374	374	374	374	374	374
Panel E: Per capita violence levels (remote sensing)						
Security handover	-3.312	-1.766	-7.871	-3.008	-2.328	-2.198
	(0.920)	(0.855)	(2.091)	(1.771)	(0.659)	(0.676)
Mean DV	9.388	9.388	18.428	18.428	5.745	5.745
Std Dev DV	21.166	21.166	52.894	52.894	15.179	15.179
Observations	10472	10472	10472	10472	10472	10472
Number of Districts	374	374	374	374	374	374
Panel E: Poisson						
Security handover	-0.164	-0.161	-0.175	-0.125	-0.163	-0.178
	(0.080)	(0.069)	(0.103)	(0.077)	(0.079)	(0.066)
Mean DV outcome	4.590	4.629	8.178	8.228	3.003	3.042
Std Dev DV	11.198	11.237	23.994	24.058	7.801	7.844
Observations	10024	9939	10108	10047	9408	9287
Number of Districts	358	357	361	360	336	333
District time trend	No	Yes	No	Yes	No	Yes

Notes: Regressions at the district-quarter level, covering the period 2008-2014. The three outlying districts that are removed in these samples experienced more than 2,000 casualty events in the sample period. All regressions include district fixed effects and regional command × time fixed effects. The dependent variable is subject to the transformation specified in each panel. Panels A-D are estimated with OLS, panel E is based on a Poisson model. The number of observations (and districts) in the Poisson model does not include observations that are absorbed by the model parameters. Standard errors clustered at the district level and are presented in parentheses.

Table A8: Summary Statistics at the gridcell level

	Mean (1)	Standard Deviation (2)	N (3)
Gridcell-month level			
All casualty events	0.135	1.018	107016
Direct Fire	0.284	2.993	107016
IED Explosion	0.086	0.685	107016

Notes: Observations at the gridcell-month level (2008-2014).

Table A9: Comparison of characteristics between matched geographically similar distantly located gridcells

	T1	T2	T2-T1	T3	T3-T2	T4	T4-T3	T5	T5-T4
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Any All casualty events	0.043	0.016	-0.026	0.040	-0.003	0.026	-0.017	0.102	0.060
	(0.024)	(0.007)	(0.025)	(0.008)	(0.025)	(0.006)	(0.025)	(0.018)	(0.030)
Any Insurgent casualty events	0.012	0.007	-0.006	0.013	0.001	0.009	-0.003	0.041	0.029
	(0.009)	(0.004)	(0.010)	(0.004)	(0.010)	(0.002)	(0.009)	(0.010)	(0.013)
Any Security force casualty events	0.023	0.012	-0.012	0.028	0.005	0.015	-0.008	0.074	0.051
	(0.012)	(0.006)	(0.013)	(0.007)	(0.014)	(0.004)	(0.013)	(0.014)	(0.019)
Any Civilian casualty events	0.014	0.008	-0.006	0.016	0.002	0.008	-0.006	0.041	0.027
	(0.007)	(0.004)	(0.008)	(0.004)	(0.009)	(0.002)	(0.008)	(0.010)	(0.013)
Any Direct Fire	0.042	0.022	-0.020	0.057	0.015	0.041	-0.001	0.128	0.086
	(0.027)	(0.009)	(0.028)	(0.011)	(0.029)	(0.011)	(0.029)	(0.022)	(0.034)
Any Indirect Fire	0.009	0.010	0.001	0.026	0.018	0.009	0.000	0.065	0.057
	(0.005)	(0.004)	(0.006)	(0.007)	(0.008)	(0.003)	(0.005)	(0.014)	(0.015)
Any IED Explosion	0.036	0.014	-0.021	0.038	0.003	0.020	-0.016	0.098	0.063
	(0.020)	(0.006)	(0.021)	(0.009)	(0.021)	(0.005)	(0.020)	(0.018)	(0.027)
Any Nightlights	0.139	0.073	-0.066	0.063	-0.077	0.009	-0.131	0.062	-0.078
	(0.068)	(0.014)	(0.070)	(0.014)	(0.070)	(0.005)	(0.068)	(0.017)	(0.070)

Notes: The table reports coeffients on tranche dummies (and their differences) from a gridcell by month level regression with month fixed effects. The panel is restricted to gridcell-months before the tranche-specific security transition. Standard errors clustered at the district level and are presented in parentheses.

