

# The Economics of Peace and Security Journal

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Economists for Peace  
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## Articles

*Tiffany Chou* on development assistance and reduction of violence in  
Afghanistan

*Kade Finnoff* on gender violence in Rwanda

*Rupayan Gupta* on defense alliance design

*Prakarsh Singh* on the insurgency in Punjab, 1978-1990

*Olaf J. de Groot* on analyzing the costs of military engagement

## Editors

Jurgen Brauer, Augusta State University, Augusta, GA, USA  
J. Paul Dunne, University of Cape Town, South Africa

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This journal raises and debates all issues related to the political economy of personal, communal, national, international, and global conflict, peace and security. The scope includes implications and ramifications of conventional and nonconventional conflict for all human and nonhuman life and for our common habitat. Special attention is paid to constructive proposals for conflict resolution and peacemaking. While open to noneconomic approaches, most contributions emphasize economic analysis of causes, consequences, and possible solutions to mitigate conflict.

The journal is aimed at specialist and nonspecialist readers, including policy analysts, policy and decisionmakers, national and international civil servants, members of the armed forces and of peacekeeping services, the business community, members of nongovernmental organizations and religious institutions, and others. Contributions are scholarly or practitioner-based, but written in a general-interest style.

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## Abstracts

**Tiffany Chou.** “Does development assistance reduce violence? Evidence from Afghanistan.” Current military doctrine emphasizes the importance of development spending in reducing insurgent violence. Using data from three distinct development programs, the Afghan National Solidarity Program, USAID’s Local Governance and Community Development Program, and the U.S. military’s Commander’s Emergency Response Program (CERP), combined with military records of insurgent-initiated events, this article explores whether development aid in Afghanistan is violence-reducing. I find that overall spending has no clear effect on rebel attacks. Moreover, the type of development program most effective at reducing violence in Iraq—small CERP projects—does not appear to do so in Afghanistan. Possible reasons include troop strength, conditionality of aid, effectiveness of aid in producing benign outcomes, and measurement issues.

**Kade Finnoff.** “Intimate partner violence, female employment, and male backlash in Rwanda.” Patterns of gendered violence during civil conflict are among the least well-understood aspects of civil war, and even greater gaps in our understanding exist regarding the long-term patterns of gendered power and violence in countries affected by war. This article examines the prevalence and correlates of intimate partner violence, based on household-level data from the Demographic and Health Survey conducted in Rwanda in 2005. Three results stand out. First, there are significant differences in the prevalence of three different types of gendered violence: physical, emotional and sexual violence. Second, women who are employed but whose husbands are not experience more sexual violence, not less, as would be expected in conventional household bargaining models. This can be interpreted as reflecting 'male backlash' as gender norms are destabilized. Finally, there is a strong inter-district correlation between the post-conflict prevalence of sexual violence and the intensity of political violence during the genocide.

**Rupayan Gupta.** “Designing institutions for global security.” The article merges aspects of alliance theory with bargaining theory and mechanism design. Illustrated with a numeric example, it models a within-alliance neutral agency whose purpose it is to propose an efficient level of public good provision for the alliance as a whole and suggests a mechanism by which to overcome incentives for inefficient provision. The article concludes with an extensive discussion for future research needs on alliance mechanism design, e.g., suggesting that a review of the literatures on central bank design and similar institutions might be helpful.

**Prakarsh Singh.** “Insurgency, crime, and agricultural labor expenditure: Evidence from Punjab, 1978-1990.” Using micro-level farmer expenditure surveys, this article studies the insurgency in the Punjab region of India, thought to have cost over 20,000

lives. It finds that the violence is statistically associated with an 11.4 percent decline in spending on permanent agricultural labor but did not have a statistically significant effect on the use of temporary labor. Moreover, insurgency-related violence likely signaled an increase in future kidnappings of farm labor and may have incentivized labor away from longer duration contracts. Richer farmsteads appear to be more sensitive to insurgent violence than poorer ones in reducing their labor spending.

**Olaf J. de Groot.** “Analyzing the costs of military engagement.” Analyzing governments’ expenditure when it comes to military engagement is a challenging task. As governments are neither transparent nor eager to come forward with the necessary information, researchers make a lot of assumptions that require extensive justification. This article details a range of relevant cost channels and describes the difficulties in estimating their respective sizes. But when worked-up in a careful and deliberate way, it is possible to obtain reasonable estimates of the budgetary effects of military engagements. Following the outlined methodology creates an opportunity to improve openness, which will benefit researchers, policymakers, and the public at large.

## Does development assistance reduce violence? Evidence from Afghanistan

Tiffany Chou

Current counterinsurgency (COIN) doctrine emphasizes the role of benign development assistance as a key component in any campaign to enhance security in conflicted and postconflict regions.<sup>1</sup> As a consequence, significant resources have been spent on rebuilding Afghanistan's institutions and livelihoods with the intention that such projects achieve both conventional development goals and donors' security objectives. Since 9/11, the U.S. government has appropriated nearly US\$20.3 billion for governance and development in Afghanistan, on top of the security-related and human costs of the war.<sup>2</sup> The questions of when, where, and how development assistance builds stability are especially relevant to policymakers as the military intervention in Afghanistan enters its tenth year and international donors begin to shift their attention to other conflicted areas such as the Middle East and Africa.

While counterinsurgency researchers and practitioners appear to agree on the importance of popular support in determining the outcome of insurgent conflicts, the question of how to gain it is still debated. "Hearts and minds" proponents argue that the government can win civilian support by addressing grievances, thus reducing the "demand" for rebellion. Others argue that rebels, like secular criminals, might be more sensitive to the opportunity costs and potential payoffs of rebellion. This would be especially true in weakly governed places where the state cannot successfully "buy off" potential rebels, either through legitimate work opportunities or other income transfers, nor can they effectively utilize a cooperative populace's information. So far, the empirical evidence on the relative importance of grievances ("demand") compared to employment/income-generation ("supply") as motivations for insurgent violence has been somewhat mixed. Rather than analyzing the underlying reasons for insurgency, this article explores a more fundamental question: Does spending lower violence?<sup>3</sup>

While counterinsurgency is almost as old as war itself, there has been relatively little empirical research into whether these reconstruction efforts have generated security improvements as intended. Recent empirical evidence suggests that this strategy of combining military operations with civilian development has been somewhat successful in Iraq.<sup>4</sup> This article, however, looks at reconstruction and violence in Afghanistan and finds that those efforts have ambiguous effects on conflict. For each of three reconstruction programs (the Afghan National Solidarity Program, USAID's Local Governance and Community Development Program, and the U.S. military's Commander's Emergency Response Program), project spending

does not statistically reduce, nor increase, the level of rebel violence.

However, the difference in results between the U.S. military's CERP and the two other programs suggests that aid conditionality is an essential, but currently under-emphasized, prerequisite for stability-enhancing development. The theoretical model predicts stark differences in effectiveness between aid that is contingent on community cooperation (conditional aid) and aid that is not: Only conditional aid reduces insurgent violence. Development projects provided independent of information-sharing have no effect on violence because

they are valuable to the community regardless of whether the government or rebels are in control; hence, they cannot induce information-sharing on the margin. Out of the three programs examined here, only CERP practices conditionality and hence is the only one predicted to have violence-reducing potential. The empirical results are consistent with this conjecture as CERP is the only one to have consistently negative, if imprecisely estimated, effects on rebel violence.

While overall spending does not appear to be "winning hearts and minds," there is some heterogeneity across different types of spending. In particular, I find preliminary evidence that small-scale CERP projects might be more effective at reducing violence than larger ones. This finding is consistent with the theoretical prediction that projects or places where the government is more effective at providing services should exhibit stronger violence reduction. However, these estimates are imprecise and only small-spending delivered through the U.S. military demonstrates this effect; small-scale development through USAID's LGCD program does not appear to have much effect on rebel activity.

The next section outlines a model of counterinsurgency with an emphasis on two empirically testable hypotheses regarding the relationship between development spending and insurgent violence. (Interested readers can see the full mathematical model in the Appendix or in Berman, Felter, and Shapiro, 2011.) This is followed by a section that discusses both the military records on violence and the institutional details of the three different development programs used to empirically test those hypotheses. The empirical sections present the main findings, and this is followed by a concluding section, endnotes, references, and the Appendix.

**This article looks at reconstruction and violence in Afghanistan. For each of three reconstruction programs, the Afghan National Solidarity Program (NSP), USAID's Local Governance and Community Development Program (LGCD), and the U.S. military's Commander's Emergency Response Program (CERP), project spending does not, statistically, reduce the level of violence. However, small-scale CERP development aid made available conditional on information-sharing does appear to be somewhat effective in reducing rebel violence.**

### Theoretical model

What distinguishes an insurgency from a traditional interstate military conflict? Both are contests between armed parties in pursuit of political power, but unlike conventional armed conflict, insurgencies emphasize the pivotal role of noncombatants. Civilians, who are generally unarmed and may not even share political ideologies with the rebels, are crucial to the success of insurgent campaigns because they can provide actionable information that makes military operations more effective. Rather than being merely passive observers of a conflict, the populace is an active player in insurgencies, one that responds swiftly to both state and rebel actions. In a conflict between the government and rebel forces, the local population can either share its information with the government (and other allied forces) or not. The key insight from the theoretical model is that the government can induce information sharing by providing basic necessities or other goods and services.<sup>5</sup>

The three actors in the strategic interaction are Government ( $G$ ), Rebels ( $R$ ), and Community ( $C$ ). Government seeks to minimize costs through a combination of violence mitigation and service provision while rebels maximize their utility by choosing a level of violent action. The community's key action is to choose whether or not to share information with government. Payoffs to each of the players are determined by whether  $G$  or  $R$  is in control.

The key assumption in the model is that government service provision is only valuable to the community when  $G$  is in control at the end of the game. While all government services improve the local community's wellbeing, only conditional services are able to affect  $C$ 's decision to share information and, in equilibrium, will be violence-reducing. Empirically speaking, a regression of violence on reconstruction spending should have a negative coefficient (denoted as hypothesis  $H_1$ ).

Aid conditionality seems a rather extreme assumption since it cannot literally be true of certain projects (e.g., infrastructure). However, it is a necessary condition for spending to be violence-reducing in the model. Intuitively, unconditional service provision does not affect the community's behavior since it benefits in both states of the world. Since spending by traditional development agencies is not conditional on cooperation, the model predicts stark differences in the violence-reducing potential between the military's CERP and the other, unconditionally provided, aid programs. While the model's prediction about unconditional spending is quite clear, this should be treated as a positive statement, one about a concrete implication of the model, rather than a normative one about what policymakers should do. Government can still provide unconditional services to increase the community's welfare, even if it does not induce information sharing. As a practical matter, some reconstruction projects, like paving roads or building power plants, provide logistical benefits to government as well as to locals.

The basic model treats all spending uniformly; an additional dollar for digging wells or paving roads increases the community's wellbeing by the same amount. The

second hypothesis concerns the relative effectiveness of particular types of service provision. Projects that provide higher marginal utility to the community ("more bang for the buck") should have stronger violence-reducing effects (denoted as  $H_2$ ). More effective spending provides higher marginal benefits to the community; in equilibrium, this makes it more likely to share information, which in turn decreases insurgent violence. The empirical interpretation is that small projects, which are quicker to implement and more adaptable to community needs, should exhibit stronger violence-reducing effects than large ones. The definition of small projects is based on program guidelines, which will be discussed in more detail later on.

### Data on insurgent violence and reconstruction programs

To create a measure of insurgent activity, I use declassified incident records from the U.S. military's Combined Information Data Network Exchange (CIDNE) database. These records consist of 60,075 events of "significant activity" (SIGACT) from April 2002 through January 2010. Each event record comes with date, time, attack type, and geographic coordinates, which allow each incident to be precisely geo-located. These data are then converted into a detailed district-month panel of insurgent activity.

A few limitations of the violence data are worth discussing. First, a SIGACT, by definition, must be insurgent-initiated; events initiated by coalition or Afghan forces are not included. Also, to the extent that rebels attack civilians or conduct criminal activity, SIGACTs will undercount true violence experienced by the population. As the model is framed as rebels attacking the government, SIGACTs are the appropriate measure of insurgent activity to test the theoretical predictions. In practice, civilians are likely to care about all types of violence and insecurity in their community, not just the ones targeted at government forces, and neither the model nor the data capture this. Second, SIGACTs can vary in scale and complexity, ranging from direct fire incidents to improvised explosive devices (IEDs), and since there is no information about the damage caused or units involved in these attacks, all event types are just pooled together.<sup>6</sup>

As a measure of government service provision, I use project expenditures from each of three different reconstruction programs (NSP, LGCD, and CERP) to create a district-month panel of reconstruction spending. These programs all fund a variety of projects types though project selection is likely to differ based on the incentives of the different stakeholders and involved parties.

Started in 2003, the National Solidarity Program (NSP) is intended to help individual communities build and manage their own development projects.<sup>7</sup> Logistically, NSP allocates block grants, based on the number of households, to individual rural areas and aids a Community Development Council (CDC) in identifying and developing projects to use those funds. The NSP data cover almost US\$680 million in project expenditures spread across 316 out of Afghanistan's 398 districts.

The second development program is USAID’s LGCD, which seeks to improve Local Governance (LG) and Community Development (CD) in insecure areas.<sup>8</sup> LGCD projects are also community-initiated and driven since proposals can be brought up and approved through the local CDC, but they lack the explicit block grant funding scheme of NSP. In contrast to NSP, LGCD is relatively new with initial projects starting in 2007. While LGCD itself is active in other regions of Afghanistan, the data are limited to just projects in the South and East regions.

The final reconstruction program for which I have data is the U.S. military’s Commander’s Emergency Response Program (CERP). As its name suggests, CERP is intended to allow commanders to provide “urgent, small-scale, humanitarian relief, and reconstruction projects and services that immediately assist the indigenous population.”<sup>9</sup> However, CERP projects do not have an explicit maximum, and they range in size from small condolence payments to construction of major roads. Since 2004, CERP has appropriated almost US\$2.64 billion in Afghanistan.<sup>10</sup> While CERP is the longest running of the three reconstruction programs examined here, district identifiers and project expenditures were only usable for four months in 2009-2010.

Using these data on individual project locations, dates, and costs, I construct a panel of reconstruction expenditures by uniformly spreading project spending over all days in which each project was active and then aggregating up to the district-month level. This spending measure is the main explanatory variable in the regression analysis. This implicitly assumes that spending is a viable measure of service provision. For a variety of reasons, this might not be the case in Afghanistan, which will be discussed further in the concluding section.

The sample means for the spending and violence variables are listed in Table 1. To account for size effects, both violence and spending measures are scaled by district population, and the regressions are also weighted by population. From April 2002 to January 2010, the average number of SIGACTs per month is 0.017 incidents per 1,000 people, or about 10.2 attacks annually in a median district of 50,000 residents. For comparison, this is about six times lower than in Iraq, which averaged about 0.098 attacks per month per 1,000 residents. Average monthly spending by NSP is about US\$0.23 per person while average LGCD and CERP spending is only half that (around US\$0.11 and US\$0.08 per capita, respectively). This is far less than in Iraq where CERP averaged almost US\$1.76 per person per month.

### Empirical effect of reconstruction spending on insurgent violence

One methodological issue is worth discussing before moving to the empirical results. Traditional development programs like NSP are limited to operating in areas that are sufficiently safe for their civilian staff. In contrast, CERP and LGCD are intended be stability-enhancing, and program directors might strategically allocate resources to areas inherently prone to violence. This implies that a simple cross-sectional analysis of violence on reconstruction spending would find higher NSP spending in low

**Table 1: Summary statistics**

	<i>Observations</i>	<i>Number of districts</i>	<i>Mean</i>
Incidents per 1,000 (Apr 2002 - Jan 2010)	37,412	398	0.0174 (0.0867)
NSP spending (per capita) (Apr 2002 - Jan 2010)	29,704	316	0.233 (0.399)
LGCD spending (per capita) (Jul 2007 - Dec 2009)	5,328	144	0.109 (0.487)
CERP spending (per capita) (Oct 2009 - Jan 2010)	808	202	0.0810 (0.386)
- Large projects (>\$50,000)	808	202	0.0271 (0.298)
- Small projects (≤ \$50,000)	808	202	0.0539 (0.230)

*Notes:* Incident records are from the CIDNE database. Means are weighted by Landscan population; standard deviations are in parentheses. LGCD is only active in the South and East. An observation is a district-month.

violence areas, but the reverse for CERP and LGCD spending. A simple positive correlation between, say, CERP spending and SIGACTs does not mean that reconstruction causes violence though as one would not have accounted for the fact that the kinds of districts that tend to receive CERP funds are also probably the most violent ones.

Rather than just simply comparing spending and violence across districts, the empirical method here compares violence and spending within districts. There are a variety of district-level characteristics that are likely correlated with insurgent activity, for example ethnic makeup, proximity to the border, or mountainous geography. These features make SIGACTs extremely persistent across time within any particular district, but comparing changes in violence to changes in spending removes these time-invariant district effects.<sup>11</sup> These “first difference” regressions, which are the preferred specification throughout, are labeled FD in the tables to differentiate them from the simple ordinary least squares (OLS) that compare reconstruction and SIGACTs across districts. Since there may be strong seasonality or time trends in SIGACTs, the full specifications also include controls for the quarter and year of observation.<sup>12</sup> In other words, the regression coefficients in the FD regressions are interpreted as the effect of an additional dollar per person in reconstruction spending

on violence within individual districts and net of time effects.

