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Team production on the battlefield: Evidence from NATO in Afghanistan

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Abstract

Managing military operations across and between teams of partner nations remains a first-order challenge to security and development during conflict. NATO, under the umbrella of the International Security Assistance Force (ISAF), brought together troops from 28 countries to help enhance security provision in Afghanistan. ISAF units were given responsibility for specific operational units. The assignment of responsibilities to different national armed forces could lead to coordination problems. We explore whether the provision of security is affected by horizontal frictions (when different countries are responsible for different sides of borders) or vertical frictions (when different countries control different levels of the operational hierarchy). We find that both horizontal frictions and vertical frictions reduce military support activities, including aid projects. They are also associated with higher levels of insurgent violence. These findings indicate that misalignment between units within military organizations can undermine the effectiveness of security and development interventions during war, with broader implications for managing complex teams under risk.

Keywords: National Security, Public Goods Provision, Org. Behavior & Management
JEL Classification: D72, D74, L23

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1 Introduction

Managing military operations across and between teams of partner nations was a defining feature of the twentieth century, during which two global wars were fought through alliances coordinating troops and supplies. The difficulties of managing alliance commitments during conflict led, in part, to the formation of the North Atlantic Treaty Organization (NATO). NATO remains tasked with coordinating a constellation of partner nations with the aim of enhancing security in Europe and more broadly. Coordinating team production on the battlefield during the recent Afghan conflict revealed a number of managerial challenges relevant to the broader literature on team production. In this paper, we leverage this large-scale military campaign as an empirical case study for testing theories of frictions within organizations. We find evidence that various frictions undermined security provision and development assistance. These findings are relevant to managing multinational assistance in a range of settings with ongoing hostilities, especially following the Russian invasion of Ukraine.

NATO, under the umbrella of the International Security Assistance Force (ISAF), brought together troops from 28 countries to help support the establishment of peace and security in Afghanistan. ISAF troop consignments were given responsibility in specific areas of the Afghanistan. The assignment of areas to different countries could lead to inefficiencies. Individual nations may not fully internalize the benefits of security in neighboring regions, as in classical models of production in teams (Holmstrom, 1982). Moreover, their cooperation could suffer from language barriers, cultural differences, and inconsistent rules of engagement. While understanding the effectiveness of organizational practices in cross-national settings is an important question in management science (Lachman et al., 1994, e.g.), there is little empirical evidence on the frictions that arise in the context of international military cooperation. This paper aims to identify the effect of miscoordination between allied countries on the effectiveness of their security operations.

In this paper, we reconstruct the history of ISAF troop consignments in Afghanistan. We identify two types of frictions. *Horizontal frictions* arise when different countries are in charge of the Provincial Reconstruction Teams (PRT) or the regional commands (RC) across a given province border. *Vertical frictions* arise when different countries are in charge of the Provincial Reconstruction Team on the one hand and the Regional Command on the other hand. We hypothesize that these frictions affect security operations in two dimensions. First, the frictions could lower military support activities, such as medical evacuations, close air support, patrols, and the delivery of small-scale aid projects. Second, and as a result, frictions could reduce effective security provision and increase the intensity of violence produced by insurgents. We test these hypotheses with detailed administrative conflict data from the war in Afghanistan between 2007 and 2011.

Our findings support our hypotheses. We identify the effect of horizontal frictions along borders by comparing misaligned border segments and aligned border segments in the same province. We find that misaligned segments see higher conflict intensity, less aid projects, and less medical evacuations. These results are robust to controlling for a wide range of characteristics. To examine the role of vertical frictions, we use the rotation of the country in charge of certain regions to identify the effect of introducing frictions over time. We find that frictions increase conflict intensity, and there is suggestive evidence that they lower the allocation of aid projects and patrolling activity. The picture that emerges across these results is that horizontal and vertical frictions undermine certain support activities, and that they lead to worse security.

These results are relevant for a large share of present-day conflict settings, as security operations are typically carried out by complex bureaucratic institutions or international alliances. The organizational economics of war has not fully developed as an area of study, possibly because of data constraints. We overcome this limitation in the context of ISAF in Afghanistan, leveraging the number of actors involved and highly detailed records on conflict activity, development assistance, and public sentiment. We also add to existing qualitative work on miscoordination between ISAF members (Auerswald and Saideman, 2009), by quantifying the associated costs and testing particular mechanisms of influence.

The findings in this paper can help to recognize and mitigate the costs of miscoordination in international military operations. In particular, these results are relevant to ongoing multinational support for Ukraine following the Russian invasion in 2022. Team production on the battlefield often involves coordination of resources, including the rapid and efficient allocation of military equipment and training. As of May 2024, European Union members and the United States have committed more than 140 billion (USD) in support, including an Patriot air defense system, Stinger anti-aircraft missiles, Leopard tanks, and fighter jets.[1] Transfers of this diversity and magnitude raise natural questions about coordination frictions in managing and monitoring military assistance during an ongoing interstate war. More broadly, if Western forces were pulled into an active military role, coordinating operational zones akin to the ISAF mission would likely become a crucial pillar of (and potential impediment to) the multinational provision of security support in Ukraine.

To our knowledge, our paper is the first to document the empirical relevance of organizational frictions in multinational military missions. The management of multinational organizations presents specific challenges (Ronen, 1986; Lachman et al., 1994; Mortensen and Neeley, 2012). Ronen (1986) emphasizes the complexities arising from the need to balance centralized control with local responsiveness, while Lachman et al. (1994) highlights the importance of understanding the interplay between organizational structure and national contexts. Indeed, successful multinational organizations need to manage cultural differences carefully. (Weber et al., 1996) underscore that managers need to adopt culturally adaptive strategies to foster successful multinational cooperation. Mortensen and Neeley (2012) finds that direct and reflected knowledge contributes

[1] For extended details, see: `https://tinyurl.com/4zxu8um9` and `https://tinyurl.com/jyy95rw2`.

to enhanced trust among distant colleagues. While the literature on multinational collaboration is mainly motivated by the case of global firms, there exist important parallels with the setting of international military coalitions. Our paper documents the challenges to cooperation in this context, and it is in the line of existing work that studies organizational and management questions in military organizations (e.g., Roberts et al., 1994; Holderness and Pontiff, 2012).