Table A10: Security transfer to Afghan National Security Forces and conflict (SIGACTS) - Gridcell Level

	Dummy indicators					
	All Casualty Events		Direct Fire Attacks		IED Explosions	
	(1)	(2)	(3)	(4)	(5)	(6)
Security handover	-0.021	-0.009	-0.018	-0.006	-0.016	-0.011
	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)	(0.005)
Mean DV	0.050	0.050	0.064	0.064	0.039	0.039
Observations	107016	107016	107016	107016	107016	107016
Number of Grid Cells	1274	1274	1274	1274	1274	1274
District time trend	No	Yes	No	Yes	No	Yes

Notes: Regressions at the gridcell-month level, covering the period 2008-2014. All regressions include gridcell fixed effects and match pair × time fixed effects. The dependent variable is expressed as a binary indicator variable. Standard errors are clustered at the district level and presented in parentheses.

Table A11: Main results by tranche

	Log(x+1)		
	All Casualty Events (1)	Direct Fire Attacks (2)	IED Explosions (3)
District Level (IV)			
Troop withdrawal	0.683	0.533	0.735
	(0.293)	(0.304)	(0.281)
Security handover Tranche 1	-0.482	-0.330	-0.533
	(0.196)	(0.231)	(0.179)
Security handover Tranche 2	-0.139	-0.136	-0.209
	(0.085)	(0.091)	(0.083)
Security handover Tranche 3	-0.100	-0.014	-0.096
	(0.064)	(0.073)	(0.062)
Security handover Tranche 4	-0.381	-0.396	-0.287
	(0.083)	(0.101)	(0.091)
Security handover Tranche 5	-0.156	-0.026	-0.166
	(0.112)	(0.136)	(0.108)
Mean DV	0.920	1.145	0.686
Std Dev DV	1.137	1.319	0.984
Weak IV statistic	65.038	65.038	65.038
Observations	10556	10556	10556
Number of Districts	377	377	377

Notes: Regressions at the district-quarter level covering the period 2008-2014. All regressions include district fixed effects and regional command × time fixed effects, and district-specific trends. The instrument used for "Troop withdrawal" is the interaction of the travel distance to the nearest military airport and an indicator for the post-2011 period. The IV control set includes distance to any airport × time fixed effects, and distance to province borders × time fixed effects. Outcomes are subject to a Log(x+1) transformation. The weak IV statistic is the Kleibergen-Paap rk Wald F-statistic. Standard errors are clustered at the district level and presented in parentheses.

Table A12: Military Support

	Log(x+1)					
	Close air support		Medevacs		IED Explosives Found & Cleared	
	(1)	(2)	(3)	(4)	(5)	(6)
Troop withdrawal	-0.069	-0.004	0.395	0.535	-0.165	-0.107
	(0.121)	(0.148)	(0.216)	(0.192)	(0.230)	(0.221)
Security handover		0.014		-0.003		-0.083
		(0.043)		(0.043)		(0.058)
log(Direct Fire)	0.094	0.114	0.065	0.106		
	(0.013)	(0.014)	(0.010)	(0.013)		
Troop withdrawal=1 × log(Direct Fire)		-0.098		-0.207		
		(0.076)		(0.067)		
Security handover=1 × log(Direct Fire)		-0.010		-0.016		
		(0.039)		(0.034)		
log(IED Explosion)					0.364	0.414
					(0.019)	(0.023)
Troop withdrawal=1 × log(IED Explosion)						-0.319
						(0.168)
Security handover=1 × log(IED Explosion)						-0.006
						(0.065)
Mean DV	0.176	0.176	0.134	0.134	0.674	0.674
Std Dev DV	0.486	0.486	0.465	0.465	1.024	1.024
Weak IV statistic	51.575	25.758	51.575	25.758	51.802	25.420
Observations	10556	10556	10556	10556	10556	10556
Number of Districts	377	377	377	377	377	377

Notes: Regressions at the district-quarter level, covering the period 2008-2014.All regressions include district fixed effects, regional command × time fixed effects, and district-specific trends. The instrument used for "Troop withdrawal" is the interaction of the travel distance to the nearest military airport and an indicator for the post-2011 period. The IV control set includes distance to any airport × time fixed effects, and distance to province borders × time fixed effects. Outcomes are subject to a Log(x+1) transformation. "Medevacs" stands for "Medical Evacuations". The weak IV statistic is the Kleibergen-Paap rk Wald F-statistic. Standard errors are clustered at the district level and presented in parentheses.