Table 2 presents estimates of both the cross-sectional (OLS) and first-differenced (FD) regressions of insurgent violence on reconstruction spending for each of the three development programs. Looking first at the OLS columns, there is a very weak positive relationship between violence and spending for NSP and a noticeably stronger positive one for both LGCD and CERP. Places with high LGCD or high CERP spending tend to be more violent than those with low spending, but insurgent activity is not a strong predictor of whether a district receives NSP. This is consistent with the discussion above about how different types of programs target resources differently and reinforces the fact that we should be careful drawing conclusions from just a simple cross-sectional regression.

The adjacent FD columns estimate the same violence-on-spending regressions but account for a district's predisposition to violence. For NSP and LGCD, the spending coefficients are positive, meaning that districts that have large increases in spending experience increases in violence, but not statistically different from zero. Since neither program delivers aid conditionally, the model predicts that they will not be violence-reducing.

The spending coefficient for CERP, however, is negative, implying that increases in CERP spending predict decreases in SIGACTs. CERP is spent conditionally, and thus is the only program that, according to the model, should have a violence-reducing effect. While the coefficient on CERP is also not statistically different from zero, the estimated effect is relatively large. To put this in context, insurgent violence sharply increased between 2005 and 2006 as the militants regrouped and renewed attacks; in the data, the average monthly rate of violence increased by 0.011 SIGACTs per 1,000 residents. The spending coefficient of -0.011 means that an additional dollar per capita of CERP projects reduces violence by 0.01 SIGACTs per 1,000 residents, or enough to mitigate the entire increase in rebel activity between 2005 and 2006 (if the effect is indeed causal). While the standard errors for all three programs are all quite large, CERP is the only one that appears to result in economically meaningful reductions of violence.

The magnitude of CERP's effect is also remarkably similar to its effect in Iraq, even though the context and environmental conditions differ between the two countries. In Iraq, the spending coefficients for CERP were between -0.009 and -0.011, surprisingly similar to the -0.011 in Afghanistan.<sup>13</sup> Moreover, the aforementioned Iraq results were highly significant and very precisely estimated since that theater tracked CERP projects reliably over a much longer time period (almost five years, compared to just four months in Afghanistan). The availability of data in Iraq allow for more precise estimates than is possible here.

While there are multiple dimensions of nonlinearity, there is one particular dimension that bears mentioning. While CERP and LGCD have the stated function of enhancing "stability"—which is generally understood to mean the security of noncombatants—the theory and regressions were developed using violence directed

**Table 2: Development spending and violence**

<i>y=incidents per 1,000</i>	<i>NSD spending</i>		<i>LGCD spending</i>		<i>CERP spending</i>	
	<i>OLS</i>	<i>FD</i>	<i>OLS</i>	<i>FD</i>	<i>OLS</i>	<i>FD</i>
Spending (US\$/capita)	0.00090 (0.00342)	0.00116 (0.00300)	0.0164 (0.0118)	0.000246 (0.00319)	0.0387 (0.0233)	-0.0110 (0.00967)
Year FE		X		X		
Quarter FE		X		X		
R2	0.000	0.002	0.002	0.005	0.004	0.003
Observations	29,704	29,388	5,328	5,184	808	606
Number of districts	316	316	144	144	202	202

*Notes:* Robust standard errors in parentheses, clustered by district. Regressions are weighted by population. An observation is a district-month. Sample is strongly balanced to include only districts that ever have NSP or LGCD as where appropriate. CERP projects count per 1,000, rather than spending per capita, is the explanatory variable in the CERP columns. Quarter and year fixed effects (FE) are omitted from CERP spending regressions since there is only one year of data. Dependent variable (*y*) is insurgent events per 1,000 population as recorded by CIDNE. None of the coefficients are significantly different from zero at the 10 percent level..

against combatants as the outcome. In other words, SIGACTs are implicitly assumed to be proxy for district stability or government control. For example, there could be a nonlinear relationship between the observed outcome, SIGACTs, and unobserved rebel control simply because there are no military targets to attack in insurgent zones of control, nor would there be anyone around to record the incident. As government or coalition forces start to enter these insurgent strongholds, the number of SIGACTs could increase as the rebels are presented with more potential targets. Since the government sometimes expands into regions where it previously had little control, this could be viewed as a stability improvement even though reported violence is actually increasing. To examine this possibility, I divide districts using a composite index of stability and then estimate the violence-on-spending regressions within each stability category. However, splitting the estimation sample by stability does not qualitatively change the result that development spending is ineffective at reducing insurgent violence.<sup>14</sup>

### Effectiveness of small CERP projects

I now turn to the second testable hypothesis ( $H_2$ ): Projects that provide higher benefit



on the margin are more effective at reducing violence. To test this, I classify CERP projects as large or small based on administrative guidelines, and then repeat the analysis with small spending included separately from large spending. In this context,  $H_2$  implies that the coefficient on small spending is more negative than that for large spending.

Funding regulations for CERP allow small projects to be authorized and implemented regionally without seeking the approval of higher-ranking (and more remote) officers. More specifically, Standard Operating Procedures for CERP in Afghanistan allow battalion commanders to authorize projects of US\$50,000 or less.<sup>15</sup> These smaller grants provide local commanders and aid officials more flexibility and responsiveness in meeting urgent community needs. Such projects are likely to be highly valued by the local population compared to larger ones with a long implementation time.

Table 3 explores  $H_2$  using CERP data, splitting spending using the US\$50,000 cutoff. In the first column, an additional dollar per person in small CERP projects reduces violence by 0.029 incidents per 1,000 residents, almost three times as large as the estimate on overall spending in Table 2. In column 2, large spending is also negatively signed, but the coefficient, at -0.004, is much smaller in magnitude than that for small projects. Column 3 includes both types of projects simultaneously, and the results are almost identical to when the two types are included individually.<sup>16</sup> The standard errors are again quite large, and the coefficients on large and small spending are not statistically different ( $p = 0.35$ ). Given the lack of precision, these results provide weak evidence in support of  $H_2$ . Small CERP projects appear to be almost twice as effective at reducing violence in Iraq compared to Afghanistan, where an additional dollar per capita in small projects reduced violence by 0.053 incidents per 1,000 residents. Similarly, large projects in Iraq were less effective at reducing violence than smaller ones, with an estimated coefficient of -0.008.<sup>17</sup> For brevity, similar results from LGCD program regulations are omitted.<sup>18</sup>

While none of the three overall spending regressions appear to be strongly violence-reducing, the difference in estimates between big and small projects suggests that other dimensions of project heterogeneity might be useful in guiding future aid practices or theoretical developments. However, different categorical cuts of the spending data do not provide much insight about which project types are more effective in improving district stability since the estimates all displayed the same lack of precision as the aggregate regressions.

## Conclusion

This article tests two empirical hypotheses on current counterinsurgency theory in the Afghan context. The results suggest that development aid in Afghanistan, whether it comes from the U.S. military, USAID, or the Afghan government itself, has not been effective in reducing insurgent attacks. While overall service provision did not appear

**Table 3: Small versus large CERP projects**

$y=incidents$ per 1,000	(1)	(2)	(3)
Spending (small)	-0.0291 (0.0267)	—	-0.0290 (0.0268)
Spending (large)	—	-0.00363 (0.00390)	-0.00306 (0.00389)
R2	0.006	0.000	0.006
p-value for $\beta(\text{small})=\beta(\text{large})$	—	—	0.0348
Observations	606	606	606
Number of districts	202	202	202

*Notes:* Robust standard errors in parentheses, clustered by district. Regressions are weighted by population. An observation is a district-month. Sample is strongly balanced to include only districts that ever have spending data from CERP. “Small” projects are those that spend US\$50,000 or less. None of the coefficients are significantly different from zero at the 10 percent level.

to reduce violence, the analysis suggests that small CERP projects might be a useful tool to reduce violent insurgency.

Given the vast amount of resources, both monetary and human, that the international community has committed to rebuilding Afghanistan, a natural question to ask is: Why does CERP spending not appear to be effective in reducing insurgent activity in Afghanistan when it did so in Iraq? The results suggest three potential explanations. First, the conditionality of aid is a necessary, and possibly overlooked, condition underlying the theoretical model. While the majority of CERP implementers in Afghanistan report practicing conditionality, a significant minority do not.<sup>19</sup> Aid conditionality is the military’s official policy for CERP, but the importance of conditionality implies that future efforts to use reconstruction as a tool to increase stability could benefit from a greater emphasis or stronger guidelines about aid provision and community cooperation.

Second, the lack of violence-reduction raises questions about program effectiveness: Perhaps money spent is not translating into services provided. The model abstracts away from the efficacy of government provision of services in the sense that higher levels of spending imply higher service provision. In other words, service provision is measured as money spent, not as physical outputs or civilians helped. In a world where reconstruction and service provision by the state signals competent and committed governance, dollars spent should be closely related to services provided, and hence effective at inducing information-sharing and improving

security. This connection might be tenuous in an institutionally weak environment such as Afghanistan where monitoring is absent or extractive rent-seeking behavior is commonplace. These weaknesses can dampen or even reverse the effect of reconstruction on stability should they provide more rents for insurgents to capture<sup>20</sup> or signal incompetent or ambivalent governance.<sup>21</sup> Large construction projects, in particular, could suffer severely from this issue as they involve multiple levels of contractors and subcontractors who could be colluding or otherwise acting anti-competitively.

Third, the model reflects only static interaction. But in a dynamic model noncombatants would consider their future wellbeing, and development would increase support for the government only if it signaled a permanent shift in improved governance tomorrow. In the Afghan context the mismanagement of development funds might be signaling the opposite. Future efforts to rebuild contested and postconflict areas should not necessarily focus on spending more money, but rather on using it more effectively.

## Notes

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1. This is explicitly stated in the COIN Field Manual: “Durable policy success requires balancing the measured use of force with an emphasis on nonmilitary programs ... COIN programs for political, social, and economic well-being are essential to developing the local capacity that commands popular support when accurately perceived.” (U.S. Army, 2006, Section 2-5).

2. SIGAR (2012).

3. Hearts and mind: Gurr (1970); Horowitz (1985). Criminals: Becker (1968). Opportunity cost/payoffs: Grossman (1991); Fearon (2008), Mixed: Fearon and Laitin (2003) find that civil war is predicted by low income per capita and difficult terrain, both of which are indicative of poor state capacity and low opportunity cost of rebellion. However, Berman, Felter, Shapiro, and Callen (2011) show that employment rates are actually positively correlated with insurgent violence in Iraq, the Philippines, and Afghanistan. But in Afghanistan, rebel attacks seem to increase after coalition-induced civilian casualties, suggesting that the “supply” of insurgent activity is somewhat responsive to government actions (Condra, Felter, Iyengar, and

Shapiro, 2010).

4. Berman, Shapiro, and Felter (2011).

5. Noncombatants: U.S. Army, Section 1 3 (2006). Actionable information: Kalyvas (2006); Kaldor (2007). Populace as active player: Galula (1964); Popkin (1979). Share information or not: Berman, Shapiro, and Felter (2011). Other interpretations of “hearts and minds” theory argue that noncombatants are influenced not by improved governance but by grievances allayed, jobs provided, or because their leaders are coopted, and that the consequential act of noncombatants is not information sharing but active resistance to rebel activity, taxation or recruitment (Gurr, 1970; Horowitz, 1985). Nevertheless, all these models share the implication that development spending reduces violence.

6. For a full discussion of measurement error issues, including an analysis between how observed SIGACTs are related to underlying Afghan stability perceptions, see Chou (2011).

7. MRRD (2007).

8. USAID (2010).

9. U.S. Army, Ch.4 (2009).

10. SIGAR (2011).

11. In particular, including lagged SIGACTs on the right-hand side yields a coefficient estimate of 0.9, with a standard error of approximately 0.02, in all specifications for all reconstruction programs, but does not materially change the results.

12. Patterns of violence over the sample are discussed in more detail in Chou (2011).

13. Berman, Felter, and Shapiro (2011).

14. Full results are in Chou (2011).

15. USFOR-A, paragraph 5.K (2009).

16. Large spending can be thought of as a proxy for the presence of military forces. However, this similarity in coefficients suggests that the unobserved location of military units does not strongly bias the results.

17. Berman, Felter, and Shapiro (2011).
18. Full results are in Chou (2011).
19. Berman, Felter, and Shapiro (2011).
20. Wilder (2009); Crost, Felter and Johnston (2012).
21. Rashid (2008).

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## Appendix: Formal model

### *Players, actions, and payoffs*

There are three players in the game, denoted  $G$ ,  $R$ , and  $C$ . The key state of the game that determines payoffs is whether  $G$  or  $R$  has control at the end, denoted by a binary

variable  $a$  where  $a=1$  if  $G$  is in control and  $a=0$  if  $R$  is in control. The community has political norms regarding rebel control,  $n$ , which are conceptualized as a utility penalty if  $G$  is in control at the end of the game.

The community's sole action is to choose a level of information-sharing  $i \in [0, 1]$ . The rebels also only have one action, to choose a level of violence  $v \geq 0$ , which targets the government but still negatively affects the community. The government has two actions: It can combine benign social services,  $g \geq 0$ , with active operations to mitigate violence,  $m \geq 0$ .

The community's payoffs are as follows: If  $a=1$  (government control), it receives secular consumption  $c$  and government-provided services  $g$  but also experiences a penalty for having shared information  $n$ ; if  $a=0$  (rebel control), it still receives consumption  $c$  but also suffers from violence  $v$ . The payoff function for  $C$  is:

$$U_C(c, g, v, n, a) = a \cdot u(c + g - n) + [1 - a] \cdot u(c - v),$$

where  $u(\cdot)$  is a well-behaved utility function. Note that a key assumption is that  $g$  is conditional; the government can and will only provide services if it is in control at the end of the game.

The rebels' goal is to impose costs on government. Violent actions benefit rebels according to the function  $A(v)$  but only if they are in control at the end of the game. Violence costs rebels  $B(v)$  regardless of the ending state. The payoff function for  $R$  is:

$$U_R(v, a) = [1 - a] \cdot A(v) - B(v),$$

where  $A(v)$  and  $B(v)$  are both  $C^2$  and increasing.  $A(\cdot)$  is concave while  $B(\cdot)$  is convex. Assume that no violence results in no damage:  $A(0)=0$ .

Both the community and rebels are expected utility maximizers. The government seeks to minimize a combination of violence and costs. If  $R$  has control at the end of the game,  $G$  suffers damage  $A(v)$ , otherwise it is unharmed by rebel violence. Both violence mitigation  $m$  and service provision  $g$  incur costs, defined by  $D(m)$  and  $H(g)$ , respectively, regardless of which player is in control at the end. The government's total cost function is:

$$C_G(v, m, g, a) = [1 - a] \cdot A(v) + D(m) + H(g).$$

Cost functions  $D(\cdot)$  and  $H(\cdot)$  are  $C^2$ , increasing and convex, and scaled such that  $D(0)=H(0)=0$ . To rule out the case where mitigation is never effective, assume that  $A(n_u) > D'(0)$ . Intuitively, this condition says that even in the "worst case scenario" (i.e. areas with the highest proclivity toward violence), it costs less to provide a tiny amount of counterinsurgency effort than it does to suffer full damage from rebel violence. Hence, it is always in the government's interest to provide nonzero

counterinsurgency effort.

The final component of the model is how  $G$  converts mitigation  $m$  and information  $i$  into control. Let  $p$  denote the probability that  $a=1$ .  $G$  can combine mitigation and information to increase its probability of winning control according to:

$$p = \text{PR}(a=1) = h(m) \cdot E(i),$$

where  $h(m): \mathbb{R}^+ \rightarrow [0, 1]$  is a "contest success function" (Skaperdas, 1996). Higher COIN effort  $m$  increases the probability that  $G$  is in control, but this mitigation also faces decreasing returns;  $h(m)$  is increasing but concave.  $h(0)=0$  and  $h(m) \rightarrow 1$  as  $m \rightarrow \infty$ . Note that information sharing is necessary but not sufficient for control: if  $i=0$ , then  $p=0$ , but  $i=1$  does not guarantee that  $p=1$ .

### Description of the game

The game has four stages but strategic interaction only occurs in Stage 2 and Stage 3. In Stage 1, Nature draws norms  $n \sim U[n_L, n_U]$ , and this parameter is revealed only to  $C$ . The support of  $n$  is assumed to be wide enough that neither  $G$  nor  $R$  can fully determine the outcome of the game through his actions alone.<sup>1</sup> In Stage 2,  $G$  and  $R$  simultaneously move. In Stage 3,  $C$  observes the actions of the previous stage  $\{v, m, g\}$  and chooses its level of information sharing. Finally, Nature draws the final state  $n \sim \text{bernoulli}(p(m, i))$ , and payoffs to  $G$ ,  $R$ , and  $C$  are determined.