Our work also contributes to the broad literature on the empirical study of conflict using econometric methods. Initially, this literature focused mostly on economic shocks and conflict (e.g. Miguel et al., 2004; Ferrara and Harari, 2018; Dube and Vargas, 2013; Berman et al., 2017; Vanden Eynde, 2016) as well as the role of religious and ethnic diversity (e.g. Montalvo and Reynal-Querol, 2005; Esteban et al., 2012). Besley et al. (2012) were among the first economists to highlight the role of political institutions as drivers of civil conflict. Following this work, a number of recent papers have studied how specific sub-national institutions can spur or mitigate conflict (e.g. Shapiro and Vanden Eynde, 2023; Fetzer and Kyburz, 2023), or how new institutions emerge in war settings (Sanchez de la Sierra, 2020; Dincecco et al., 2022). In addition, a growing number of studies examine how development interventions affect conflict (Berman et al., 2011; Crost et al., 2014; Fetzer, 2020)). Sharing our focus on the organization of interventions, a recent study finds that development aid in Afghanistan is less effective and feeds perceptions of corruption when multiple donors are active in an area (Child et al., 2023). Our paper complements these findings by studying frictions in the hierarchical and territorial organization of the military alliance in Afghanistan. Finally, and arguably closest to the current project, a number of recent studies the impact military interventions. For example, Dell and Querubin (2018) find that aerial bombing campaigns in Vietnam undermined the US counterinsurgency efforts.[2]

[2]A growing set of papers also study the role of media (an in particular radio coverage) in conflict (Yanagizawa-Drott, 2014; Durante and Zhuravskaya, 2018; Armand et al., 2020; Adena et al., 2015). Communication technology touches on a very important aspect of war, but existing work mostly focuses on its use outside of the armed forces. In contrast, our paper focuses on military organization.

There is little work zooming in explicitly on the organizational aspects of war and military planning. Exceptions are Ager et al. (2022), who study the role of incentives for fighter pilots in the German air force during World War II, and Acemoglu et al. (2020) who study the incentive for Colombian soldiers to target civilians and claim them as rebel fatalities. Our paper is clearly complementing these last two studies, but its focus is not on individual incentives, but on organizational aspects. On the specific question of border reinforcements, Blair (2023) provide evidence from Iraq showing how border protections reduce the victimization of civilians by rebel fighters.[3] Fetzer et al. (2021) study a very particular organizational change: the shift in security responsibility from NATO to the Afghan Armed forces. Here, we showed how military organization of units and cooperation between different participating countries mattered for (short-term) transition success. While the organization of the setting of security transitions is very important for conflict outcomes, there is almost no evidence on a set of even more fundamental organizational questions. Given the centrality of such organizational questions in military history and the study of war, the application of insights and techniques from organizational economics to the setting of wars is highly relevant.

2 Context

NATO's International Security Assistance Force (ISAF) mission in Afghanistan started in 2001. The deployment of NATO troops peaked in 2011, with around 130,000 foreign soldiers stationed in Afghanistan around the official start of the security transition. Since the start of the military engagement, more than 3,500 NATO troops have been killed by the Taliban forces in Afghanistan.

[3] Studying the geography of conflict, Mueller et al. (2022) suggest that raising physical barriers at ethnic frontiers could reduce conflict. Martínez (2017) shows that the presidency of Hugo Chavez in Venezuela increased FARC presence in Colombian municipalities along the border. Richard and Vanden Eynde (2023) show that cooperation between national armies in the Sahel region improved security around the international borders.

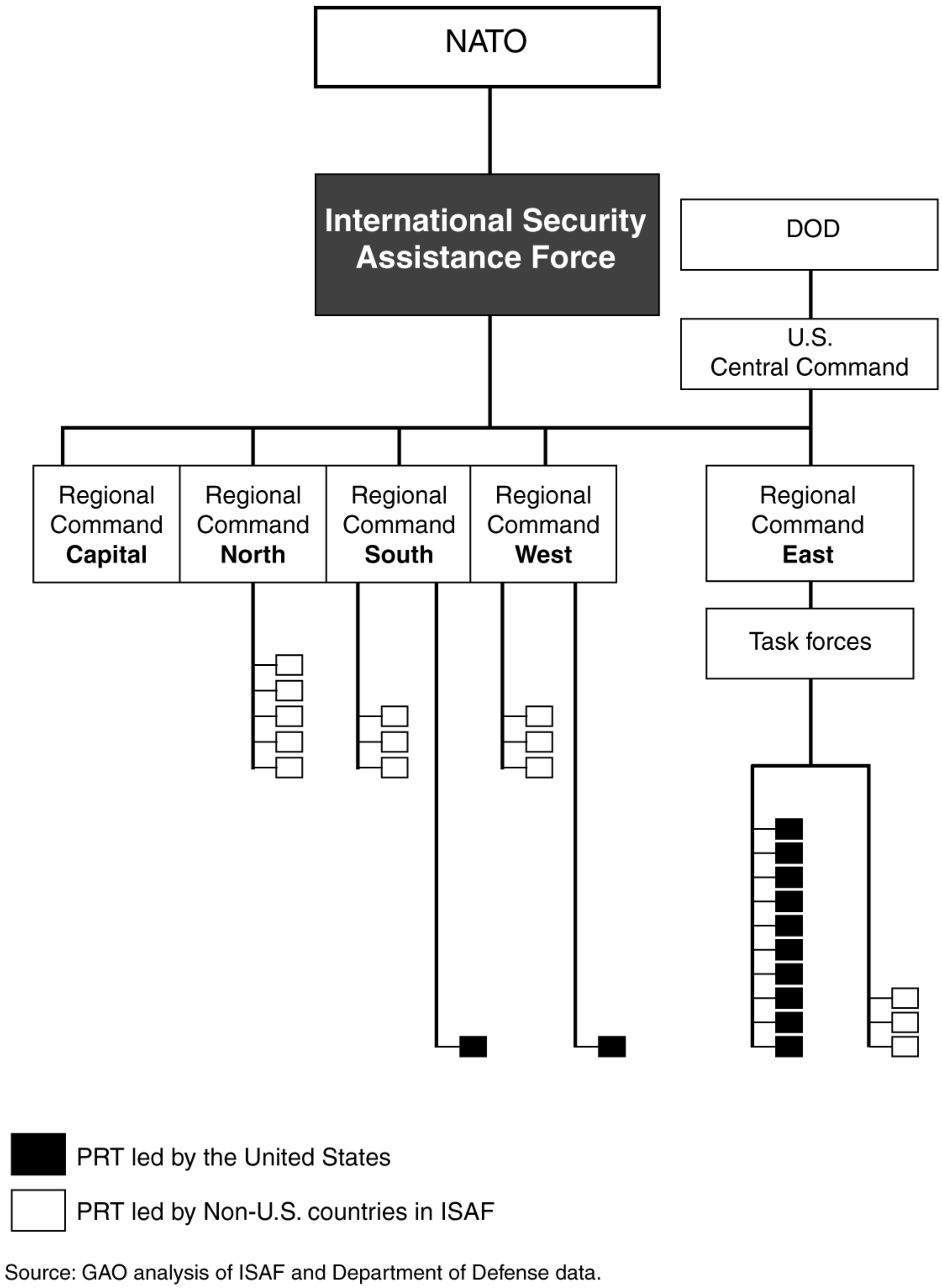


Figure 1: Chain of Command for PRTs in Afghanistan.

We consider two main levels of military organization. The first one is the province. Provinces were assigned to countries through Provincial Reconstruction Teams (PRTs). The PRTs were tasked with providing security and helping rebuild the province. Each PRT consisted of a small base of operations, from which a group of civilians and military specialists carried out relief and reconstruction projects, and through which security provision was provided for PRT-initiated activities. Hence, the country in charge of a PRT typically had a major military base in the province. The second organization level we consider is the Regional Command (RC), which are the most important operational units of the ISAF mission in Afghanistan. The responsibility of each RC was delegated to a NATO country. Figure A 1 in the appendix shows a snapshot of the military organization of Afghanistan in July 2009. Noteworthy is the Southern Regional Command, where the responsibility rotated between the Netherlands, the UK, and Canada until 2010, when the RC South was split in smaller regions and taken over by the US.