### Equilibrium

Solve for the subgame perfect Nash equilibrium via backward induction. The community's objective is to choose  $i$  to maximize:

$$\begin{aligned} EU_C(c, g, v, n, a) &= E(a) \cdot u(c + g - n) + [1 - E(a)] \cdot u(c - v) \\ &= p \cdot u(c + g - n) + [1 - p] \cdot u(c - v) \\ &= h(m) \cdot i \cdot u(c + g - n) + [1 - h(m) \cdot i] \cdot u(c - v) \end{aligned}$$

Since this function is linear in  $i$ , the only solutions are on the boundaries.<sup>2</sup>  $C$  will choose to share information if  $u(c, g, n) > u(c - v)$ ; otherwise, it will not share at all. Since  $u(\cdot)$  is monotonically increasing, this implies that  $C$ 's best response is:

$$i^* \begin{cases} 1 & \text{if } g - n > -v \\ 0 & \text{if } g - n < -v \end{cases}.$$

Given the distributional assumption about  $n$ , this implies that:

$$\text{Pr}(i^*=1) = \text{Pr}(n < g + v) = (g + v - n_L) / (n_U - n_L) = f \cdot (g + v - n_L),$$

where  $f = 1 / (n_U - n_L)$ . Substituting this into the definition of  $p$  results in:

$$(1) p^*(m, v, g) = h(m) \cdot i^* = h(m) \cdot f \cdot (g + v - n_L).$$

Turning to the previous stage of the game,  $G$  and  $R$  will simultaneously optimize, knowing that  $C$ 's actions will result in the final state  $a=1$  with probability  $p^*$  defined by equation (1).  $R$ 's problem is simply to choose violence to maximize:

$$EU_R(v, a) = [1 - E(a)] \cdot A(v) - B(v) = [1 - p^*(m, g, v)] \cdot A(v) - B(v).$$

The first-order condition for  $v$  is:

$$\begin{aligned} \delta EU_R / \delta v &= [1 - p^*] A'(v) - A(v) \delta p^* / \delta v - B'(v) \\ &= [1 - p^*] A'(v) - A(v) h(m) f - B'(v) = 0, \end{aligned}$$

which results in a best-response function  $v^*(m, g)$ . Differentiating implies that  $v^*$  is decreasing in both its arguments. Holding  $m$  constant, rebels respond to increased service provision with lower violence. Similarly, rebels respond to higher COIN effort by lowering violence, holding  $g$  constant.

$G$ 's problem is to choose both  $g$  and  $m$  to minimize:

$$\begin{aligned} EC_C(v, m, g, a) &= [1 - a] \cdot A(v) + D(m) + H(g) \\ &= [1 - p^*(m, g, v)] \cdot A(v) + D(m) + H(g). \end{aligned}$$

The first-order condition with respect to  $m$  is:

$$\delta EU_C / \delta m = -A(v) \delta p^* / \delta m + D'(m) = 0.$$

The first-order condition with respect to  $g$  is:

$$\delta EU_C / \delta g = -A(v) \delta p^* / \delta g + H'(g) = 0.$$

Solving the first-order conditions provide best-response functions  $m^*(g, v)$  and  $g^*(m, v)$ . Implicitly differentiating implies that both COIN effort and service provision are increasing in  $v$  and that, for a given level of rebel activity, mitigation and services are complements. The subgame perfect Nash equilibrium is defined by the best-response functions  $m^*(g, v)$ ,  $g^*(m, v)$ ,  $v^*(m, g)$ , and  $i^*$  derived above.

## Appendix notes

1. More specifically,  $n_L \leq v + g \leq n_U$ .

2. Trivial solutions occur in the case where  $h(m)=0$  or  $g-n = -v$ . In either case, any value of  $i$  is optimal. Since  $m=0$  is never optimal and  $h(m)$  is increasing, there are no other values of  $m$  that might yield Case 1.

## Intimate partner violence, female employment, and male backlash in Rwanda

Kade Finnoff

“Most survivors describe the genocide as a bloodbath during which rape was inevitable for practically all females—implying that, whether or not they have chosen to describe what happened to them, nearly all the women and adolescent girls who survived the genocide are now living with the traumatizing memory of a brutal sexual attack that they had suffered or witnessed firsthand.”

—Donovan (2002)

“Civil conflicts ... have specific forms of violence, including state terror enacted by agents or by vigilante groups or paramilitaries with state complicity directed primarily against innocent civilians; much of this violence is again gender specific, with women being targeted in specific ways through gender-based humiliation and torture. Moreover, many feminist scholars have argued that sexual violence against women specifically is a constitutive aspect of war. While it is clear that war is gendered, what is less recognized is that the post-war period is equally gendered. What happens to women victims of war violence? What role does righting gender inequities play in post-war reconstruction?”

—Borer (2009)

Methodologically comparable empirical research in developing countries on the prevalence, incidence, and determinants of intimate partner violence is sparse. Moreover, much of the work is concentrated on understanding its public health ramifications. The most comprehensive such study is the World Health Organization’s Multi-Country Study on Women’s Health and Domestic Violence against Women. Collecting data from over 24,000 women in 10 countries, it supported diverse prior studies in which a higher prevalence of intimate partner violence was found among women who have lower levels of education, greater financial dependence, a family history of violence, lack of wider social support networks, have a partner who abuses alcohol, have an unemployed partner, or live in a context that endorses or accepts violence against women.<sup>1</sup> Beyond this general dearth of knowledge, gender violence in civil war is particularly ill-understood, and still greater gaps in our understanding exist in regard to possible long-term patterns of gendered power and violence in countries affected by war.

Civil war fractures society and previously established norms. Gender norms in particular are altered when men are either absent or unable to fulfill their previous roles of primary wage earners. Following civil war, in low-income countries, women

often enter the paid labor force due to necessity (large numbers of female-headed households) and greater employment opportunities (through the influx of targeted international aid and NGOs). From standard bargaining models, this should have the effect of empowering women and therefore reducing their vulnerability to violence from intimate partners. However, relative female economic empowerment often occurs at the same time that men are experiencing high unemployment and frustration. To the extent that these phenomena change the dynamics of gender relations, especially in an environment of psychological and emotional distress, there may be a propensity to an eruption of conflict within the household. In some cases this conflict is expressed nonviolently, but in others it can be accompanied by acts of physical and sexual violence, especially when the social mores of society remain unchanged in other ways.<sup>2</sup> In this sense, overt violence against women during conflict can be said, postwar, to “retreat” into the domestic sphere.

The implied hypotheses have not been expressly tested using standard economic methodology. This article seeks to address these issues by examining the correlates of intimate partner violence in post-genocide Rwanda using data from a widely used and standard survey, the Demographic and Health Survey (DHS). Rwanda is a particularly apt case study as large-scale physical and sexual violence occurred during the genocide, with estimates ranging from 250,000 to 500,000 women raped.<sup>3</sup>

Using data from the 2005 DHS, in which women were surveyed alone and which included questions on intimate partner violence, the article explores three separate but linked issues. First, it seeks to identify the most common correlates of intimate partner violence. The DHS survey allows for the separate examination of three categories of intimate partner violence: physical, emotional, and sexual. Unlike similar studies done in different contexts,<sup>4</sup> results are disaggregated by the kind of violence experienced. Because these three kinds of violence are different both in conception and as forms of male domination, it is important to see whether there are differences in their patterns and prevalence. Distinct patterns by subcategory are found.

Second, the article examines possible links between women’s and men’s labor market engagement and the propensity for different forms of violence. As already suggested, patterns of labor market involvement and their effect on gender relations are complex and potentially nonlinear. Controlling for other risk factors, the main finding here is that of a positive and significant female wage effect on the probability of being the target of sexual (but not physical or emotional) violence when the male is disempowerment, defined as a situation where the woman works and receives payment while her spouse lacks paid employment. Where men are disempowered in

“While it is clear that war is gendered, what is less recognized is that the post-war period is equally gendered. What happens to women victims of war violence? What role does righting gender inequities play in post-war reconstruction?”(Borer, 2009)

this sense, women are twice as likely to be the victims of sexual assault compared to women who are not in such a relationship. This finding suggests that sexual violence in particular may constitute a different and more complex form of male domination. Running counter to canonical bargaining models in economics that predict that greater female economic empowerment leads to their greater bargaining power and hence to lower levels of (undifferentiated) violence against them, the finding instead supports sociological theories of male disempowerment, or “male backlash.” The character of intra-household bargaining may need to be reconceptualized.<sup>5</sup>

Third, the article explores the long-term correlation between exposure to genocide and postwar intimate partner violence and finds that variation in genocide death rates are positively and statistically significantly correlated with reported sexual and emotional violence in 2005.<sup>6</sup> Moreover, it can be shown that more violence-prone provinces during war are also the ones in which women experience higher rates of violence afterwards.

### Gender-based violence during the genocide and legal changes since then

In the period leading up to the 1994 genocide, anti-Tutsi propaganda in the media was explicitly gendered, promoting the notion of extreme sexual promiscuity in Tutsi women. As such they were portrayed as threats to Rwandan (and in particular Hutu) society. Four of the highly publicized “Hutu 10 commandments” explicitly addressed gender relations (Green, 2002):

- ▶ Every Hutu should know that a Tutsi woman, wherever she is, works for the interest of her Tutsi ethnic group. As a result, we shall consider a traitor any Hutu who: marries a Tutsi woman; befriends a Tutsi woman; employs a Tutsi woman as a secretary or a concubine.
- ▶ Every Hutu should know that our Hutu daughters are more suitable and conscientious in their role as woman, wife, and mother of the family. Are they not beautiful, good secretaries and more honest?
- ▶ Hutu woman, be vigilant and try to bring your husbands, brothers and sons back to reason.
- ▶ The Rwandese Armed Forces should be exclusively Hutu. The experience of the October [1990] war has taught us a lesson. No member of the military shall marry a Tutsi.

Moderate Hutu women were also the targets of the propaganda. For example, prior to the genocide, then-deputy prime minister, Agathe Uwiringiyimana was portrayed as sexually promiscuous and a threat to the nation.<sup>7</sup> She was murdered within hours of assuming the post of prime minister after the plane crash that killed President Habyarimana and triggered the beginning of the genocide.

Women experienced high levels of sexual violence during the genocide. As

mentioned, estimates range from a lower bound of 250,000 to an upper bound of 500,000 women raped, and the end of the genocide did not bring with it the end of sexual violence against women. There are numerous cases of young women captured and detained in sexual slavery both during and after the genocide. A term was even coined for women found in hiding by militias—*ceiling brides* or *women of the ceiling*. Seen as war booty, these women were held against their will and routinely raped.<sup>8</sup>

Since 1994, there have been many legal changes to enhance gender equity and to increase the political and institutional participation of women in Rwandan society. Rwanda now boasts the largest political representation of women in the world, with 56 percent of the Rwandan parliament female. A host of legal changes have been made and incorporated into the constitution ratified in 2003, whereby women are now legally recognized as equal to men. Laws have also changed to give women some limited rights to household assets in the case of the death of a husband.<sup>9</sup>

On 15 July 2008, the Rwandan Senate passed the first law specifically on the prevention and punishment of gender-based violence. Prior to this, gender-based violence, including sexual violence, was punishable under Article 30 of the 1977 Rwandan Penal Code. However, there were substantial limitations in the Code, for example the lack of a definition of rape.<sup>10</sup> The 2008 law addressed many of the previous gaps, including definitions of gender-based violence and rape. While intended to provide a clear legal mandate for prosecuting crimes, surprising inequities in punishment guidelines remain. For example, apart from the identity of the perpetrator, rape and conjugal rape have the same definition, yet punishment for rape is imprisonment for 10 to 15 years while for conjugal rape it is 6 months to 2 years. Punishment for adultery now carries a longer imprisonment term than conjugal rape.

Despite the new law, spousal abuse remains common in contemporary Rwandan society. A 2004 joint study on gendered violence by the Ministry of Gender and Family Promotion and the International Rescue Committee found 53.8 percent of women reporting domestic violence by their partners within the twelve months preceding the survey.<sup>11</sup> Intimate partner violence takes place in the context of widespread gender inequities. Women who leave abusive relations have often been subjected to harsh gender penalties, ranging from lack of legal rights in ownership or user rights of household assets such as land to losing parental rights such as custody of children.<sup>12</sup>

### Postwar prevalence and correlates of intimate partner violence in Rwanda

A major drawback of empirical work on intimate partner violence is that different forms of violence are aggregated into a single measure. Thus, it is not known whether different forms of violence have the same risk factors associated with them. For example, in the case of the aforementioned 2005 WHO study, even though the data were collected in disaggregated form, results given were an aggregation of physical and sexual violence.<sup>13</sup> While there was some recorded overlap between physical and

sexual violence, in three out of 12 countries covered a substantial number of women had experienced only sexual violence. In a postwar setting—following widespread gendered violence during war—it is especially important to examine each type of violence separately.

Data collected in the Rwandan Demographic and Health Survey in 2005 (RDHS-III) included a module on domestic violence, which was applied to half of the households interviewed and included 4,066 randomly chosen women. Because of its sensitive nature, a female interviewer administered the domestic violence questionnaire in private without any other family members present or even in close proximity.<sup>14</sup> Due to the extremely personal and sometimes deeply traumatic nature of these experiences, it is unrealistic to expect a large survey to capture the full extent of intimate partner violence. Hence the data presented in this article are likely to be underestimates of the true level of sexual violence by intimate partners.

Using an abbreviated version of the Conflict Tactics Scale, the questionnaire covered three broad types of violence: physical, sexual, and emotional. Detailed information was collected on spousal violence for ever-married or cohabiting women, including divorced, separated, or widowed women. Of the 4,066 respondents, 1,341 were currently married, 995 were cohabiting, 157 were widowed, and 39 were divorced. Respondents were asked whether they had experienced a range of specific acts that covered a spectrum from less to more severe forms of emotional, physical, and sexual violence.<sup>15</sup> The questionnaire gathered data to assess both the prevalence of intimate partner violence over the women’s adult life and within the year prior to the interview. The survey included socioeconomic background questions asked of each respondent. While data on consumption or income measures were not collected, information on household assets and characteristics is available. Socioeconomic background information on the woman’s current spouse was also collected, including age, education, and employment.

Overall 38.6 percent of ever-married or cohabiting women reported having experienced physical, emotional, or sexual violence by their intimate partner at some time since age 15. Table 1 presents the prevalence of intimate partner violence by residence (urban/rural) and type of violence. Physical violence is the most common type reported by ever-married women (35.6 percent), followed by sexual violence (13.9 percent) and emotional violence (13 percent). The same pattern is observed among currently married women, but at slightly lower levels in each category. These results are consistent with data from other empirical studies.<sup>16</sup>

Ever-married women residing in urban areas report somewhat lower overall levels of intimate partner violence (36.9 percent versus 38.8 percent for rural women). Disaggregating among types of violence, physical violence for urban residing women is lower (31.5 percent versus 35 percent for rural women), but levels of emotional and sexual violence are substantially higher. In particular, urban women report much higher levels of sexual violence (22 percent) compared to their rural counterparts (12.7 percent).

**Table 1: Prevalence of intimate partner violence by category of violent act for ever-married or cohabiting women (percentages)**

<i>Type of violence (Number of observations)</i>	<i>Rural (1591)</i>	<i>Urban (294)</i>	<i>Total (1885)</i>
<i>Intimate partner violence</i>	37.6	32.9	37.1
- Emotional	9.5	11.7	9.7
- Physical	33.7	27.5	33.0
- Sexual	11.7	17.8	12.4
<i>Emotional</i>			
- Humiliated her in front of others	8.8	10.8	9.0
- Threatened her or someone close to her with harm	3.4	4.9	3.6
<i>Physical</i>			
- Pushed/shaken/thrown something at her	15.1	12.5	14.8
- Slapped or arm twisted	26.5	19.4	25.7
- Punched with fist or something harmful	12.3	10.9	12.2
- Kicked or dragged her	6.5	6.8	6.5
- Tried to strangle or burn her	1.4	2.7	1.5
- Threatened with knife, gun, or other weapon	1.0	2.8	1.2
- Attacked with knife, gun, or other weapon	0.4	1.9	1.0
<i>Sexual</i>			
- Physically forced unwanted sexual intercourse	10.5	16.6	11.2
- Forced to perform other unwanted sexual acts	4.9	6.5	5.1

*Source:* Author’s calculation based on Rwandan Demographic and Health Survey, 2005.

The most frequent domestic violence act reported by ever-married women was that they had been slapped or had an arm twisted (27.8 percent). The attack with the lowest reported frequency was with a knife, gun, or other type of weapon (1 percent). Sexual violence in the form of forced sexual intercourse by their spouse is the fourth most common form of intimate partner violence (12.9 percent). Urban women report much higher levels of spousal rape than rural women (20.6 vs. 11.8 percent).