Our empirical strategy will exploit plausibly exogenous misalignment between hierarchies or border segments. A first order concern with this approach is that the assignment of provinces to countries is endogenous to violence patterns. The empirical strategy will try to address this concern by exploiting only variation within provinces, whereas we expect endogenous assignment to operate mainly between provinces. In addition, it is worth keeping in mind that the exercise of assigning PRTs to countries was constrained by the institutional environment. In particular, the US wanted to keep a presence in the Western and Southern region of Afghanistan, while maintaining control of all provinces on Eastern Afghanistan-Pakistan border (Perito, 2005).

3 Hypotheses

The potential costs of frictions between NATO allies are discussed by various sources. For example:Auerswald and Saideman (2009) write that:

> Yet as the war in Afghanistan has made abundantly clear, multilateral cooperation is neither straightforward nor guaranteed. Countries differ significantly in what they are willing to do and how and where they are willing to do it.

The EU Directorate General for External Policies explicitly points at divergence between EU member states and the US:

> EU institutions and Member States came to view Afghanistan as a long-term commitment, providing a consistent source of development cooperation and humanitarian aid. The USA was operating on shorter-term military horizons, with the intention of using the military to provide development projects on a 'feast and famine' basis.

Theoretically, the sources of frictions between allies can be manifold. Perhaps closest to the quotes above is the misalignment of interests between partners. It could also be the case that career incentives are less powerful when military officers cooperate with officers from other national armies, who may have little influence over their career progression[4] In the case of border regions, classic externality problems can also play a role: actors on either side of the border may not fully internalize the benefits of their security efforts if the benefits accrue in part to another national army. This mechanism is close in spirit to moral hazard problems in teams (Holmstrom, 1982), which could be relevant for horizontal and vertical frictions alike. If several agents are responsible for providing security, each of them may exert sub-optimal effort because of free-riding incentives. These free-riding incentives may be exacerbated by the political costs of casualties at the home front. Indeed, Fetzer et al. (2023) show that domestic support for the war in Afghanistan in NATO countries is highly sensitive to own-country soldier deaths. Finally, multinational cooperation may be hampered by a range of technical

[4] It is hard to provide direct empirical evidence on career concerns. Recent work has used data from European football to study how career concerns affect effort (Miklós-Thal and Ullrich, 2016).

and cultural frictions. These include difficulty of communication across languages and cultures, as well as constraints to the interoperability of military equipment.

4 Data

Afghanistan offers a rich environment for studying the role of organizational frictions. We are able to use recently declassified micro data collected by the United States Central Command as well as coalition and local national security partners. Throughout the ongoing conflict, these security forces have tracked rebel attacks by documenting the approximate time (often to the minute) and precise location (to within a few meters) of attacks carried out against them or reported to them. This data set contains over 200,000 individual observations of rebel attacks between 2008 and 2014, identified by type of attack (e.g. direct fire attack, improvised explosive device) and has been prepared and made available to the academic community by Shaver and Wright (2016). As the data covers a broad range ”significant activities”, the data is referred to as SIGACTS.

The two most important types of attacks insurgents engage in throughout the war are direct fire attacks and the explosion of improvised explosive devices (IED). Direct fire includes attacks with weapons, including small arms and rocket-propelled grenades. Individual insurgents (often acting in groups) carry out these attacks in a variety of ways. IEDs tend to be directed at moving targets (e.g. vehicle patrols and convoys) and are usually placed on or near roads. Our data also provide insight into when counterinsurgents neutralize IEDs and other explosive devices and document the local flow of intelligence from non-combatants to security forces. We use this data to understand changes in the effectiveness of security forces depending on the alignment of military commands.

We collect information from ISAF and NATO archives on rotation schedules in the province (PRT) and regional (RC) headquarters (as in figure A 1, which we introduced earlier). We rely on numerical tables of geographic names from these archives and classify the areas using a standardized administrative map compiled by the Empirical Studies of Conflict research group. All events are adjusted according to this map. In addition, our empirical projects rely on a variety of other data sources, such as detailed grid cell population data, nightlight emissions, and elevation measurements, which we use in various empirical exercises.

We complement administrative incident data with survey evidence from the Afghanistan Nationwide Quarterly Assessment Research (ANQAR). ANQAR captures civilian attitudes toward government and anti-government entities. Survey responses are collected on a quarterly basis. ANQAR survey data were collected by the Afghan Center for Socio-Economic and Opinion Research (ACSOR). Within district, surveyed villages were randomly sampled and ten households were subsequently surveyed using a grid-based random walk. When ANSOR could not access sampled villages, intercept interviews were used to collected information from residents traveling in neighboring areas. We have restricted access to data from 2008 to 2016, covering roughly 370,000 respondents, through a NATO partner agency. In the analysis, we use district-specific quarterly average responses.

We also use aid data from the Commander's Emergency Response Program (CERP)[5] and from the Afghan Country Stability Picture (ACSP), which is a comprehensive catalogue of aid projects.

[5]CERP was the most important aid program for which PRTs were responsible (jointly with military commanders). The program was financed by the US Department of Defense, but its coverage was not restricted to US-led PRTs. Efforts were undertaken to improve coordination. "According to DOD, as of September 2008, U.S. military personnel serve in non-U.S.-led PRTs to provide management and oversight of the Commander's Emergency Response Program (CERP), a DOD program that provides military commanders with funds to allow them to respond to urgent humanitarian and reconstruction needs." (Source: Government Accountability Office, October 1, 2008).

5 Empirical strategy

We conduct two empirical exercises. First, we estimate the effect of horizontal frictions along the province borders. Second, we estimate the effect of introduction of frictions at the province level using a two-way fixed effects model. The estimating equation for the border frictions is given by:

$$\begin{aligned} y_{i,b,p,r,t} = &\alpha BorderFriction_{b,p,r} + \beta X_{i,b,p,r} + \gamma trigger_{i,b,p,r,t} \\ &+ PRTCountry_{p,r} + RCCountry_{r} + \eta_{p,t} + \epsilon_{i,b,p,r,t} \end{aligned} \tag{1}$$

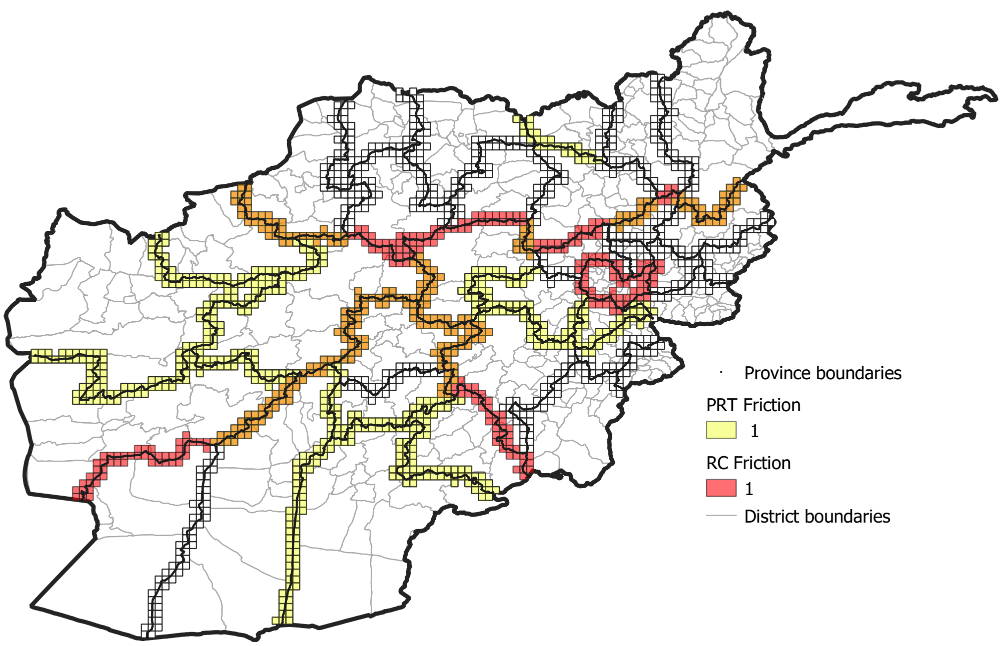


Figure 2: Province border frictions between 2008 and 2010

In this equation, we measure outcomes at the level of a gridcell i, in border segment

b, province p, region r, and quarter t. The main parameter of interest is α, the coefficient on the border frictions indicator, which is defined at the level of a given segment. We control for dummies for each country at the PRT level, for each country at the RC level, and we include province-quarter level fixed effects. For our military support variables, we control for violence events (at the gridcell-quarter level) that could trigger support activities.[6] We focus on a zone of 10km around the administrative borders of each province.[7] We further restrict the sample to a time period in which the PRT assignment is stable: from July 2008 until March 2010. We cluster standard errors at the level of a border segment (in the same province). Figure 2 illustrates the variation we use in this approach.

[6]As the trigger-response relationships are best estimated at the quarter-level, we do not collapse the data at the gridcell-level, even though the variation we exploit is only cross-sectional.

[7]We test the sensitivity of the results to the size of the buffer zone in table A3, which we describe as part of the robustness analysis below.

Table 1: Border frictions: conflict outcomes, 2008-2010

	(1) Attack	(2) Direct Fire	(3) IED Explosions	(4) Indirect Fire	(5) Coalition casualties	(6) Insurgent casualties	(7) Aid Projects	(8) Medevacs	(9) Accidents
Panel A:									
RC border friction (0/1)	0.034**	0.034**	0.021**	0.020*	0.017***	0.009*	-0.025**	-0.004	0.002
	(0.017)	(0.015)	(0.010)	(0.011)	(0.006)	(0.005)	(0.010)	(0.005)	(0.003)
PRT border friction only (0/1)	0.005	0.028	0.001	0.004	0.015	0.010	-0.022**	-0.013*	-0.000
	(0.019)	(0.017)	(0.017)	(0.016)	(0.012)	(0.009)	(0.010)	(0.007)	(0.003)
Panel B:									
Border friction (0/1)	0.025*	0.032**	0.015	0.015	0.016**	0.009	-0.024***	-0.007	0.001
	(0.015)	(0.014)	(0.011)	(0.010)	(0.007)	(0.006)	(0.009)	(0.004)	(0.002)
Mean DV	0.098	0.070	0.041	0.038	0.013	0.011	0.045	0.014	0.009
Std Dev DV	0.297	0.255	0.198	0.190	0.114	0.104	0.208	0.118	0.096
Observations	12131	12131	12131	12131	12131	12131	12131	12131	12131
Number of Clusters	157	157	157	157	157	157	157	157	157
Province by quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Violence triggers							Yes	Yes	Yes

Notes: Quarterly by grid cell level data between 2008Q3 and 2010Q1. The sample consists of gridcells within a 10km range from province borders. Outcomes are measured as 0/1 dummies. PRT border frictions indicate when different countries are in charge of the Provincial Reconstruction Teams on the different sides of the border. RC border frictions indicate the regional command borders. The control set includes distance to a class 1/2 road (log), distance to the nearest airport (log), distance to the nearest military airport (log), elevation (log), nightlights at baseline (log), and population at baseline (log). Violence triggers include Direct and Indirect Fire attacks, IED explosions, and casualties among coalition forces (measured as dummies). Standard errors are clustered at the border segment by province level and are presented in parentheses, stars indicate *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As a second exercise, we use a difference-in-difference approach to leverage the rotation of RC responsibilities in certain regions:

$$
\begin{aligned}
y_{p,r,t} = & \sum_{\tau=-4,\tau\neq-1}^{4} \alpha_\tau 1(t = FrictionChangeTime_{p,r} + \tau) \\
& + \gamma trigger_{p,r,t} + \eta_{r,t} + \zeta_{p,r} + \lambda_{p,r} t + \epsilon_{p,r,t}
\end{aligned} \tag{2}
$$

In this equation, $t_{p,r}$ is the month t in which province p in region r experiences a change in its friction status. We include province fixed effects, region by month fixed effects, and province-specific time trends. A recent literature has highlighted how estimators in standard two-way-fixed effect models can be biased when treatment effects are heterogenous (e.g., de Chaisemartin and D'Haultfœuille, 2020). To address these concerns, we use the estimator proposed by de Chaisemartin and D'Haultfoeuille (2022), which allows for heterogenous treatment effects over time, for linear unit-specific trends, and for movements in and out of treatment.[8]

6 Results

6.1 Horizontal border frictions

Table 1 shows the how frictions across province borders affect conflict dynamics (equation 1). The violence outcomes in the first four columns show that border frictions increase the incidence of violence. Direct fire attacks are 3% more likely, coalition casualties are 2.1% more likely. These effects are positive for both PRT and RC frictions and across different violence measures. Interestingly, insurgent casualties is the only category for which none of the effects is significant, which suggests that the security forces

[8] In our analysis, the estimator will be based on 8 friction changes in 8 different provinces (3 removing frictions, and 5 introducing them). Of the 5 changes that introduce frictions, 3 cases concern provinces that get assigned a PRT for the first time. The estimator uses the first observed friction change in the sample. The time-windows we use guarantee that coefficients are estimated using at least 7 switchers.

are weakened relative to the insurgents. Column 5 shows that border frictions reduce the probability of receiving aid projects (any CERP or ACSP project) by around 3% and reduce the probability of medical evacuations by 0.7%. The latter effect is not significant at conventional levels, but there is a significant effect for PRT frictions on this outcome. These results suggest that the support activities provided by the security forces and the civilian PRT personnel (in the case of aid) are less effective when there are border frictions. We control in these specifications for the incidence of violence events that could trigger support activity. Accidents could be an extreme consequence of miscoordination, but is more likely to capture control intensity. However, we do not find consistent effects on this outcome. In general, the findings support the idea that organizational frictions worsen conflict outcomes from the perspective of the alliance and hamper the provision of aid, which is a key support activity in this context.