*Violence by selected characteristics*

Table 2 presents the prevalence of violence by type and selected characteristics for currently married or cohabiting women. In terms of household characteristics, a direct association between a woman’s age category and a husband’s age category and *physical* violence is seen, but without any apparent relation between age and



**Table 2: Prevalence of violence by type and selected characteristics of currently married or cohabiting women (percentages)**

<i>Characteristics</i>	<i>Emotional violence</i>	<i>Physical violence</i>	<i>Sexual violence</i>
<i>Woman's age</i>			
- 17-26	9.6	29.4	13.5
- 27-36	9.8	31.5	11.9
- 37+	9.1	38.2	11.1
<i>Husband's age</i>			
17-26	8.0	26.4	11.3
27-36	9.2	26.4	13.2
37+	10.2	34.7	11.6
<i>Spousal age difference</i>			
- No difference	9.0	25.7	11.7
- Wife>Husband	10.2	33.6	8.9
- Wife<Husband	9.5	33.6	12.6
<i>Woman's education</i>			
- None	8.3	33.5	9.3
- Primary	10.3	34.4	13.9
- Secondary	7.8	18.5	6.5
<i>Husband's education</i>			
- None	9.8	34.7	12.8
- Primary	9.8	35.0	12.6
- Secondary	8.0	17.6	7.6
<i>Spousal education difference</i>			
- No difference	9.3	33.0	13.2
- Wife>Husband	11.9	36.3	13.6
- Wife<Husband	8.5	30.8	8.7
<i>Number of household members</i>			
- 2-4	8.4	28.2	12.3
- 5-7	11.6	37.2	13.1
- 8+	6.1	31.4	8.8
<i>Number of children</i>			
- 0	3.2	15.1	10.7
- 1-3	9.6	31.0	11.9
- 4-8	10.7	38.1	13.4
- 9+	8.8	36.5	8.0

**Table 2 (continued)**

<i>Male children living at home</i>			
- 0	8.7	27.3	11.3
- 1+	9.8	34.9	12.4
<i>Death of a male child</i>			
- No	9.6	32.3	12.5
- Yes	9.4	34.4	11.2
<i>Wealth</i>			
- Poorest quintile	7.3	35.4	11.9
- Second quintile	11.8	37.3	12.7
- Third quintile	9.2	32.1	12.4
- Fourth quintile	9.2	32.3	12.0
- Fifth quintile	10.2	25.7	11.4
<i>Region</i>			
- Urban	11.5	26.7	17.2
- Rural	9.3	33.8	11.4
<i>Social support</i>			
- Limited family contact	28.0	50.1	26.3
- Limited girlfriend contact	25.7	50.7	20.8
<i>Alcohol abuse</i>			
- Does not consume alcohol	7.0	22.5	10.6
- Less severe alcohol abuse	8.4	36.1	11.4
- Severe Alcohol abuse	29.1	66.4	24.7
<i>Female family history of IPV</i>			
- No	8.3	29.0	10.0
- Yes	12.3	40.5	16.4
<i>Polygamy</i>			
- One wife	9.0	32.1	12.1
- More than one wife	18.4	48.1	12.5
<i>Genocide intensity</i>			
- Low-intensity	7.6	34.2	8.6
- Mid-level intensity	10.1	30.3	14.3
- High-level intensity	11.8	36.2	13.8

*Source:* Author's calculation based on Rwandan Demographic and Health Survey, 2005.

emotional or sexual violence. An intriguing pattern emerges in relation to the number of children and intimate partner violence: As the number of children increases up until 8 children, all three forms of violence rise, but from 9+ children onward, levels of violence decline across the board. There is no clear pattern related to the size of households.<sup>17</sup> Contrary to expectations, women who have at least one male child living at home reported a much higher incidence of physical violence, but not emotional or sexual violence. There is also a direct association between the probability of physical violence and women who have lost a son.

Regarding social characteristics, women whose husbands limit contact with family and friends experience substantially higher rates of all types of violence, and physical violence in particular. Polygamy is associated with a higher incidence of emotional and physical violence. There is a notable rise in incidence across types of violence for women who report severe alcohol abuse by their husbands. Also notable is the higher violence for women who report witnessing their father beat their mothers. Lastly, a higher intensity of killings during the genocide is associated with higher incidence of emotional and sexual violence across regions.

For labor market characteristics, the most evident pattern is that women who are engaged in wage-employment reported a higher incidence of sexual violence. Women whose husbands are unemployed do not experience notably higher rates of violence across the board, although women whose husbands are employed but unpaid do report higher rates of sexual violence. The employment difference between genders (the “relative employment difference”) shows a higher incidence of sexual violence among women who work for wages and whose husbands are unpaid.

### Multivariate results

A logistic analysis is used to investigate the correlates of different types of intimate partner violence by selected characteristics. The dependent variables were defined as emotional, physical, and sexual violence coded as equal to 1 if violence ever experienced and as 0 otherwise. Drawing on a typology of risk factors identified in the literature, the following independent variables were used in the analysis:

- ▶ Household characteristics (age, education, household composition, number of children, wealth, region);
- ▶ Social characteristics (social support, alcohol abuse, history of violence, polygamy, genocide intensity)<sup>18</sup>; and
- ▶ Labor market characteristics (unemployed, working without pay, working for wages, relative employment difference between husband and wife).

Reporting odds ratios, Table 3 (overleaf) presents estimates from the logistic specification of the correlates by type of violence.

### Household characteristics

No discernible patterns across age categories and type of violence are found, and there is little evidence of a consistent relationship between women’s education and their experience of violence. Unlike prior studies, women with secondary or higher educations do not appear to experience a protective effect from education. However, there is strong statistical evidence that male secondary education reduces the likelihood of using physical violence (by almost 60 percent).

As to household composition, no systematic pattern linking household size and the prevalence of intimate partner violence across categories is seen. But women in households where there are large numbers of children are more likely to experience emotional, physical, and sexual violence (although the coefficient for sexual violence are not statistically significant). There is an increasing relation between the number of children and the prevalence of emotional and physical violence. Women with more than 9 children are more than eight times as likely to have experienced emotional violence and more than twice as likely to have experienced physical violence as women with no children.

No discernible relation between wealth quintile and type of violence was found. Women in the second and fifth wealth quintiles report statistically significantly higher prevalence rates of emotional abuse, but there is no economic significance readily apparent in this result. Finally, for physical and emotional violence, no systematic variation between rural and urban women is found. But urban women are statistically more likely (in fact, 80 percent more likely) to have experienced sexual violence. This result is at odds with the data collected by the 2005 WHO multi-country study on domestic violence, which found that urban women are much less likely to have experienced sexual violence.<sup>19</sup>

### Social characteristics

Strong support is found for the protective role played by women’s family and friends in reducing the likelihood of all three types of violence. Women whose husbands limit the women’s family contact are over 200 percent more likely to have experienced emotional violence, over 60 percent more likely to have ever experienced physical violence, and over 100 percent more likely to have ever experienced sexual violence. Women whose partners have limited her contact with her female friends are over 100 percent more likely to have experienced emotional or physical violence. For sexual violence this pattern is not observed, indicating an important distinction in the impact of social support by type of violence.

Regarding alcohol abuse, a systematic relation emerges for all forms of violence. Women whose husbands frequently get drunk are more than 500 percent likely to have ever experienced emotional or physical violence and more than 200 percent more likely to have ever experienced sexual violence. This result corroborates

**Table 3: Logistic estimation on prevalence of violence by intimate partner for currently married or cohabiting women (odds ratios)**

<i>Characteristics</i>	<i>Emotional violence</i>	<i>Physical violence</i>	<i>Sexual violence</i>
<i>Woman's age (r=17-26)</i>			
- 27-36	0.763	1.044	0.808
- 37+	0.55	1.385	0.813
<i>Husband's age (r=17-26)</i>			
27-36	1.112	1.201	1.2
37+	1.319	0.934	1.132
<i>Woman's education (r=none)</i>			
- Primary	1.17	1.23	1.583*
- Secondary	1.213	0.949	0.704
- Higher	—	—	9.475
<i>Husband's education (r=none)</i>			
- Primary	0.886	1.05	0.914
- Secondary	0.748	0.441**	0.573
- Higher	—	—	0.305
<i>Number of household members (r=2-4)</i>			
- 5-7	1.248	1.171	0.905
- 8+	0.54	0.787	0.61
<i>Number of children (r=0)</i>			
- 1-3	4.074*	2.778**	1.022
- 4-8	5.115*	3.490**	1.414
- 9+	9.182**	3.858**	1.362
<i>Male children living at home (r=0)</i>			
- 1+	0.924	0.974	1.193
<i>Death of a male child (r=no)</i>			
- Yes	0.963	0.849	0.869
<i>Wealth (r=poorest quintile)</i>			
- Second quintile	2.234*	1.288	1.159
- Third quintile	1.536	0.994	1.093
- Fourth quintile	1.644	1.093	1.139
- Fifth quintile	2.082*	1.056	1.089
<i>Region (r=urban)</i>			
- Rural	0.942	0.774	1.803**

**Table 3 (continued)**

<i>Social support 1 (r=unlimited family contact)</i>			
- Limited family contact	3.085**	1.668*	2.170**
<i>Social support 2 (r=unlimited girlfriend contact)</i>			
- Limited girlfriend contact	2.165**	2.044**	1.172
<i>Alcohol abuse (r=does not consume alcohol)</i>			
- Less severe alcohol abuse	1.725*	2.078**	1.433
- Severe Alcohol abuse	6.248**	6.165**	3.054**
<i>Female family history of IPV (r=no)</i>			
- Yes	1.499*	1.681**	1.728**
<i>Polygamy (r=husband has one wife)</i>			
- More than one wife	1.888	1.6	0.977
<i>Genocide intensity (r=low-intensity)</i>			
- Mid-level intensity	1.398	0.823	1.650*
- High-level intensity	1.980*	1.281	1.662*
<i>Woman's employment (r=unemployed)</i>			
- Working without wages	1.166	1.155	1.267
- Working for wages	0.973	1.024	1.677*
<i>Husband's employment (r=unemployed)</i>			
- Working without wages	0.742	0.765	1.57
- Working for wages	0.921	0.983	1.149
Number of observations	1,868	1,869	1,867

Notes: \* significant at 5%; \*\* significant at 1%; r=omitted category; [—] observations dropped because *n* is too small.

extensive documentation of alcohol abuse correlated with intimate partner violence.<sup>20</sup>

A strong and consistent pattern is also found between type of violence and whether a woman witnessed her father beating her mother (history of violence). The intergenerational effect is statistically significant across all three types of violence, and strongest for sexual violence: A woman whose father beat her mother is more than 70 percent more likely to have ever experienced sexual violence. This finding is consistent with other research that has found strong intergenerational effects of violence.<sup>21</sup> In contrast, no consistent relation emerged between polygamy and the various forms of violence. This is contrary to several small studies in central Africa which found a direct association between polygamy and intimate partner violence.<sup>22</sup>

Finally, to test for the effect of levels of sexual violence during the genocide,

intensity of killings by province is used as a proxy variable. While this does not tell one directly about levels of sexual violence, it is nonetheless likely that there was a close association. For the logistic regression, three binary categorical variables were created: high-level, mid-level, and low-level genocide intensity. A statistically significant correlation is found between prevalence of sexual violence for mid- and high-level intensity of genocidal killings by province (see Table 3). Women in provinces with high-intensity genocide-related killings were over 60 percent more likely to have reported sexual violence in 2005.<sup>23</sup> This relation is not found for physical violence, and is statistically significant for emotional violence only in high-level genocide intensity provinces. While not definitive, these findings lend support to earlier research on sexual violence which finds higher rates in societies with widespread social upheaval and fraying of social and communal ties.<sup>24</sup>

#### *Labor market characteristics*

Economic models of intra-household bargaining predict greater female empowerment from increases in a woman's economic status, such as waged employment. This prediction is tested, examining both female and male employment. Table 4 presents the logistic regression results on violence types and labor market characteristics, controlling for household and community-level effects. Across model specifications, no statistically significant relation is found between emotional or physical violence and employment status. But a strong direct relation is found between female wage employment and the likelihood of having experienced sexual violence. Women who work and receive wages are 68 percent more likely to report having experienced sexual violence by their spouse than those who do not work for wages.

It could be the case that women who work for wages have a higher tendency to report sexual violence (rather than having a higher incidence). To control for this possibility, potential reporting bias is examined for women who work for wages and who report higher levels of *all* forms of violence. No evidence of a consistent bias is found.<sup>25</sup> Women's attitude toward violence was also examined and no difference was found between women who work for wages and those who do not.

The direct relation between female wage earning and sexual violence runs counter to extant bargaining models, wherein greater female decisionmaking and access to paid employment increases bargaining power and decreases domestic violence. Perhaps what is being observed here is a contradictory nature of female empowerment: In some respects, access to paid employment may increase female bargaining power, but at the same time it may create tensions within the household as male dominance is threatened.

Sociologists have proposed a theory of "male backlash," wherein men respond with violence as women experience greater economic empowerment relative to men and culturally accepted notions of masculinity are threatened.<sup>26</sup> For example, in a comparative study of two communities in Kenya and Tanzania, one study found that

**Table 4: Logistic estimation on prevalence of violence by type and labor market characteristics (odds ratios)**

	<i>Emotional violence</i>	<i>Physical violence</i>	<i>Sexual violence</i>
<i>Variable</i>	<i>Models I &amp; II</i>	<i>Models I &amp; II</i>	<i>Models I &amp; II</i>
<i>Woman's employment (r=unemployed)</i>			
- Working without wages	1.091	1.166	1.391
- Working for wages	0.97	0.973	1.682**
<i>Variable</i>	<i>Model II only</i>	<i>Model II only</i>	<i>Model II only</i>
<i>Husband's employment (r=unemployed)</i>			
- Working without wages	0.742	0.765	1.57
- Working for wages	0.921	0.983	1.149
<i>Variable</i>	<i>Model III only</i>	<i>Model III only</i>	<i>Model III only</i>
<i>Relative employment difference</i>			
- Woman working for wages and husband working without wages	0.594	0.815	2.043*

*Notes:* \* significant at 5%; \*\* significant at 1%; model I: ever-married women sample; model II and III: currently married women sample.

economic disempowerment of men relative to women undermined the material foundation of patriarchy and increased the prevalence of sexually aggressive behavior of men. Similarly, examining the prevalence of rape across countries, another study found a high incidence of rape in societies where male power has been destabilized.<sup>27</sup>

To test for relative female empowerment (or relative male disempowerment), a binary variable was created that takes the value of one when women receive wages and their partners are unpaid for their labor, and zero otherwise.<sup>28</sup> The results, presented in Model III in Table 4, show strong evidence that female economic empowerment relative to men adversely affects levels of sexual violence. When compared to women who do not work for wages, women in wage-employment are over 100 percent more likely to report sexual violence by their unpaid (non-waged)

spouses. This robust evidence for the “male backlash” effect implies the need to better understand changes in gender identity and social relations within the context of changing economic opportunities and postwar social insecurity.<sup>29</sup>

## Conclusion

Gender violence and sexual torture in civil wars recently have become important areas of research. As part of this set of concerns, it is important to understand the long-term effects on society and the ways in which gendered violence continue to be experienced in countries emerging from civil war. This article investigates the prevalence of intimate partner violence in post-genocide Rwanda. Significant differences are found in the prevalence of different types of gendered violence. Women who live in urban areas, have a primary education (versus no education), and have wage employment experience significantly higher rates of sexual violence. A direct, and increasing, relation between the number of children a woman has and the prevalence of emotional and physical violence is also found.

A second finding is that women who are employed, but whose husbands are not, experience substantially more sexual violence. This finding may be interpreted as “male backlash”: Men’s reaction to losing power as gender norms are in flux. This finding is contrary to predictions found in the bargaining literature in economics where greater female economic empowerment is posited to result in more favorable outcomes for women. In a postwar society like Rwanda’s, models of intra-household bargaining fail to take into account periods of widespread social upheaval where male power has been destabilized. Female economic opportunities, while important in their own right, may not bring about wider social change without addressing masculinity, patriarchal social relations, and the ways in which gender inequities play out within the household. These results also convey the importance of understanding both the long-term effects of various types of state-sanctioned violence and the complex dynamics involved in female economic empowerment during periods of social unrest when male patriarchy is directly challenged.

Finally, the article finds a strong correlation between the prevalence of sexual violence in 2004 and the intensity of violence during the genocide, ten years earlier. This points to the need for further research, to explore the way in which patterns of war-related violence affect gender violence in its aftermath.

## Notes

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1. WHO: Garcia-Moreno, *et al.* (2005). Previous studies: In a review of international studies on intimate partner violence, Krahé, Bieneck, and Möller (2005) find only five studies on prevalence rates for domestic violence in developing countries. Much of this work examines socioeconomic differences, gender roles, and cultural acceptance of violence.
2. The experience of violence against women after periods of conflict is a relatively neglected area of research. Notable exceptions include Meintjes *et al.* (2002), Pillay (2002), and Sideris (2002). Pillay (2002) outlines four elements, not all of which are mutually exclusive, that underlie male violence against women in the aftermath of war. These are the growing power of women, the social acceptance of violence against women, eroding concepts of masculinity, and changes in the economic power of men and women. In Rwanda, post-1994, all of these elements are arguably present.
3. Human Rights Watch (1996b).
4. See, for example, Panda and Agarwal (2005).
5. A central notion in bargaining theory is that leaving the household is a feasible fall-back option for both men and women. Where such options are practically difficult (even if theoretically possible) because of legal difficulties and prevailing norms, a more nuanced understanding of household conflict and cooperation may need to be developed. In particular, one may expect to observe what at first may seem counterintuitive: Women’s economic empowerment leading to a greater propensity for conflict as prevailing norms are challenged and men react with sexual violence as a form of control.
6. To be clear: The question on sexual violence in the Rwandan Demographic and Health Survey (DHS) asks whether the respondent had experienced violence over the 12 months prior to the interview (and ever over lifetime). For women reporting sexual violence within the last 12 months prior to the interview, it is therefore possible that the violence experienced occurred in 2004 as well. The data was collected in 2005 and published in 2006.
7. Powley (2004).