Robustness The variation we exploit in Table 1 is cross-sectional, and there is an obvious concern that our friction measure could capture the effect of confounding factors. The main specification already controls for key baseline characteristics, such as distance to roads, distance to airports, elevation, population (at baseline) and nightlights (at baseline). In table A1, we show how the border friction dummy correlates with these control variables. In table A2, we calculate Oster's delta (Oster, 2019) to assess the sensitivity of the coefficients to selection on unobservables. The proportional selection measures are actually negative for most outcomes. Only the results for aid appears to weaken when we add controls. In table A3, we test the sensitivity of the border friction results to different definitions of border areas. Panel A provides the main results, using a 10km buffer, as a bench mark. Panels B and C confirm that these results go through if we use larger (15km) or smaller (5km) buffers. In table A4, we show the main results in a cross-sectional dataset that is collapsed at the grid-cell level. At this level, we use an *asinh* transformed outcome.

6.2 Vertical PRT/RC Frictions

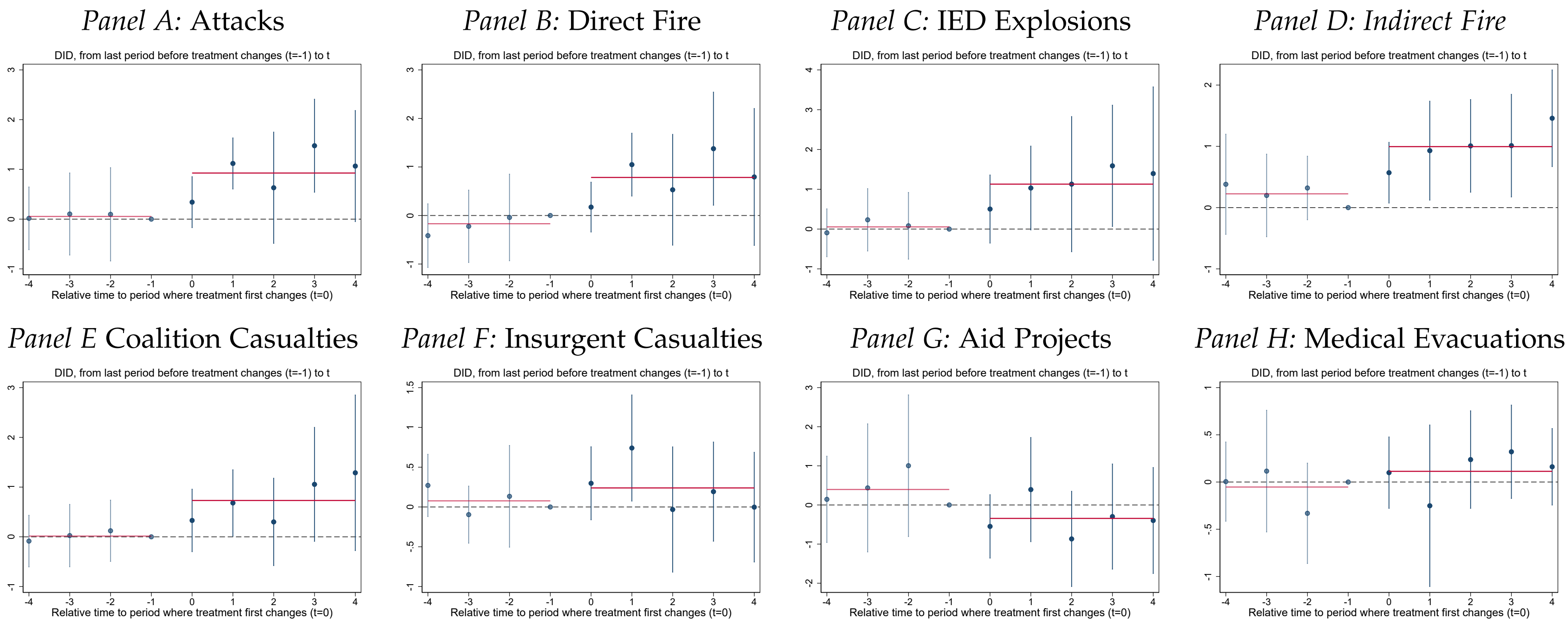
In our second empirical exercise, we uses changes in rotation patterns to study conflict dynamics (equation 2). Figure A 2 shows that violence increases markedly. The increase of the inverse hyperbolic sine of attacks is close to one, which is consistent with a doubling of violence levels. At the same time, both the allocation of new aid projects and the number of accidents experience a drop, which is less precisely estimated. These results suggest that the support activities carried out in a province reduce with the introduction of frictions. Table A5 provides estimates for the average effect of frictions, which are significant for most violence outcomes.

It is possible that hierarchical frictions affect the quality of the administrative conflict data we study. To address this concern, we also show results for survey measures in figure 4.[9] The corresponding average effects are reported in table A6. In line with the violence events, respondents report that security is worse when new frictions are introduced. The effect is large - frictions reduce the share of people who consider security as "good" by more than 15 percentage points. There is also a reduction in the observed patrols of the Afghan National Army. As the Afghan National Army was working closely with ISAF troops in the time period we study, we interpret this reduction as a decrease in military support activities.[10]

[9]The surveys are quarterly and can be dis-aggregated at the district level. This data is available from 2008 onwards.

[10]In the online appendix (figure A 3), we study the impact of frictions on the coverage of the survey. If areas are inaccessible for surveyors, this could reflect a worsening of the security situation and mechanically lead to improvements in the reported security conditions. Frictions appear to have an impact on survey coverage, but the effect is delayed compared to the improved security sentiment in Panel A. Therefore, we do not think the effects are driven by differential survey coverage of districts.

Figure 3: Difference-in-difference results for Hierarchical Frictions.