8. Rape estimates: Based on the standard method of using the number of pregnancies resulting from rape, in turn estimated to range from 2,000 to 5,000; see Human Rights Watch (1996a). Sexual slavery: Human Rights Watch (1996a). Ceiling brides: This term arose because the women were hidden by their captors, or found hiding, in the space between the ceiling and the roof of homes. War booty: Human Rights Watch (1996a); Human Rights Watch (2004).
9. Institutional participation: The Rwandan constitution stipulates that at least 30 percent of decisionmaking positions be filled by women. 56 percent: UNIFEM (2008). Limited rights to household assets: While inheritance laws have been reformed, it is unclear whether this has led to substantial changes in gendered inheritance norms.
10. Failing to define different kinds of acts of gender-based violence has led to widely varying interpretations of the law and to inconsistent verdicts. See Afeefa, *et al.* (2006); Human Rights Watch (2004).
11. Administered to 722 women in five of the country's eleven provinces, only 477 women were actually interviewed. The survey found that 32.4 percent of women reported verbal or physical abuse by someone *other than their spouse or sexual partner* over the five years preceding the survey. See Ministry of Gender and Family Promotion (2004).
12. Heads of household are defined as male regardless of occupation or position within the household (Article 206 of Civil Code Book 1). Male ownership of assets extended to children. Article 41 of the law on gender-based violence does try to redress polygamous or unlawful marriages with multiple wives by mandating equal distribution of property (without infringing on child rights of property).
13. See Garcia-Moreno, *et al.* (2005). In Rwanda, another DHS study also aggregates emotional, physical, and sexual violence; see Kishor and Johnson (2004). Panda and Agarwal (2005) separate out emotional violence but use an aggregate of physical and sexual violence in their analysis.
14. For a methodological discussion of the survey, see NISR/ORC (2006).
15. To avoid some of the cultural/interpretation difficulties in this type of research, it is preferred to measure violence by asking whether someone has experienced specifically defined acts as opposed to asking about violence in general. For the Conflict Tactics Scale, see Strauss (1990).
16. Heise (1998); Krahé, *et al.* (2005); WHO (2005).
17. As many families after the genocide took in relatives or close friends, the number of household members is included as well as the number of children.
18. Genocide intensity is a proxy for the level of gendered violence by using deaths during the genocide as a percentage of province population. A census conducted by the Government of National Unity was released in 2002 which provides estimates of deaths by province during the genocide; see Davenport and Stam (2001). There are a number of organizations which have provided estimates of deaths during the genocide. All, including the government census, are contentious; see Davenport and Stam (2001); Straus (2006). In this article, the government census is used as it is the only source that has records of deaths by province, interpreted here as an upper-bound estimate of deaths.
19. Garcia-Moreno, *et al.* (2005).
20. Heise and Garcia-Moreno (2002).
21. Garcia-Moreno, *et al.* (2005); Panda and Agarwal (2005).
22. González-Brenes (2004); McCloskey, *et al.* (2005).
23. Internal migration and changing demographics mean that one can only tentatively mention the association between areas with high-intensity killings during the genocide as also being areas with higher intimate partner violence reported 11 years later on. This might be an interesting line of future research to explore.
24. Meintjes, *et al.* (2002); Turshen and Twagiramariya (1998).
25. Neither would there appear to exist a logical explanation for why women who work for wages would report higher levels of sexual violence but not of other forms of violence.
26. Aizer (2007).
27. Kenya/Tanzania: Silberschmidt (2001). Rape across countries: Seifert (1996).
28. This does not include unemployed men. To distinguish between subsistence farmers (who comprise the majority of the workforce) and the unemployed (a very small proportion of the workforce), the analysis separated out the unemployed from those working without pay.

29. Changing gender relations postwar is not a phenomenon unique to Rwanda. For instance, post-World War II, notably U.S. and U.K. middle- and upper-class women were expected to withdraw from the labor market back into unpaid household labor and reproductive activities, yet many wished to stay in the labor force.

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## Designing institutions for global security

Rupayan Gupta

This article synthesizes selected recent research in the economics of military alliances, conflict, bargaining, and mechanism design and suggests directions for future research. It argues that insight might be gained by combining certain aspects of these research streams. The literature on military alliances in particular might gain by applying techniques from bargaining theory and mechanism design. In fact, other areas of conflict studies have incorporated these latter techniques to a large degree and have benefitted from such incorporation.<sup>1</sup>

Starting with Olson and Zeckhauser's seminal contribution, the literature on the economics of alliances is rich.<sup>2</sup> Much of this literature was driven by the real-life context of NATO responses against the perceived threat of the Warsaw Pact bloc. Another significant strand of the literature was, and continues to be, motivated by alliance responses to nonstate terrorism. In this context, security-related actions of an alliance member (or of military expenditure, often taken as a proxy for such actions) were thought to have two kinds of effects for other alliance members. First, a positive externality effect (a beneficial spillover) on other alliance members and, second, a negative externality, occurring either when greater arming by any one ally leads to an adverse reaction by the alliance's adversary and inducing all other alliance members to arm more as well or when more effort by any one ally deflects nonstate terrorist organizations to target other allies, especially when actions against terrorists are defensive (deterrence) rather than offensive (preemptive) in nature.

The war with Iraq (2003) introduced a new type of occurrence that was somewhat different from the traditional interaction observed among NATO allies. Negative externalities accrued to allies like France and Germany, mostly due to unilateral actions by another ally, the United States. At least contextually, this was very different from the phenomena studied in the earlier alliance literature, even when that literature had considered the possibility of negative externalities.

As to bargaining theory and mechanism design, they have by now found their place in the toolkit of applied economists and have been used to analyze many contemporary events. Elements of both bargaining theory and mechanism design have been used in the conflict economics literature. Analyses of conflict regarding environmental and resource issues have also been analyzed using these techniques. The design of international institutions to mitigate conflict using mechanism design techniques was highlighted in a collection of articles in the *Review of Economic Design* (v13 n3, 2009). In the introduction, Massimo Morelli writes that "even in the most pessimistic world of anarchy, the quest for self-enforcing institutions that may help conflict resolution or the reduction of negotiation and renegotiation costs is an important one, and a lot more work can be done by economists and political scientists

to identify self-enforcing institutional mechanisms that work better than others and that therefore the relevant players could coordinate on."<sup>3</sup>

Given the recognition in the conflict economics literature that bargaining theory and mechanism design techniques are useful, there is much scope to use such techniques to study the interaction between and among members of defense alliances where, however, use of these techniques has been lacking in the recent literature.<sup>4</sup> To be clear, the focus here is on interactions between and among the allies themselves, not between allies and their adversaries. Such studies have been done.<sup>5</sup> Alliance cost sharing has also been studied, but one pair of authors argues that "applicability and success of [the suggested cost sharing] mechanism depends on the orders of a supranational planning agency and on some minimal amount of cooperation among ... members."<sup>6</sup> This article, then, synthesizes two recent studies that bridge the gap between alliance theory, on the one hand, and bargaining theory and mechanism design, on the other.<sup>7</sup> These papers analyze the efficient provisioning of effort by a military alliance to combat the perceived threat posed by a rogue nation. One of the main contributions of these papers is to suggest an institutional mechanism by which to move the joint effort of an alliance from a unilateral, inefficient level to an multilateral, efficient level. The mechanism involves the delegation of certain privileges to a neutral agency within the alliance to suggest a scheme (or deal) involving transfers and effort levels among alliance members whose adoption is voted on by a subset of member nations under unanimity rule.<sup>8</sup>

The next section outlines a model and numerical example to present some of the conceptual aspects and findings of the synthesized studies. The section thereafter discusses the findings in the broader context of mechanism design and their practical use. The final section concludes with an agenda for future research.

### A model and numerical example

Suppose an alliance consists of five countries,  $i = 1, 2, \dots, 5$ , which jointly combat a rogue nation. The preferences of any one country  $i$  might be written as

**Arguing that insight might be gained by combining certain aspects of research streams in the economics of military alliances, bargaining, and mechanism design, the article provides a model and a numerical example regarding the creation of an intra-alliance agency with the power to propose an alliance level of effort that would be economically efficient. A voting mechanism is proposed whereby alliance members can achieve the desired outcome. The article concludes with an extensive discussion of and suggestions for further research on intra-alliance design.**

$$(1) \quad U_i(m_i, e) = m_i + \lambda_i e - e^2,$$

where  $m_i$  is a private good (money) consumed by  $i$  and  $e = \sum_i e_i$  is the sum of joint effort expended by the alliance against the rogue nation. In turn,  $e_i$  is country  $i$ 's contribution to the joint effort. The use of the squared term in the function means that in addition to a positive externality, joint effort can also exert a negative externality. Thus, each nation has an “ideal point” as far as security effort is concerned (a “single-peaked” utility function with respect to such effort). The term  $\lambda_i$  is a shorthand description for an index of public support for the security effort of nation  $i$ . It can reach from zero to infinity [ $\lambda_i \in (0, \infty)$ ]. In a more elaborate model, this index could be made a reactive function of the perceived threat delivered by the rogue nation, i.e.,  $\lambda_i = \lambda_i(t)$ , where  $t$  is the perceived threat level, but in the current example the index is treated as a constant. Joint alliance effort is assumed to be offensive, nonrival, and nonexcludable in that its results jointly accrue to every member of the alliance. This effort might include military action, trade embargoes, and other kinds of punitive action. The budget constraint of country  $i$  is written as  $m_i + ce_i \leq M_i$ , where  $M_i$  can range, in principle, from zero to infinity ( $0 < M_i < \infty$ ) and reflects the initial endowment of the private good of nation  $i$ . The term  $ce_i$ , with  $c > 0$ , captures the cost of effort level  $e_i$ .

### *The unilateral outcome*

For the purposes of a numerical example, let  $M_i = M = 100$ ,  $c = 2$ ,  $\lambda_1 = \lambda_2 = \lambda_3 = 1$ ,  $\lambda_4 = 8$ , and  $\lambda_5 = 10$ . Given these numbers, country 5's utility function, net of effort cost, then is

$$(2) \quad V_5 = M + \lambda_5 e - e^2 - ce_5 = 100 + 10e - e^2 - 2e_5.$$

Similarly, for country 4,  $V_4 = 100 + 8e - e^2 - 2e_4$ , and for countries 1, 2, and 3, one obtains  $V_1 = V_2 = V_3 = 100 + 1e - e^2 - 2e_i$ , where  $i = 1, 2$ , and 3, respectively. Country 5's effort maximization problem gives the first-order condition (FOC) as follows:

$$(3) \quad \delta V_5 / \delta e_5 = 10 - 2e_5 - 2\sum_{i=1}^4 e_i - 2 = 0,$$

where  $\sum_{i=1}^4 e_i$  refers to the sum of the efforts of countries 1 to 4, i.e., excluding the effort of country 5, hence the “-5” in the subscript of the third term. If this sum is zero ( $\sum_{i=1}^4 e_i = 0$ ), then for equation (3) to hold, it follows that  $e_5 = 4$ . In the Nash equilibrium, total alliance effort is equal to the effort of country 5 alone,  $e = e_5 = 4$ , with  $e_1 = e_2 = e_3 = e_4 = 0$ . This is seen by substituting  $e_5 = 4$  in the FOC's of the other countries' maximization problems. (If  $e_5 = 4$ , their FOCs will return an individual optimal effort level that is nonpositive. But since effort cannot be negative, their optimal effort level

must therefore be zero.) The equilibrium level of the joint effort provision by all five countries is, in this case, a unilateral outcome.

Country 5's utility in the unilateral outcome is  $V_5^* = 100 + 10 \times 4 - 4^2 - 2 \times 4 = 116$ . Similarly, country 4's utility is also 116, namely  $V_4^* = 100 + 8 \times 4 - 4^2 = 116$ . Note that country 4 free-rides on country 5's effort so that country 4 has no effort cost. By analogy, countries 1, 2, and 3 each have utilities of  $V_1^* = V_2^* = V_3^* = 100 + 1 \times 4 - 4^2 = 88$ .

Now suppose that country 4 had to fight the perceived threat all by itself. How much effort would it put in? The “private equilibrium” effort of country 4 would be given by

$$(4) \quad \delta V_4 / \delta e_4 = 8 - 2e_4 - 2 = 0,$$

which, when solved, gives  $e_4 = 3$  and  $V_4 = 100 + 8 \times 3 - 3^2 - 2 \times 3 = 109$ . Since  $V_4^* = 116 > 109$ , country 4 indeed has strong free-riding benefits under the unilateral outcome. The private equilibrium of country 1 (or 2 or 3) can similarly be computed. Since  $V_1 = V_2 = V_3 = 100 + e_i - e_i^2 - 2e_i = 100 - e_i - e_i^2$ , when  $i$  is the only effort provider (put  $i = 1, 2$ , and 3, respectively), this gives an optimal private effort level of zero for these countries, respectively, and a corresponding private utility level of 100. For each of them, this is *more* than in the unilateral outcome ( $100 > 88$ ). Also note that the “ideal” effort level for these countries is 0.5 (differentiating  $m_i + 1 \times e - e^2$  with respect to effort, setting the resulting equation equal to zero, and solving for effort). So, these countries would benefit from a reduction in effort from the unilateral level of 4.

### *The efficient outcome*

By maximizing a Benthamite social welfare function, i.e., the sum of the countries' utilities, one would get the following formula for an efficient joint effort:

$$(5) \quad e_E = [1/(2I)] \times [\sum \lambda_i - c] = [1/(10)] \times [21 - 2] = 1.9,$$

where the capital  $I$  denotes the total number of countries (i.e., 5). If country 5 makes the entire effort of 1.9 by itself, so that its effort alone equals the alliance effort, then its utility is

$$(6) \quad V_5[E] = 100 + 10(1.9) - 1.9^2 - 2(1.9) = 111.59,$$

which, however, is *less* than its utility level in the unilateral outcome (which was equal to 116). For country 4, utility would be  $V_4[E] = 100 + 8(1.9) - 1.9^2 = 111.59$ , again *less* than in the unilateral outcome. But for countries 1, 2, and 3, the utilities are  $V_1[E] = V_2[E] = V_3[E] = 100 + 1.9 - 1.9^2 = 98.29$ . Since these are *higher* values than

in the unilateral outcome (of 88), each of them should be willing to pay between just over 0 and 10.29 for a reduction in effort from the unilateral level of 4 units to the efficient level of 1.9 units. As things stand, however, none of the five countries have an incentive to move toward the efficient alliance effort.

### *Inefficient overprovision of effort*

If country 5 did make a credible commitment to provide 1.9 units of effort—the efficient level—and countries 1, 2, and 3 continued to make no effort, then country 4 would want to make  $3 - 1.9 = 1.1$  units of effort, that is, the difference between its private effort level and the effort country 5 is making. This can be checked by plugging the values into country 4's reaction function:

$$(7) \quad e_4 = [\frac{1}{2}] \times [8 - 2\lambda e_4 - 2] = [\frac{1}{2}] \times [8 - 2(1.9) - 2] = 1.1.$$

Country 4's utility in this case is  $V_4 = 100 + 8 \times 3 - 3^2 - 2 \times 1.1 = 112.8$ , greater than the utility it gets in the case of the efficient outcome ( $112.8 > 111.59$ ). The joint effort level now is  $e = 3$ , with 1.9 units contributed by country 5 and 1.1 units by country 4. While country 4 pays for 1.1 units, it enjoys the benefits of 3 units. Thus, if country 5 did move from the unilateral to the efficient level (from 4 to 1.9), it would induce country 4 to make an effort of its own. (For countries 1, 2, and 3, whose private effort levels of zero are less than the efficient level ( $0 < 1.9$ ), their best-response effort remains zero, even if country 5 were to move from the unilateral to the efficient level.) One consequence of this scenario is that if country 4 cannot be stopped from starting to make an effort of its own when country 5 reduces its effort to the efficient level, then joint effort cannot be sustained at the efficient level. Since  $3 > 1.9$ , there will be an overprovision of alliance effort!

### *Efficiency condition*

Three things become clear from this example. If one has to design a scheme to sustain the efficient outcome, then it should have the following features:

1. *Country 5 must be compensated* for the amount of its utility loss ( $116 - 111.59 = 4.41$ ) if it moves from the unilateral effort (4 units) to the efficient level (1.9 units).
2. *Country 4 must be compensated* for its utility loss as well ( $112.8 - 111.59 = 1.21$ ) when joint effort level is at 3—with 1.9 units contributed by country 5 and 1.1 units by country 4—rather than at the efficient outcome of 1.9 units only.
3. *Countries 1, 2, and 3 should pay* in the range  $[0, 10.29]$ , where 10.29 is the difference between their utility levels at the efficient outcome (1.9) and the unilateral outcome (4).

For there to exist such a scheme, the total compensation to be paid to countries 4 and 5 must be less than the total amount countries 1, 2, and 3 are willing to pay. This condition is satisfied here since  $4.41 + 1.21 < 3 \times 10.29$ .

### *How to obtain the efficient outcome*

In the following game, it is assumed that a coordinating supranational agency comes into existence which is able to make proposals to the alliance members. Institutional rules under which this agency makes proposals include that it is not a totalitarian planner for the alliance, since there is voting on its proposal. What follows can be thought of as a “ready-made recipe” that an independent supranational agency within an alliance might follow if, in the presence of heterogeneous preferences of its members, it wants the alliance to achieve efficiency against perceived threat.