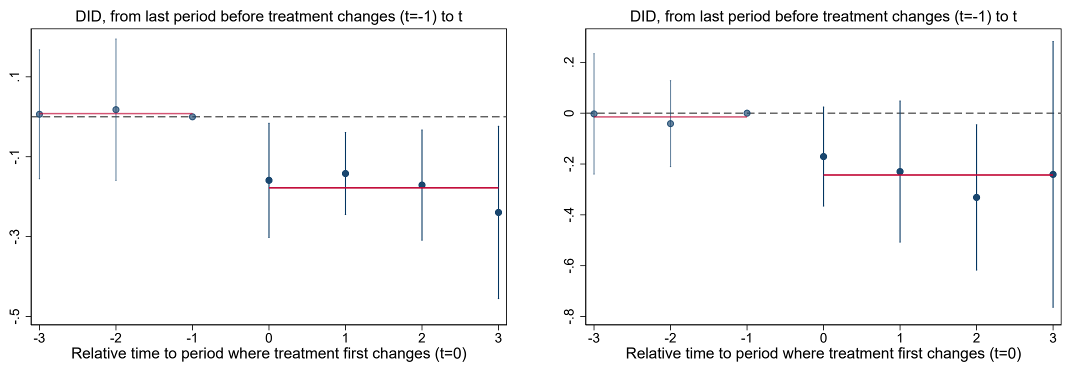


Notes: Data at the Province Month level between 2007 and 2010. Outcomes are *asinh* transformed. Difference-in-difference estimations are for the first change in treatment status. Frictions indicate when different countries are in charge of the PRT and RC. The model includes province fixed effects, region-by-quarter fixed effects, and province-specific linear trends. In panels G and H, violence triggers include Direct and Indirect fire attacks, IED explosions, and casualties among coalition forces. Standard errors are clustered at the province level

Figure 4: Difference-in-difference results for Hierarchical Frictions, survey outcomes

Panel A: Security is good

Panel B: ANA seen at least monthly



Notes: Data at the District-Quarter level between 2008 and 2010. Outcomes are measured as shares. Difference-in-difference estimations are for the first change in treatment status. Frictions indicate when different countries are in charge of the PRT and RC. The model includes province fixed effects, region-by-quarter fixed effects, and province-specific linear trends. Violence triggers include Direct and Indirect Fire attacks, IED explosions, and casualties among coalition forces. Standard errors are clustered at the province level

Robustness As highlighted by Chen and Roth (2023), logarithmic transformations (including the *asinh* transformation) cannot be interpreted as capturing percentage changes and depend on the unit of analysis. However, as we measure outcomes at the province-quarter level, the effect we capture are mostly on the intensive margin. In figure **??**, we show that our results hold for outcomes that are expressed in per capita terms.

7 Conclusion

This paper studies how organizational frictions between military allies affect security operations. We exploit the assignment of responsibilities to different NATO partners during the War in Afghanistan, and we find evidence that both horizontal frictions along administrative borders and vertical frictions between the Provincial Reconstruction Teams and the Regional Commands were associated with the reduction in certain support activities and an increase in violence perpetrated by insurgents.

The findings of this paper have broad relevance, as most modern military interventions involve international coalitions. In the specific context of Afghanistan, the shortcomings of the ISAF mission were accentuated by the collapse of the Afghan Republic in the summer of 2021. Our paper helps to understand the structural problems that prevented that ISAF mission in Afghanistan from achieving long-lasting improvements in security provision. For all these reasons, the setting of the ISAF mission in Afghanistan is a particularly important setting to illustrate the costs of organizational frictions in multinational collaboration.

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Appendix to **Team production on the battlefield**

For Online Publication

Figure A 1: Province Reconstruction Teams (PRT) and Regional Commands (RC) in July 2009. *Source: NATO Placemats.*

Table A1: Border frictions: correlation with controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Distance to road Class 1/2 (log)		Distance to airport (log)		Distance to military Airport (log)		Elevation (log)		Nightlights (baseline) (log)		Pashtun	
Panel A:												
RC border friction (0/1)	0.137	0.062	-0.158*	-0.181**	0.004	0.072	556.633***	534.995***	0.070	0.104**	0.046	0.054
	(0.114)	(0.097)	(0.086)	(0.073)	(0.048)	(0.054)	(101.726)	(98.610)	(0.055)	(0.040)	(0.044)	(0.043)
PRT border friction only (0/1)	0.034	0.042	-0.072	-0.025	-0.212***	-0.165***	377.370***	332.515***	0.122**	0.164***	0.053	0.029
	(0.121)	(0.103)	(0.096)	(0.089)	(0.058)	(0.059)	(121.062)	(114.205)	(0.058)	(0.053)	(0.054)	(0.054)
Mean DV	10.486	10.486	10.911	10.911	11.761	11.761	1809.061	1809.061	0.172	0.172	0.350	0.350
Std Dev DV	1.161	1.161	0.685	0.685	0.668	0.668	1079.400	1079.400	0.816	0.816	0.477	0.477
Observations	81263	81263	81263	81263	81263	81263	81263	81263	81263	81263	81263	81263
Number of Districts	159	159	159	159	159	159	159	159	159	159	159	159
Panel B:												
Border friction (0/1)	0.107	0.057	-0.127**	-0.117*	-0.068	-0.015	505.058***	475.031***	0.090*	0.131***	0.051	0.048
	(0.108)	(0.086)	(0.064)	(0.069)	(0.045)	(0.051)	(97.922)	(94.016)	(0.054)	(0.040)	(0.042)	(0.041)
Observations	81263	81263	81263	81263	81263	81263	81263	81263	81263	81263	81263	81263
Province by quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes		Yes		Yes		Yes		Yes		Yes

Notes: Quarterly data between 2008Q3 and 2010Q1. The sample consists of gridcells within a 10km range from province borders. PRT border frictions indicate when different countries are in charge of the Provincial Reconstruction Teams on the different sides of the border. RC border frictions indicate the regional command borders. All regressions control for population measures. The control set includes all controls except the one used as an outcome. Violence triggers include Direct and Indirect Fire attacks, IED explosions, and casualties among coalition forces. Standard errors are clustered at the border segment by province level and are presented in parentheses, stars indicate *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A2: Border frictions: conflict outcomes - Oster's delta

	(1) Attack	(2) Direct Fire	(3) IED Explosions	(4) Indirect Fire	(5) Coalition casualties	(6) Insurgent casualties	(7) Aid Projects	(8) Medevacs	(9) Accidents
Panel A:									
RC border friction (0/1)	0.034**	0.034**	0.021**	0.020*	0.017***	0.009*	-0.025**	-0.004	0.002
	(0.017)	(0.015)	(0.010)	(0.010)	(0.006)	(0.005)	(0.010)	(0.005)	(0.003)
PRT border friction only (0/1)	0.005	0.028	0.001	0.004	0.015	0.010	-0.022**	-0.013*	-0.000
	(0.019)	(0.017)	(0.017)	(0.016)	(0.012)	(0.009)	(0.010)	(0.007)	(0.003)
Proportional selection	-0.077	0.255	-0.013	-0.008	-0.222	-0.027	-1.636	22.832	-0.001
Panel B:									
Border friction (0/1)	0.025*	0.032**	0.015	0.015	0.016**	0.009	-0.024***	-0.007	0.001
	(0.015)	(0.014)	(0.011)	(0.010)	(0.007)	(0.006)	(0.009)	(0.004)	(0.002)
Proportional selection	-0.250	-0.246	-0.533	-0.269	-1.420	-0.097	0.132	0.967	-0.025
Province by quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Violence triggers							Yes	Yes	Yes

Notes: Quarterly by grid cell level data between 2008Q2 and 2010Q1. The sample consists of gridcells within a 10km range from province borders. Outcomes are subject to a $log(x+1)$ transformation. PRT border frictions indicate when different countries are in charge of the Provincial Reconstruction Teams on the different sides of the border. RC border frictions indicate the regional command borders. The control set includes distance to a class 1/2 road (log), distance to the nearest airport (log), distance to the nearest military airport (log), elevation, nightlights, and population. Standard errors are clustered at the province border pair level and are presented in parentheses, stars indicate *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A3: Border frictions: conflict outcomes for different border zone buffers, 2008-2010

	(1) Attack	(2) Direct Fire	(3) IED Explosions	(4) Indirect Fire	(5) Coalition casualties	(6) Insurgent casualties	(7) Aid Projects	(8) Medevacs	(9) Accidents
Panel A: 10km buffer									
RC border friction (0/1)	0.034**	0.034**	0.021**	0.020*	0.017***	0.009*	-0.025**	-0.004	0.002
	(0.017)	(0.015)	(0.010)	(0.011)	(0.006)	(0.005)	(0.010)	(0.005)	(0.003)
PRT border friction only (0/1)	0.005	0.028	0.001	0.004	0.015	0.010	-0.022**	-0.013*	-0.000
	(0.019)	(0.017)	(0.017)	(0.016)	(0.012)	(0.009)	(0.010)	(0.007)	(0.003)
Panel B: 15km buffer									
RC border friction (0/1)	0.030**	0.018	0.018**	0.016*	0.008*	0.003	-0.007	0.001	0.001
	(0.014)	(0.012)	(0.009)	(0.009)	(0.005)	(0.004)	(0.007)	(0.004)	(0.002)
PRT border friction (0/1)	0.005	0.018	0.000	-0.007	0.003	0.005	-0.014	-0.009*	0.003
	(0.013)	(0.012)	(0.009)	(0.010)	(0.007)	(0.006)	(0.009)	(0.005)	(0.002)
Observations	16870	16870	16870	16870	16870	16870	16870	16870	16870
Panel C: 5km buffer									
RC border friction (0/1)	0.042**	0.031**	0.022**	0.027**	0.009*	0.010**	0.001	0.006	0.003
	(0.016)	(0.015)	(0.010)	(0.013)	(0.005)	(0.005)	(0.009)	(0.010)	(0.002)
PRT border friction (0/1)	-0.005	0.007	-0.005	-0.018	-0.000	-0.004	-0.003	-0.015	0.001
	(0.017)	(0.014)	(0.011)	(0.013)	(0.005)	(0.005)	(0.008)	(0.010)	(0.001)
Observations	6566	6566	6566	6566	6566	6566	6566	6566	6566
Province by quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Violence triggers							Yes	Yes	Yes

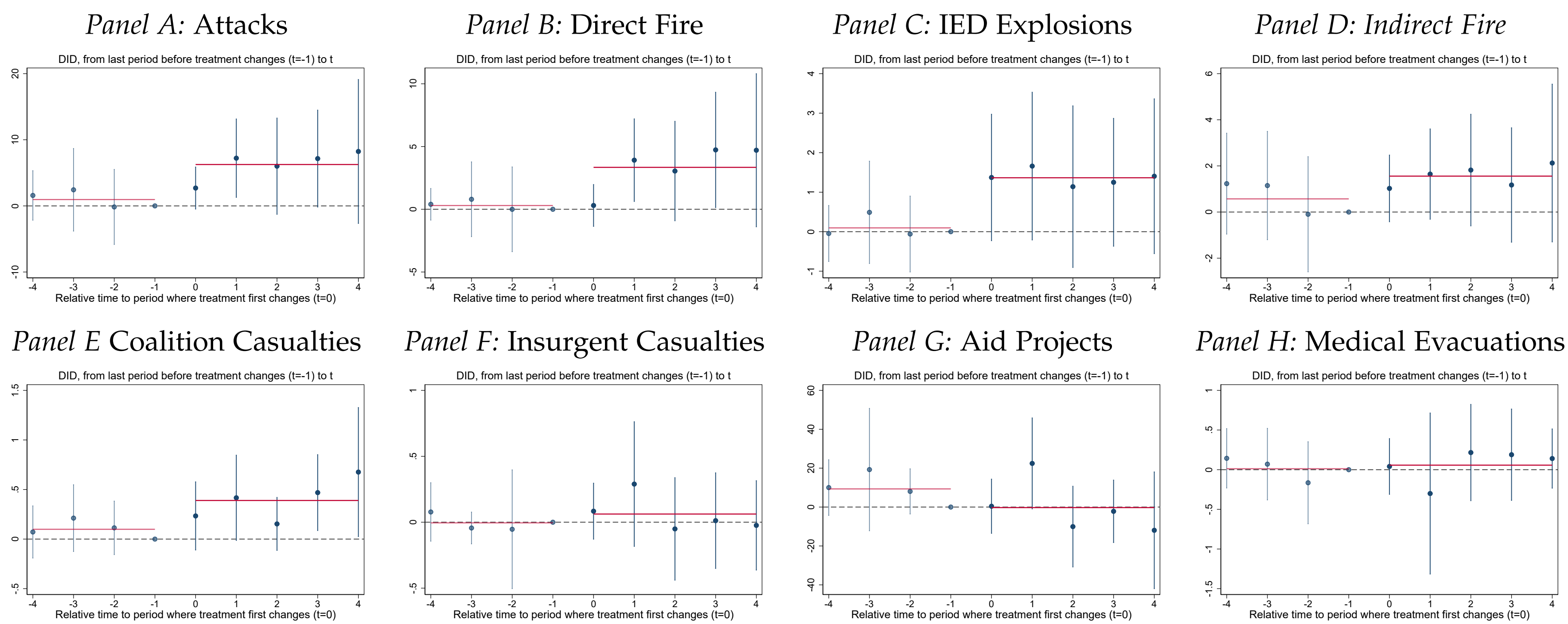
Notes: Quarterly by grid cell level data between 2008Q2 and 2010Q1. The sample consists of gridcells within a 10km range from province borders. Outcomes are subject to a $log(x+1)$ transformation. PRT border frictions indicate when different countries are in charge of the Provincial Reconstruction Teams on the different sides of the border. RC border frictions indicate the regional command borders. The control set includes distance to a class 1/2 road (log), distance to the nearest airport (log), distance to the nearest military airport (log), elevation, nightlights, and population. Standard errors are clustered at the province border pair level and are presented in parentheses, stars indicate *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A4: Border frictions: collapsed at the gridcell-level (IHS)

	(1) Attack	(2) Direct Fire	(3) IED Explosions	(4) Indirect Fire	(5) Coalition casualties	(6) Insurgent casualties	(7) Aid Projects	(8) Medevacs	(9) Accidents
Panel A:									
RC border friction (0/1)	0.162*	0.137*	0.095*	0.092*	0.078***	0.051**	-0.156**	-0.033	0.015
	(0.086)	(0.073)	(0.055)	(0.053)	(0.027)	(0.023)	(0.067)	(0.022)	(0.014)
PRT border friction only (0/1)	0.024	0.117	-0.008	0.018	0.062	0.054	-0.126*	-0.062**	0.002
	(0.113)	(0.094)	(0.088)	(0.078)	(0.053)	(0.044)	(0.067)	(0.030)	(0.013)
Observations	1733	1733	1733	1733	1733	1733	1733	1733	1733
Panel B:									
Border friction (0/1)	0.119	0.131*	0.063	0.069	0.073**	0.052*	-0.147**	-0.042**	0.011
	(0.082)	(0.070)	(0.056)	(0.053)	(0.031)	(0.026)	(0.060)	(0.020)	(0.012)
Mean DV									
Std Dev DV									
Observations	1733	1733	1733	1733	1733	1733	1733	1733	1733
Number of Clusters	157	157	157	157	157	157	157	157	157
Province by quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Violence triggers							Yes	Yes	Yes