The supranational agency is a neutral player. Its role is restricted to making a certain proposal in the game and then to act according to the proposal if it is adopted. To be clear, the neutral player is not choosing anything in this game: The agency proposes, but the alliance members choose. The central result is that there exists a particular scheme that the neutral player can propose that will get the alliance to its efficient effort level.

In terms of the example, countries 1 to 5 and the neutral player, N, are the players in the institutional game. This is a game of complete and perfect information and consists of four stages. In stage 1, N makes a proposal of the following form:

$$(8) \quad P, R, T, f, g, e_1 = 0, 0, 0, 0, e_E,$$

where

- ▶ P is a set of *payees*, here countries 1, 2, and 3.
- ▶ R is a set of *recipients*, here countries 4 and 5. In general, this set will contain the unilateral agent and all other agents whose private effort provision level exceeds the efficient level.
- ▶ T is a total amount of *transfers* paid by payees and received by recipients. In the example this is  $(4.41 + 1.21)$ .
- ▶ f is a *sharing rule*, here any rule that shares  $(4.41 + 1.21)$  among countries 1, 2, and 3 such that the payment share of each falls in the interval  $[0, 10.29]$ . Note that there are many sharing rules which can do this. A simple example would be that each pays  $(1/3) \times (4.41 + 1.21)$ .
- ▶ g is a *dividing rule*, here dividing T between countries 4 and 5. In this case, country 5 gets 4.41 for adhering to the proposal, and nothing otherwise, and country 4 gets 1.21 for adhering to the proposal, and nothing otherwise.
- ▶  $e_E = (0, 0, 0, 0, 1.9)$  is an *effort vector* where the fifth country, country 5, makes the efficient amount of effort (1.9 units) and the others make no effort.

In stage 2, the unilateral player and the payees vote on the proposal under unanimity rule. In the example, this would be countries 1, 2, 3, and 5. Country 4 is not included in the vote. (The exclusion of country 4 from stage 2 will be explained later.) If the proposal passes, this means that the voters commit themselves to the provisions of the proposal, that is, to the payment and effort aspects, respectively. Countries 1, 2, and 3 hand over the amount of  $(4.41 + 1.21)$  to the neutral player, each paying its share according to the proposed sharing rule.

In stage 3, if the proposal does not pass, the status quo game occurs with all countries making their individual effort choice. As shown, this effort choice game will lead to the unilateral provision of 4 units by country 5. But if the proposal does pass stage 2, then only country 4 makes an effort choice according to the provisions of the proposal.<sup>9</sup> As seen, the proposal states that country 4 gets a transfer of 1.21 for adhering to the proposal (and making zero effort), and it gets nothing if it deviates from the proposal. Again, note that country 4 did not vote in the second stage. It is the other recipient country designated in the proposal, in addition to country 5.

In stage 4, which occurs only if the proposal passes, the neutral player makes payments to the recipients according to its proposal.

The main result is that the effort vector  $(0, 0, 0, 0, 1.9)$  is sustained as the subgame-perfect effort outcome of the institutional game for the scheme suggested by the neutral player. Features of this outcome are (1) multilateral participation, at least via payments; (2) that countries 1, 2, and 3 are better off than in the unilateral outcome, even after paying compensation; (3) that, after obtaining compensation, country 5 is better off than under the unilateral outcome; and (4) that after receiving compensation, country 4 is worse off than under the unilateral outcome (where it was free-riding) but better off than it would have been at its private equilibrium outcome. Country 4 it is still obtaining free-riding benefits, only smaller than before.<sup>10</sup>

### *A illustrative parable*

To put the example in the context of a parable relevant for our times, suppose that country A is trying to acquire nuclear weapons capability, with adverse consequences for global security. The five-country alliance in the example is trying to stop this. Country 5, the leading alliance power, has the capability to invade country A and to bring about a regime change. Left alone, country 5 might just undertake this venture. Let country 4 be a regional power that expects to benefit from a regime change in country A but, on its own, would attempt no more than a small strike on the suspected nuclear capabilities of A. Countries 1, 2, and 3 would prefer not to take any military action at all, perhaps because of trade ties they have with A, which might be disrupted in case of military tensions in the region. (For example, A might be the supplier of commercially important resources.) Nonetheless, countries 1, 2, and 3 also prefer for A not to acquire nuclear weapons status.

Now suppose that the efficient effort by the alliance is to stop the nuclear weapons

ambitions of country A not through invasion or other military strike but through means such as embargoes, strong enforcement of nonproliferation, or subversion of A's scientific capabilities. The result outlined in this article says that a neutral agency could propose the efficient outcome to the alliance members and have everyone except country 4 to vote on it under unanimity rule. (It is easy to see that country 4 would prefer country 5 to invade country A rather than that the proposal succeed; therefore, it makes sense to exclude country 4 from the initial vote.) The efficient outcome would occur mostly through country 5's direct effort, but with "compensation" such as material and logistical support offered by countries 1, 2, and 3. Country 4's security would also be guaranteed, up to the point of its private provision (enough effort to ensure that there is no attack against its territory), perhaps through transference of military assistance (anti-missile technology, early detection devices, etc.). Thus, alliance efficiency would be brought about not through country 1, 2, and 3's disengagement from the whole process, but through their multilateral participation.

### **Discussion**

The example demonstrates that in principle it is possible to design a supranational agency within a military alliance that would lead to the provision of an efficient level of security against a perceived threat. This section discusses whether the features suggested by the model are necessary or desirable in achievement of that goal. To do that, it is necessary that summarize various results from the two synthesized papers.<sup>11</sup>

First, the institutional mechanism needed to move the joint effort level of an alliance from a unilateral, inefficient level to a multilateral, efficient level involves the delegation of certain powers to a neutral agency that proposes a deal involving transfers and assignment of effort levels among alliance members, and whose adoption is voted on by a subset of alliance member under unanimity rule. Potential deal-breakers are left out of certain stages of the voting process so that sequential voting takes place. This emphasizes the bargaining and mechanism design features within this alliance theory example. While the move to efficiency is not sure to happen under every circumstance, even with the facilitation of the neutral agency, these papers outline the conditions under which it is likely to occur.

Second, the transfer scheme is likely to work when the support for the movement toward efficiency through payments arises from the desires of the payers regarding security effort (captured by the public opinion parameter,  $\lambda$ ) either "getting close" or "remaining close" to the desire of the country that might act unilaterally. Thus, for the mechanism to work, a partial "meeting of minds" among alliance members must occur. This finding is important as it arises only when the security-related desires of the payers evolve, rather than stay fixed. Technically, this evolution of security-related desires is brought about through the endogenization of the security threat.<sup>12</sup> In contrast, when security-related desires of the countries are fixed, "distance

between opinions” would provide the incentive for the proposed mechanism to work.<sup>13</sup> When it is the perceived threat that is evolving, one realizes that there is another possible path for the mechanism to work, namely a “convergence of opinions” that would cause a fall in the level of transfers needed to move to efficiency.

Third, when the security-related desires of alliance members diverge rather than converge in the face of changing perceived threat levels, there are implications for the workability of the mechanism. On the one hand, an efficient level higher than the unilateral level might be easier to sustain in the situation where opposite movement in security desires among alliance members occurs, as compared to the situation where changes in security desires move in the same direction. This happens because payer countries become more willing to pay up in the former case. On the other hand, an efficient level which is lower than the unilateral level might be harder or easier to sustain, depending on certain specific conditions regarding the desired amounts of payment-transfers, of both payers and recipients. This result demonstrates the presence of “fair-weather friends” within an alliance, i.e., allies that increase support for joint security effort when the threat becomes less dangerous, but withdraw support in more dangerous circumstances.

Given these results, several questions come to mind, including the following: (1) Is the restriction of the set of voters on the deal proposed by the neutral player strong enough to break the alliance? (2) Why is the unanimity rule among the set of voters needed; why not apply another voting rule? (3) Given the restrictions imposed in the model, are the results obtained of practical use? And (4) How can one ensure the proper working and feasibility of a neutral player in reality?

The answer to the first question is “no.” The countries that are not given first-round votes (in the example, the stage 2 vote) can vote later (in stage 3) to be compensated such as to realize at least the same utility levels that they would obtain by staying out of the alliance. Even though this level is lower than the even greater benefits they would receive under the unilateral (but inefficient) status quo outcome, clearly they can do no better by breaking off from the alliance. Thus, restricting the initial set of voters—to keep out potential deal-breakers—should not lead to a depletion of the alliance’s membership.

With respect to the second question—regarding the unanimity rule—its role is to secure commitment from all beneficiaries from the ex-ante to the ex-post outcome. All alliance members will benefit from the transfer payment, so there is no reason for any one of them not to vote “yes,” other than that the potential payers under the deal would wish to vote “no” in order to secure free-riding on the alliance contribution of the others. But that is just the point: One can circumvent this destructive (inefficient) behavior either by securing commitment through a unanimity rule or through the stipulation that all voters follow a majority “yes” vote, even if any one member individually votes “no.” Given sovereignty, if we require the latter, this comes to the same as requiring commitment under unanimity rule. (In fact, note that given the unanimity rule, ex-post beneficiaries will always vote in favor of change.)<sup>14</sup>

With regard to question three, given the restrictions in the model (for instance, no transactions cost, linear effort technology, linear costs, no income effects, and nonbinding wealth constraints), would the conclusions seen here be valid in a more general context? The omission of transactions costs is not of much import as their existence can be included in the payments structure, if necessary. Obviously, the presence of insurmountable transactions costs would make the scheme unworkable (as would be the case with any Coasean scheme). Of greater import are the other simplifications, the relaxation of which will not give us the strong unilateral outcome seen in the benchmark model discussed here with only one effort provider. However, even though there will be more countries making efforts, the joint effort level will likely not be at the efficient level and, given the features of the model, can be either more or less than efficient for different parameter values. The question is: Will the mechanism outlined work in more general cases as well? Intuitively, yes. To understand why, note that the main features of the mechanism are (1) that potential deal-breakers, those that make no effort but gain utilities under the status quo, are excluded from early-round voting; (2) that the unanimity rule prevents potential payers to free-ride on other payers; (3) that the effort-maker is fully compensated, up to its status quo utility level; and (4) that only partial compensation is offered to nonproviders who would benefit from the status quo.

Other than added complexity, there is no immediately obvious reason why a generalization of this mechanism to the case of multiple effort providers—when the assumptions of the model are relaxed and strong unilateralism does not occur and where all providers at status quo are fully compensated up to their status-quo utility levels—will not work as well. (The payers might have to make compensation through effort, and not just monetary transfers.) But such extension should be modeled of course, and additional insights might be obtained. Another valuable extension of the model might involve the consideration of weakest-link and best-shot effort technologies. For example, it has been shown that effort (in-kind) transfers versus income transfers may have different welfare effects when weakest-link effort technologies are considered.<sup>15</sup> Further, it might be useful to incorporate the role of uncertainty in the model. Uncertainty might arise from regime change in any of the governments of the alliance members (for example, the different tastes for direct action by the G.W. Bush and Obama administrations in the United States) or due to regime change in a rogue nation. With uncertainty, it will likely be difficult to maintain an ex-post balanced budget constraint for the transfer of funds, and the workability of the suggested mechanism may have to depend on a lump-sum membership fee that can be charged to all alliance members, perhaps in the form of annual dues.

Finally, with respect to question four—how can one ensure the proper working and feasibility of a neutral player in reality?—the underlying paper suggests how a neutral agency might be structured in a real-world situation, and it also discusses some of the problems that it might face in its operations.<sup>16</sup> These include, first, that the

agency would be staffed by career officers belonging to an international civil service whose membership would be determined by technical qualifications and clearance of a suitable examination process. Second, checks and balances (both top-down and bottom-up) among the ranks of these career officers might be required to ensure neutrality. And third, as the challenges to the neutrality of this agency would likely be similar to those faced by central banks and their staff with respect to independence from political interference, it might be beneficial to parse that literature to learn if some of its (suitably modified) findings may be applicable in the present context.<sup>17</sup> Additionally, when the neutral agency suggests a scheme to a set of voting members, the details of the proposal should be crafted by a team led by a manager whose nationality matches one of the voting countries on that issue. It may be presumed that the preferences of this manager will be aligned with the preference of the country whose citizen she is. This would ensure a level of oversight by her which would be beneficial to the production of a workable scheme. Note that the mechanism suggested in this article is incentive compatible for the set of voting countries, so that choosing an overseeing official from one of these countries would not be a bad idea. This removes some of the skepticism regarding the possibility of finding a neutral agent (team manager) in a real world scenario: Our neutral agent need not be perfectly “neutral,” but only needs to be a “good enough” citizen of one of the countries which are willing to vote (and then act) on the issue under deliberation.

In sum, the role of the neutral agency is two-fold: First, it acts as a coordinator that provides the nudge<sup>18</sup> for the alliance to move to efficiency and, second, once affirmatively voted on, it ensures smooth transfers between payer and recipient alliance members. For Coasean bargaining to work, we need institutions and mechanisms to facilitate the process (a role played by laws, legal enforcers, and courts in other social spheres). In the present context, the neutral agency plays the role of such a facilitator.

## Conclusion

Tools from bargaining theory and mechanism design can be used to analyze issues pertaining to intra-alliance interactions. This article discusses two such attempts that demonstrate, more than anything, the large extent of unexplored territory that remains to be investigated. No doubt, input will be needed from scholars in the fields of international relations and diplomacy to construct truly workable solutions to the problem of the efficient provision of global security. Proposed solutions must be presented to practitioners who, in real-life, might be policymakers with the ability to implement any such reforms (and who could provide valid critiques from a real-world perspective). This unified, collaborative venture across various fields in economics, between economics and other disciplines, and a conversation between academia and policymaking will be important in the evolution of a civil global order. The adoption of the ideas proposed in this article will ultimately occur if policymakers are

convinced of their usefulness and exert the necessary political will to institutionalize them in an appropriate manner.

## Notes

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1. For a review of bargaining models used in the study of conflict, see Jackson and Morelli (2011). For the role of mechanism design in trade and environmental conflicts see, e.g., Staiger (1995) as well as Oates and Portney (2003, pp. 341-346) and Stavins (2003), respectively. An interesting application of mechanism design to resolve conflict arising from land-acquisition policies in a developing economy can be found in Ghatak and Mookherjee (2011).
2. Olson and Zeckhauser (1966). For a comprehensive review of the literature see Sandler and Hartley (2001). Gupta (2010) also provides a broad review.
3. For surveys on bargaining theory and mechanism design, see Muthoo (2004) and Sjostrom and Maskin (2002), respectively. Their use in conflict economics: see, e.g., Hirschlifer (1985); Fearon (1995); Skaperdas (2006); Jackson and Morelli (2007). In environmental and natural resource literatures: see, e.g., Chander and Tulken (1992; 1994); Adams, Rausser, and Simon (1996). In the international relations field, there is a literature on of rational design of international institutions. A collection of influential work may be found in the special issue of *International Relations*, vol. 55, no. 4 (2001). In two papers Koremenos, Lipson, and Snidal (2001a; 2001b) introduce the theoretical underpinnings of the “rational design project” and then summarize the empirical findings of the project. Wendt (2001) addresses some of the gaps of the rational design project. Of particular interest is his view that making institutions is about the future and has an intrinsic normative element, so there is a need of knowledge about what values to pursue in designing institutions.
4. This despite Boulding’s (1966) advocacy long ago for the incorporation of such techniques, or as he might have called it, the proper control of organizations using various mechanisms. A reading of pages 178-188 of Boulding’s classic reveals that some of the proposals made in this article were anticipated, although not wholly elaborated, by him.

5. For a strategic model of bargaining with terrorists see, e.g., Lapan and Sandler (1988). For a contribution that deals with offering “safe havens” to terrorists, see, e.g., Lee (1988). Another interesting topic is the use of “cheap talk” in adversarial arms races, e.g., in Baliga and Sjoström (2004).

6. Weber and Wiesmeth (1991, p. 196). It should be noted that Weber and Wiesmeth make no mention of the form and nature of this agency. Arce and Sandler (2001) analyze the use of “correlated signals” among alliance members but the details of the “signaling device” are not much discussed in the context of military alliances except to note that political entrepreneurship or leadership might let alliance members to coordinate their efforts.

7. Gupta (2010; 2012).

8. Gupta (2010) also proposes ground rules that would govern the neutral agency.

9. The way the stage 3 is described in the main text, country 4 gets to make a “free choice” regarding effort (conditional on receiving the transfer), but it makes no effort and chooses to receive the positive transfer instead (its weakly dominant strategy). One could also have said that country 4 gets a “vote” in stage 3 to accept the {zero effort, transfer} bundle versus the {effort, no transfer} bundle and would have chosen the former. As long as one keeps the rule that country 4 does not have a vote earlier, in stage 2, the model in the main text is okay because at stage 2, country 4 would have voted “no” to scuttle the proposal and return to the status quo (unilateralism), where it would get a higher utility.