Notes: Grid cell level data aggregated between 2008Q3 and 2010Q1. The sample consists of gridcells within a 10km range from province borders. Outcomes are subject to an *asinh* transformation. PRT border frictions indicate when different countries are in charge of the Provincial Reconstruction Teams on the different sides of the border. RC border frictions indicate the regional command borders. The control set includes distance to a class 1/2 road (log), distance to the nearest airport (log), distance to the nearest military airport (log), elevation (log), nightlights at baseline (log), and population at baseline (log). Violence triggers include Direct and Indirect Fire attacks, IED explosions, and casualties among coalition forces (measured as dummies). Standard errors are clustered at the border segment by province level and are presented in parentheses, stars indicate *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure A 2: Difference-in-difference results for Hierarchical Frictions.



Notes: Data at the Province Month level between 2007 and 2010. Outcomes are measured per 100,000 of the population. Difference-in-difference estimations are for the first change in treatment status. Frictions indicate when different countries are in charge of the PRT and RC. The model includes province fixed effects, region-by-quarter fixed effects, and province-specific linear trends. In panels G and H, violence triggers include Direct and Indirect Fire attacks, IED explosions, and casualties among coalition forces. Standard errors are clustered at the province level

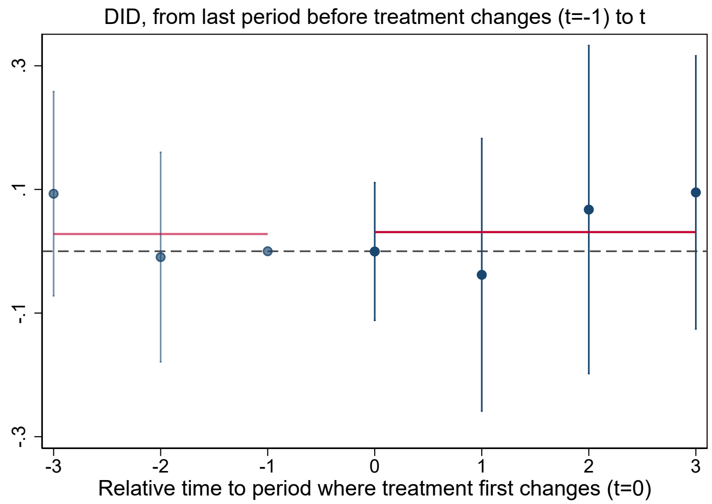
Table A5: Difference-in-difference results for Hierarchical Frictions

	(1) Attack	(2) Direct Fire	(3) IED Explosions	(4) Indirect Fire	(5) Coalition casualties	(6) Insurgent casualties	(7) Aid Projects	(8) Medevacs	(9) Accidents
Friction (0/1)	0.916 ***	0.775**	1.110	0.982***	0.718*	0.255	-0.329	0.103	-0.518
	(0.336)	(0.388)	(0.712)	(0.307)	(0.430)	(0.240)	(0.501)	(0.214)	(0.465)
Number of Observations	537	537	537	537	537	537	537	537	537
Mean Dependent Variable (sample)	2.872	2.305	1.540	1.586	0.683	0.559	4.451	0.821	0.584
Violence triggers							Yes	Yes	Yes

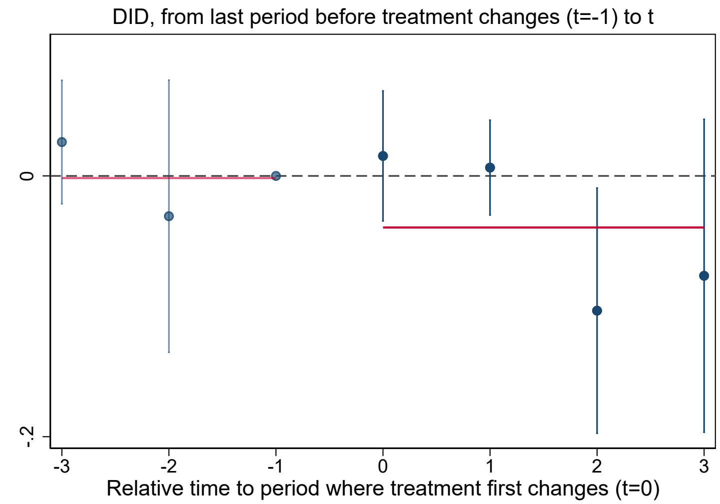
Notes: Data at the Province-Month level between 2007 and 2010. Outcomes are subject to an *asinh* transformation. Frictions indicate when different countries are in charge of the PRT and RC. We use the estimator of de Chaisemartin and D'Haultfoeuille (2022), allowing for heterogeneous and dynamic treatment effects. All regressions include province fixed effects, regional command by quarter effects, and province-specific linear trends. Violence triggers include Direct and Indirect Fire attacks, IED explosions, and casualties among coalition forces (measured as dummies). Standard errors are clustered at the border segment by province level and are presented in parentheses, stars indicate *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure A 3: Difference-in-difference results for Hierarchical Frictions, additional survey outcomes

Panel A: Anti-government elements have most influence



Panel B: Missing observations (share of districts)



Notes: Data at the District-Quarter level between 2008 and 2010. Outcomes are measured as shares. Difference-in-difference estimations are for the first change in treatment status. Frictions indicate when different countries are in charge of the PRT and RC. The model includes province fixed effects, region-by-quarter fixed effects, and province-specific linear trends. Violence triggers include Direct and Indirect Fire attacks, IED explosions, and casualties among coalition forces. Standard errors are clustered at the province level

Table A6: Difference-in-difference results for Hierarchical Frictions, Survey outcomes

	(1) Security is good	(2) Anti-goverment elements have most influence	(3) ANA seen at least monthly	(4) Missing observations
Friction (0/1)	-0.173 ***	0.024	-0.237 *	-0.036
	(0.059)	(0.084)	(0.136)	(0.026)
Number of Observations	1956	1956	1621	4283
Mean Dependent Variable (sample)	0.394	0.194	0.570	0.633

Notes: Data at the District-Quarter level between 2008 and 2010. Frictions indicate when different countries are in charge of the PRT and RC. We use the estimator of de Chaisemartin and D'Haultfoeuille (2022), allowing for heterogeneous and dynamic treatment effects. All regressions include province fixed effects, regional command by quarter effects, and province-specific linear trends. Violence triggers include Direct and Indirect Fire attacks, IED explosions, and casualties among coalition forces (measured as dummies). Standard errors are clustered at the border segment by province level and are presented in parentheses, stars indicate *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.