10. The example does not demonstrate an additional scenario, namely that there might be an additional country whose utility might rise when the alliance moves from the unilateral to the efficient outcome (i.e., the unilateral outcome was “too bad” for this country), but the efficient outcome might be lower than its private security level, so it will need to be compensated at the efficient outcome to maintain zero effort level. Specifically, suppose there was another country, country 6 say, whose single-peaked utility function (with respect to effort) was such: The unilateral outcome lies far to the right of the peak, on the decreasing stretch of the function. This would give it low utility. Suppose the efficient effort level lies to the left of the peak on the increasing stretch, and at a point that gives higher utility compared to the earlier unilateral effort point. So this country has a positive gain if effort shifts from unilateral to efficient level. However, if the marginal cost = marginal benefit tangency condition for this country occurred on the rising stretch of the U-function, but to the right of the efficiency point (and there is no reason why this cannot happen), then even though this country benefits from a movement from unilateralism to efficiency, it still needs to be compensated at the efficient outcome to stop it from making effort! So, this

country is different from countries 1, 2, and 3 who benefit from moving to the efficient outcome and pay for that. But country 6 benefits from the movement, yet also gets a transfer to sustain the efficient outcome.

11. Gupta (2010; 2012).

12. See Gupta (2012).

13. As in Gupta (2010).

14. One might wonder why alliance member would tolerate the existence of the neutral agency in the working of the alliance. In my view, since members would stand to gain by its establishment, the agency can be established at an opportune time and institutionalized and, once institutionalized, would be hard to dislodge.

15. Vicary and Sandler (2002).

16. Gupta (2010, especially pp. 190-192).

17. See, e.g., Neumann’s (1991) work on personnel independence in central banks.

18. Thaler and Sunstein (2008).

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## Insurgency, crime, and agricultural labor expenditure: Evidence from Punjab, 1978-1990

Prakarsh Singh

Much evidence now exists on the adverse macroeconomic effects of violent conflict on economic output and growth. For example, a “typical” civil war is estimated to lead to around a 20 percent decline in household income and also to a reduction in economic growth of around 2 percent per year. In addition, a number of studies have computed estimates of the macroeconomic impact of terrorism on tourism, foreign direct investment, and growth.<sup>1</sup> But in assessing the effects of violent conflict on economies there are problems associated with causal identification as it is possible for other factors, such as weak institutions, to lead to both violence and bad economic outcomes.<sup>2</sup> Reverse causality from lower growth to violent conflict can then statistically bias the empirical estimates. This is one reason for the growth in the literature on understanding the effects of violence at the microeconomic level where the empirical biases are likely to be less severe and the transmission mechanisms can be better delineated. Micro-level evidence not only allows for “cleaner” estimates and heterogeneous effects to be explored but also may provide policymakers with sounder advice on how to cope with violence and to better anticipate the likelihood, duration, and channels of any adverse consequences that different forms of violence may take.

A companion article establishes evidence on the magnitude of the decline in long-term versus short-term agricultural *investment* in response to violent conflict in the Punjab. Defined as resulting in three or more deaths, a major insurgency event in a given district in a given year is statistically associated with reduced long-term fixed investment of close to 17 percent for an average farmer. Effects were far more muted for short-term investment. (Long-term fixed investment is represented by investment in wells and short-term investment by spending on fertilizers.) For 1981 to 1990, the insurgency’s effects on investment resulted in an average farmer losing close to 4 percent of his annual income. Heterogeneous effects are found by income-level and farm location.<sup>3</sup>

In contrast, the present article focuses on farmers’ *labor*-related decisions in the face of insurgent violence. Using micro-level farmstead expenditure surveys for the period 1981-1993, and focusing on the monetary amount spent by farmers on two types of hired labor, the main finding is that insurgency-related violence adversely affected farmstead spending on permanent, but not temporary, hiring, possibly not because of labor demand factors but because of labor supply shifts away from longer-duration contracts. However, this effect appears to hold only for the richer half of the surveyed farm households.

The following sections briefly consider the literature this article contributes to and describe Punjab and the insurrection it experienced. Other sections then deal with the data, methods, and results, followed by a discussion as well as endnotes and references.

### Microeconomic studies

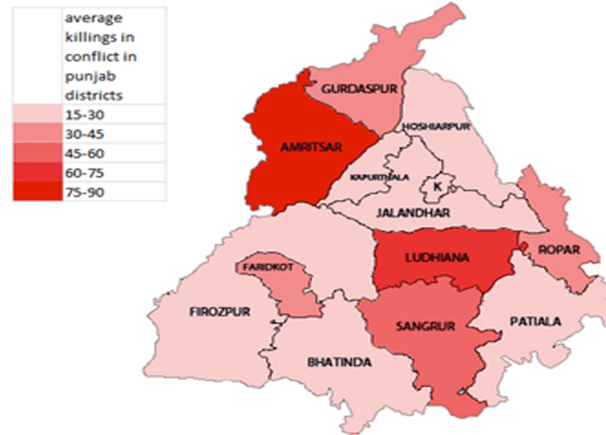
Recent microeconomic studies of civil war have found adverse effects for cases ranging from Colombia to Burundi and Iraq. Often the focus is on education and health outcomes, that is, primarily public sector-related effects. Evidence on private sector-related effects, for example on investments by firms during and after violence, is more limited. In Colombia, for instance, fixed private investment assets have been found to decline, relative to mobile assets, in the case of guerilla warfare because they cannot be carried away in case of displacement due to war. Similarly, a study on Uganda finds that civil strife is correlated with lower investment and fewer nonagricultural enterprise startups. For either sector, the size of the estimates differs depending on the nature of the violence experienced, the type of investment, and the geographical location. A study on the effect of the Rwandan civil war on household welfare for instance found that violence reduced household consumption growth.<sup>4</sup>

### Violence in the Punjab

Punjab is both a state in northeast India as well as a region extending much beyond the administrative borders of the state. Part of the region lies in today’s Pakistan, the result of the partition of British India in 1947. In 1966, the Indian Punjab was further divided, along linguistic lines, of which the modern-day state of Punjab is one part. In 2011, its population numbered about 28 million people, with Punjabi-speaking Sikhs forming the majority in the rural areas and Hindus dominating the urban areas. For complex sets of reasons, a Sikh-led independence movement arose, the roots of which go back to the division of British India. The demand for a Sikh-dominated, Punjabi-speaking independent state, to be called Khalistan, were not granted by the government of India and eventually led to what is generally termed an “insurgency.”<sup>5</sup> Aimed at India’s government and its representatives in the army and police, this lasted

**The article focuses on Punjabi farmers’ labor-related decisions in the face of insurgent violence. Using micro-level farmer expenditure surveys, and focusing on the monetary amount spent by farmers on two types of hired labor, the main finding is that insurgency-related violence adversely affected farmstead spending on permanent, but not temporary, hiring, possibly not because of labor demand factors but because of labor supply shifts away from longer-duration contracts. However, this effect appears to hold only for the richer half of the surveyed households.**

**AVERAGE KILLINGS IN CONFLICT IN PUNJAB DISTRICTS**



**Figure 1:** Average annual killings, Punjabi districts, 1981 and 1991, in major insurgency incidents.  
*Source:* www.SATP.com.

from about 1981 to 1993 and is thought to have claimed over 20,000 lives.<sup>6</sup> On average, the insurgents appear to have been moderately-well educated, coming from families owning small and medium-sized farmsteads. The movement ended with splintered insurgent groups being defeated by the state police.<sup>7</sup>

Punjab's violent history is anomalous to some stylized facts of the civil war literature. For example, the literature points to a negative correlation between income and the likelihood of violence (that is, less income being associated with a higher probability of violence), and there is also cross-country evidence to suggest that "rough terrain" contributes to greater possibility of violence. But neither of these characteristics holds for Punjab. Prior to the violence, it had India's highest per capita GDP. Known as the bread-basket of India, Punjab is an extensive plain, sloping gently from the Himalayan mountains in the north to deserts in the south. Demarcated by the Indus and Yamuna rivers on its western and eastern borders, respectively, the land is rich, fertile, and flat. In one of several insightful interviews conducted by Joyce Pettigrew during the insurgency, a political leader told her: "If only we had had the mountains or the sea, we would have had our freedom by now ... the people are our jungle."<sup>8</sup>

Having a rural base in Punjab was essential to the insurgents as this helped them remain hidden from police forces. This was despite not having forest cover or rugged terrain. Local knowledge allowed the rebels to credibly threaten retribution for informing the police. Kidnapping, or the threat thereof, was an efficient means used by insurgents to extract rents. Farmers were affected by the violence and were aware of attacks due to a high degree of local social capital. The companion article shows that between 1987/88 and 1992/93, Punjab's agricultural growth dropped from six percent to two percent due to a decline in long-term physical investment by farmers in response to increased violence in their districts. The mechanism applied by the insurgent movement was extortion. This instilled fear and, as will be shown in this

article, led farming households to reduce spending on permanent manual labor with consequent declines in agricultural output.<sup>9</sup>

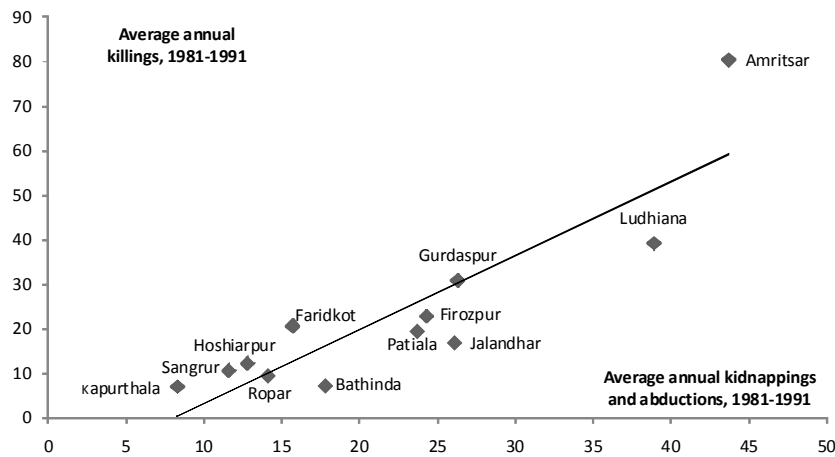
To analyze how the violence affected Punjab's economy, it is necessary to understand how it can work its way to influence business decisions. A likely mechanism is through the threat of extortion of employees (human capital losses) or through loss of property (physical capital losses). The threat of extortion may increase especially if the investment is visible to outside observers, such as insurgents. Pettigrew illustrates this in an interview with a farmer who stated: "If they were to demand a one-time payment that would be one thing. But people ask for payment regularly and not only that, several groups ask ... [T]hey assess how much we can pay by looking at the size of our house and our land holding." For instance, the threat of extortion may be higher if the farmer has a tractor or a well-equipped well.<sup>10</sup> (Components of a well include screen and casing, a centrifugal pump, an electric motor, a diesel engine, galvanized pipes, hydrants, belts, and sprinklers. Each of these components would have an expected average service life of between 25 to 35 years, with annual maintenance costs of less than 2 percent of the initial investment.<sup>11</sup>)

**Data and empirical analysis**

Three data sets are used in the analysis: annual insurgency-related killings and crime data, both at the district level, and annual farm expenditure survey data collected from representative farming households in each subdistrict. The data set on insurgents was obtained from the South Asia Terrorism Portal (SATP), a publicly available record of all major incidents, by district, in Punjab during the insurgency.<sup>12</sup>

The data on insurgency-related killings begins in 1981. They record 1,045 killings and 149 incidents with at least 3 killings. Figure 1 shows the average annual killings in major insurgent incidents in all districts of Punjab. "Major insurgent incidents" are defined as incidents where at least three people died. Intense violence occurred in two districts bordering on Pakistan, Amritsar and Gurdaspur, and also in the central district of Ludhiana. The timing of the intensity was nonlinear across all districts. For instance, following peace pacts between moderate factions of the separatists and the Indian government, a lull in violence was seen in 1985 and in 1989. However, the extent of the nonlinearity differs across districts. These differences can be used to tease out the effect of violence at the district-level on farmers' labor spending. For example, for there to be a statistically significant effect of violence, labor spending in the year immediately after an event should be correlated with the district-specific nonlinearity. Moreover, if one does find a significant effect, one can then also delve into the channels behind the violence and see if they predict future crime.

To preview the results, Figure 2 shows that insurgent violence was accompanied by an increase in the lawlessness in the districts. Data on kidnappings and abductions (horizontal axis) is taken from an official dataset prepared by the Indian Crime Bureau. These are higher in the areas where insurgency-related killing was high as



**Figure 2:** Average annual killings in major insurgency incidents and average annual kidnappings and abductions, 1981-1991.

Source: www.SATP.com and Crime Bureau, India.

well (vertical axis). The article returns to the topic of the relation between insurgency-related violence and other crime later on.

State-of-the-art microeconomic studies use difference-in-differences methodology. This relies on the assumption that violence-affected areas would have the same underlying trend in investment in capital and labor as peaceful areas if there was no violence. An alternative to using the difference-in-differences strategy where there are several time periods entails combining fixed regional effects and year-fixed effects: Whereas regional effects pick up institutional, geographical, and cultural factors that remain fixed for the entire duration of the period of violence, year effects are able to statistically control for time-varying macroeconomic effects such as inflation, trade, and agricultural innovation. By using individual-level data over time one can control for certain omitted political and economic factors that are either fixed in a district over time or are changing over the entire state in a similar fashion every year.

Repeated cross-sectional farm-level expenditure data from the Punjab Agricultural Department are used to isolate the effect, if any, of violence on farmers' spending on agricultural labor. One can also test for the effect of the insurgency on the number of people hired to try to isolate labor supply-side and labor demand-side channels. The farm-level data on labor spending was collected from annual surveys conducted by the Punjab Agricultural Surveys between 1978 and 1990. Readily available in the form of annual books, the main objective of the surveys of bullock-operated land holdings was to assess expenditure of the cultivators in the state and to analyze

important changes that occurred in farming. The surveys cover the entire state of Punjab in a repeated cross-sectional approach. One bullock-operated holding per subdistrict was surveyed. These holdings have been selected taking into account the cooperation, willingness, and capability of the cultivator in maintaining day-to-day records of his farm.

The empirical specification is as follows:

$$(1) LS_{ijt} = \alpha + \beta_1(INS)_{ijt-1} + \beta_2(YFE)_t + \beta_3(DFE)_j + \beta_4(RAIN)_{ijt} + \beta_5(HLC)_{ijt} + \epsilon_{ijt}$$

where

- ▶ the  $i, j,$  and  $t$  subscripts refer to household, district, and year, respectively.
- ▶ LS is the annual farming household expenditure on either permanent or casual labor, i.e., labor spending.
- ▶ INS is a dummy variable equal to 1 if a major (3+ killings) insurgent attack took place in that district, and 0 otherwise.<sup>13</sup>
- ▶ YFE (year-fixed effects) are dummy variables for each year following the onset of the insurgency.
- ▶ DFE (district-fixed effects) are dummy variables for each of the 12 districts in Punjab.
- ▶ RAIN is the level of rainfall recorded for each farming household in the dataset with the data (in millimeters) coming from the weather station nearest to the household.
- ▶ HLC (household-level controls) include (1) area held in hectares; (2) total number of family members; and (3) area under each quality of soil (either sandy, clay, sandy loam, or loam).

The coefficient of interest is  $\beta_1$ . After statistically controlling for year and district effects, and for rainfall and certain farm household-level factors, it measures the estimated effect of the insurgency on spending by farm households on either permanent or casual labor.

At least two concerns arise in estimating equation (1). First, a statistical bias may arise due to the selection of villages within subdistricts, farmers within these villages, and bullock-holding farmers in particular. This bias, if any, would act in the direction of showing a smaller than the likely true causal effect of insurgent violence.<sup>14</sup> Thus, the reported estimates for labor spending due to violence (see below) are likely to be underestimates. Second, whereas the annual data on violence is compiled from January to December, the data from the agricultural surveys is recorded from July to June, resulting in a six-months data shift.

The two categories of labor spending are "permanent" and "casual" labor. Both refer to manual labor. "Permanent" means wages paid to labor hired for the entire year. If any family members were working on the farm, the relevant opportunity cost was added to the permanent labor spending variable on the basis of wages paid to

**Table 1: Summary statistics of mean labor expenditure and income by district**

<i>District</i>	<i>Obs.</i>	(1)	(2)	(3)
Amritsar	57	2,176	737	45,035
Bhatinda	43	2,129	641	62,786
Faridkot	37	1,791	915	45,980
Ferozepur	35	1,932	724	69,963
Gurdaspur	36	1,526	829	53,306
Hoshiarpur	48	1,545	507	29,921
Jalandhar	42	1,956	827	35,577
Kapurthala	31	2,362	776	39,243
Ludhiana	44	2,761	1,141	68,056
Patiala	57	2,225	662	51,920
Ropar	36	2,077	547	51,809
Sangrur	44	2,636	734	51,396

*Notes:* Columns (1), (2), and (3) are, respectively, the mean expenditure on permanent labor, mean expenditure on casual labor, and mean gross farm income for a farming household per year. The observations, average expenditure, and mean farm income are of all farming households surveyed from that district over the period 1978-1990.

change in the number of hired people, this would imply that wages have increased. Higher wages could result from an inward shift of the labor supply-curve (perhaps due to labor out-migration) and a consequent movement along a steep (inelastic) labor demand curve, leading to an insignificant decline in the quantity of labor hired.

Conversely, if the  $\beta_1$  estimate of insurgent violence on labor spending is negative, this could be due to either one of two reasons. First, there is a movement along a relatively flat (elastic) labor-demand curve, reducing the number of hired people, and thus labor spending (the supply-side channel), or, second, that there is a shift in the demand curve of labor because of the complementary nature of labor with capital in the production function (the demand-side channel).<sup>15</sup> Here, we need not necessarily see a change in the number of hired people, particularly if the supply curve is assumed to be steep.

Summary statistics on labor spending and farm income for each district are presented in Table 1. As mentioned, the observations stem from a survey of a

permanent hired labor in the village. “Casual” refers to wages paid to temporary labor hired during the year. Effects on both types of labor spending can be estimated. On average, of their total farm-related expenditure, farmers spend close to 20 percent on permanent labor and 7 percent on casual labor.

The estimate of the effect of violence on labor spending (that is, wages times the number of farm workers hired) may be either positive or negative. The estimate will be positive if there is an increase in expenditure associated with the violence. One can also test for an effect just on the total number of hired people. Thus, if there is an increase in expenditure without a corresponding

representative household in each subdistrict for each of the twelve districts for twelve years. The mean expenditure on permanent and casual labor, respectively, are Rs. 2,104 and Rs. 748, with higher expenditure in richer districts (for example, Ludhiana) and lower expenditure in poorer districts (like Hoshiarpur).

Column 1 of Table 2 (on page 37) shows a statistically significant negative effect of insurgent violence on farm spending on permanent labor. Relative to baseline spending on permanent labor, the estimated coefficient of -249.5 reflects a decline of 11.4 percent. (This is similar in magnitude to the about 17 percent decline in spending on wells.<sup>16</sup>) Because the corresponding coefficient for casual labor (of 7.442) is not statistically different from zero, this finding suggests that there is no substitution of spending on permanent labor into spending on casual labor. Moreover, when splitting the sample between “rich” and “poor” farm households, the findings suggest that the effect of reduced spending on permanent labor is restricted to the richer households (minus 16 percent, relative to baseline spending.)

The reduction of spending on permanent labor (wages times labor hired) may occur because such labor is complementary with long-term investment such as wells. As mentioned, however, spending reductions may also reflect a labor supply-side effect resulting from a decrease just in the *number* of overall hires. But a separate estimation, not shown here, does not find a statistically significant effect of violence on the total number of people hired (hired workers and family members working on farms).<sup>17</sup> Moreover, an increase in the number of family members alone is associated statistically only with a reduction on casual labor spending by the poorer half of the farm households in the sample. Table 2 also shows that differences in the size of the land farmed, amount of rainfall, and soil type have essentially no (statistical) effect on labor hired.

In sum, adverse effects of spending on permanently labor hired by the richer farmsteads appear to stem solely from insurgent violence. The results with total quantity of labor used (hired labor plus family members) are not statistically significant (due to high standard errors) but are pointing toward a decrease in the quantity of labor used. Thus, while one cannot convincingly make the case for either a demand side or a supply side effect, there is weak (imprecise) evidence that it was a supply shift along an elastic demand curve, decreasing the number of hired labor.

So much for the main effect of insurgency-related violence on farm labor spending. But what is the channel by which this effect works? As suggested before, insurgent violence can signal an increase in future insecurity. To see this, Table 3 is a matrix of correlations of insurgent violence, crime, and future crime. For instance, the district-level correlation between the presence of insurgent violence and the number of robberies in the same year is 0.3728. This is similar to the correlation with next year’s robberies (0.3982). For murders, too, the correlations are not very different (0.4347 and 0.4515). However, for kidnappings (and abductions), the correlation is close to five times higher in the following year as compared to the present year (0.2257 as against 0.0464). This suggests that insurgent violence in one year may

**Table 2: Effect of insurgency violence on labor spending**

	(1) Perm. <Med.	(2) Perm. >Med.	(3) Perm. >Med.	(4) Casual <Med.	(5) Casual <Med.	(6) Casual >Med.
Violence	<b>-249.5**</b> (118.7)	-100.8 (159.4)	<b>-360.2*</b> (190.1)	7.442 (81.66)	-73.84 (47.66)	106.2 (144.2)
Area (hectares)	-52.08 (37.04)	-85.42 (52.45)	-21.13 (64.71)	-0.342 (29.51)	26.29 (41.48)	-37.39 (24.72)
Total number of family members	-0.288 (11.60)	-9.602 (14.34)	15.65 (25.96)	<b>-10.64*</b> (5.825)	<b>-10.83**</b> (4.999)	-6.904 (14.15)
Net rainfall (in mn)	-0.193 (0.235)	0.0677 (0.263)	-0.257 (0.361)	0.161 (0.174)	0.0835 (0.0741)	0.347 (0.342)
Sandy	-27.34 (40.42)	-22.81 (67.76)	-24.28 (64.62)	30.56 (44.46)	-19.91 (33.58)	87.70 (64.81)
Clay	36.17 (61.87)	86.31 (110.3)	-2.815 (85.26)	-46.82 (32.62)	-61.91 (48.29)	11.45 (36.96)
Sandy loam	36.39 (36.00)	54.05 (54.17)	39.19 (69.14)	11.19 (27.61)	-23.84 (38.12)	45.02 (30.44)
Loam	48.82 (32.70)	54.21 (39.97)	61.49 (60.71)	2.403 (27.31)	-26.25 (35.88)	<b>53.63*</b> (27.98)
Observations	510	304	206	510	304	206
R-squared	0.318	0.397	0.387	0.381	0.532	0.426

*Notes:* All results include year-fixed effects and district-fixed effects. “Perm.” and “casual” are annual expenditure by representative farming households on permanent and casual labor. “<Med.” and “>Med.” refer to splitting the dataset into farm households with income less than the median or more than the median. (Median income is Rs. 50,124.) “Net rainfall” is recorded at the weather station nearest to the farming household. The remaining variables are soil types on which cultivation takes place. Robust standard errors, in parentheses, are clustered at the village-level. Statistically significant effects, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, are highlighted with **bold type-face**.

**Table 3: Correlation matrix for insurgent violence, crime, and future crime**

	INS	R	FR	K	FK	M	FM
INS Insurgency	1						
R Robbery	0.3728	1					
FR Future robbery	0.3982	0.8525	1				
K Kidnapping	0.0464	0.2526	0.219	1			
FK Future kidnap.	0.2257	0.376	0.3644	0.4421	1		
M Murder	0.4347	0.8703	0.7194	0.3171	0.4528	1	
FM Future murder	0.4515	0.8557	0.8444	0.2876	0.443	0.9238	1

*Notes:* Insurgency is a dummy variable equal to 1 if a major insurgent incident (3 deaths or more) took place in a district in a year. Robbery, kidnapping, and murder refer to the annual number of robberies, kidnappings, and murders in a district. The corresponding future crimes are the total crimes in that district in the following year. Insurgency data is from South Asian Terrorism Portal and the crime statistics are from the Crime Bureau, Government of India.

signal a coming increase in kidnappings and abductions. Signaling works in situations of high social capital, that is, information transmission from village to village.

The main result then is that permanent, but not casual, labor spending declines in response to insurgent violence. This is consistent with both demand- and supply-side mechanisms, although there is limited evidence for the supply-side channel prevailing (a negative but insignificant coefficient on hires and an increase in kidnappings in the following year).

### Discussion and conclusion

The article reports on a study on how insurgent violence has affected certain labor-related choices by farming households in rural Punjab, India. It finds that an increase in insurgent activity is linked with a decline on spending on permanent farm labor. It also finds an increase in kidnappings and abductions (and, presumably, subsequent extortions), suggesting that violence and extortionary crime were sequenced complements during the Punjab insurgency of the 1980s. One policy implication would be to call for stronger policing. In fact, the insurgency effectively ended in 1992 as the police force increased from 20,000 to 60,000 during the preceding 10 years.<sup>18</sup> A second implication is that the police should have been more active in areas

where there are richer farmers and also in the districts bordering Pakistan where the levels of insurgent violence were particularly high (Figure 1).

Another set of policy implications deals with the agricultural policy of the state. For a primarily agricultural state such as Punjab, there needs to be deft handling of how investment can be bolstered despite the prevailing fear. Indeed, this needs to go hand-in-hand with the security situation itself. Providing subsidies toward specific long-term agricultural equipment may serve to alleviate some of the short-run negative effects of violence. Similarly, farmers can be provided with income support to hire additional labor to increase agricultural output (and productivity). Income support alone is not likely to be sufficient unless supplemented by effective police as farmers would still be subject to extortion.

Yet there are at least two reasons why even improving police effectiveness and providing income support alone may still not be sufficient to increase overall welfare: inequality and environmental degradation. During the so-called Green Revolution, Punjab's agricultural productivity increased greatly. But the consequent increase in average incomes was associated with rising inequality. For example, a review of more than 300 studies published from 1970 to 1989 showed that 80 percent of those that studied distributional effects of the new technology found increases in both interfarm and interregional inequality.<sup>19</sup>

From this and the companion article, we learn that violence has had an adverse effect on both physical investment decisions as well as on permanent labor spending decisions. Together, these effects would seem to somewhat reduce the inequality that had been generated during the years of the Green Revolution. Indeed, richer farmers were more adversely affected by violence. They cut investment by more, and they reduced spending on permanent labor more than their relatively poorer counterparts.

Policymakers will need to decide how to weigh efficiency against inequality when they make decisions on, say, subsidizing agricultural inputs for richer farmers in response to violence. Similarly, considerations in regard to labor laws and minimum wages would push the policymaker who cares about efficiency toward making the labor market more flexible in response to violence. These may have distributional consequences that may be correlated with the persistence of violence. Further research will be needed to understand how inequality may have affected insurgent violence in Punjab in the 1980s.

The two main crops grown in Punjab are wheat and rice. As both are water intensive crops, massive ground water-based irrigation resulted in a depletion of the water table. According to recent estimates, the average water table in central Punjab is falling at the rate of 0.23 cm/year. While some parts of Punjab are witnessing a rise in the water table, resulting in rising salinity and water logging, farmers elsewhere are pumping out 45 percent more groundwater than is replenished by monsoon rains. Thus, although the time period is shifted, from a counterfactual point of view the rate of decline might have been even higher if investment in wells had not declined during the insurgency of the 1980s. Ironically, from an environmental perspective, a decline

in investment in wells following violence and extortions may well be “better” than an unsustainable increase in such investments. Wise policy would take these factors into account when thinking about the overall effects of violence on investment and economic growth.<sup>20</sup>

To conclude, this article provides evidence for an 11.4 percent decline in spending on permanent labor but not on casual labor. It does so through the use of micro-level farmer expenditure surveys using district and year-fixed effects. Insurgency-related violence possibly signals an increase in future kidnappings and may incentivize labor away from working longer duration contracts. There is weak evidence for the labor supply-side channel, and also heterogeneity in the effects between richer and poorer farmsteads. Future work may try to further delineate the channels associated with the dichotomous result, trying to more fully understand labor demand and labor supply before, during, and after periods of extended violence.

## Notes

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1. Civil wars: See, e.g., Collier, Hoeffler, and Rohner (2009); Hoeffler and Reynal-Querol (2003); Abadie and Gardeazabal (2003). Tourism, etc.: See, e.g., Eckstein and Tsiddon (2004) for Israel; Enders and Sandler (1996) for Greece and Spain; Enders, *et al.* (1992).
2. For example, tropical geography and being land-locked may lead to both violence and lower growth (Sachs, 2005). Similarly with other, unobservable, factors that cannot be statistically controlled for and that might affect both violence and growth.
3. See Singh (2012). Relatedly, Brück (2004) shows for Mozambique that wartime choices such as subsistence farming enhance welfare in the postwar period.
4. Public sector: See, e.g., Camacho (2008); Akresh and de Walque (2009); Bundervoet, *et al.* (2009); Guerrero-Serdán (2009); León (2009); Chamarbagwal and Moran (2011); Shemyakina (2011). Private sector: Dinar and Keck (1997); Deininger (2003); Grun (2008). Rwanda: Bundervoet and Verwimp (2008).
5. For simplicity, this article follows the locally established terminology and refers to the perpetrators of the violence as “insurgents” rather than as “terrorists” or another designation.

6. A figure of 30,000 is often used in political speeches. But www.SATP.com and Telford (2001) both refer to “over 20,000” (Telford, 2001).
7. Insurgent education and background: Puri, *et al.* (2008). State police: See, e.g., www.satp.org [accessed 1 June 2012].
8. Pettigrew (1995). On mountain people and “rough terrain,” see Pickering (2011).
9. Retribution: This was found to be the case for a village-level analysis; Puri, *et al.* (2008). Social capital: Singh (2008). Agricultural growth: World Bank (2004). Mechanism: Singh (2012).
10. A study by Chandhoke and Priyadarshini (2005) analyzed Punjabi district-level data for 1980 to 1992 and did not find a negative correlation between violence and agricultural performance. But this was because the study failed to statistically control for state-wide trends before and during the violence. Yet such a statistical control is necessary because if there is a general, overall gain in productivity due to better technology, this can statistically “mask” any negative correlation between violence and agricultural growth.
11. Michael, Khepar, and Sondhi (2008).
12. See www.satp.org. For example, Srivastava (2009) and VandenEynde (2011) use SATP data for their analyses of terrorism trends and Naxalite violence, respectively.
13. The “-1” in the subscripted term for INS refers to a time lag, in this case of 6 months’ time, so that the equation captures the effect, if any, on labor spending by an insurgency attack occurring six months before.
14. This potential concern is addressed in Singh (2012).
15. The decline in labor spending (wages times numbers of workers) provides one possible mechanism for the decline in investment, but there may indeed be others. For example, if electricity or irrigation costs increased in response to violence, this may in turn reduce the marginal productivity of, and hence the demand, for workers.
16. Singh (2012).
17. Detailed regression table results with the number of hired people are available on request from the author.
18. *The Tribune* [India], 5 March, 1993.

19. Freebairn (1995).
20. Salinity and water-logging: Chandhoke and Priyadarshini (2005). Water-pumping and monsoon rains: Mazumdar (2011). On war and environment, generally, see, e.g., Brauer (2009).

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## Analyzing the costs of military engagement

*Olaf J. de Groot*

Conflict is costly. While few will reject this statement, it is also an ambiguous one. Does it refer for instance to the economic impact of conflict or to the actual cost of going to war? The former has been the subject of several studies, particularly in the recent past, while the latter has received relatively little attention.<sup>1</sup>

This article focuses on the second type of analysis, and especially on the *budgetary* impact of going to war. In a time of increasing calls for transparency and government accountability, one would expect that the issue of war expenditure should be high on the public agenda. Unfortunately, this is not necessarily the case. The widely discussed work by Linda Bilmes and Joseph Stiglitz highlights that governments can significantly underreport their own costs when it comes to specific military engagements. This differs from the data situation on military expenditure in general, which is more broadly and more reliably available due to continuous efforts made at the Stockholm International Peace Research Institute (SIPRI) which has developed a uniform methodology to produce internationally comparable data on military expenditure.<sup>2</sup>

The next section describes various actors with different legitimate claims to transparent information on the budgetary cost of conflict. This is followed by an overview of the existing literature on conflict cost analysis, the description of a methodology for approaching the issue of budgetary transparency, and an elaboration on the particular challenges for executing such analyses. The final section concludes.

### The interests and priorities of different stakeholders

Even though their priorities and membership overlap, researchers, government, and the public-at-large constitute the three main interest groups with respect to the analysis of conflict costs. Researchers want objective information and the ability to conduct comparative studies across regions and time. Governments can benefit from additional knowledge to improve future decisionmaking but they may also feel threatened by increased transparency if it were to expose weak decisionmaking in the past. Voters benefit from transparency by being enabled to hold policymakers accountable and, since tax monies are being spent, the public also has a wider moral claim to the right to know the cost of war.

#### Researchers

The objectives of researchers are very specific as their utility functions are largely controlled by their research output. But conducting a budgetary analysis of conflict

specifically can yield research output that is also both of intrinsic scientific interest and that may create considerable media attention. Examples are the publication of Joseph Stiglitz and Linda Bilmes' account of the cost of the United States' wars in Iraq and Afghanistan and the estimates by Tilman Brück, Olaf J. de Groot, and Friedrich Schneider on the cost of Germany's involvement in Afghanistan.<sup>3</sup>

Increasing the amount of information available across countries and conflicts not only improves data comparability but also improves researchers' capacity to provide useful and reliable policy advice. The kind of policy advice that can be generated on the basis of better data can affect both the conduct in ongoing military ventures as well as participation in future conflicts. Even an ideologically-driven researcher advocating peace should be able to benefit from evidence-based research that is able to convince politicians and the public alike.

It is also important to be able to point out to policymakers what the challenges are in conducting such research. As discussed later, the greatest challenge is the lack of transparency and accountability in government expenditure. This issue and the accompanying unavailability of much of the necessary data indicate a greater problem in society, and it is a moral imperative for researchers to point out that such a gap exists.

Finally, if war and the costs to all its participants were fully analyzed, this would extend SIPRI's work by moving from country-based military expenditure to war-based military expenditure. Presently, reasonable data may be available to compare the expenditure of, say, China and the United States, but this data cannot be used to compare the costs of, for example, the wars in Iraq and Afghanistan. Being able to do so may result in new insights about the burden of military expenditure. It may even allow for the possibility of performing cost-benefit analyses on conflicts that truly take into account the entire breadth of costs.

#### Governments

For governments, war-cost analyses are valuable as well, but for different reasons. In general, decisions to go to war are not made on the basis of cost-benefit analysis, even though they probably should be. Looking at past decisions is not helpful for politicians since these decisions can no longer be changed. Furthermore, the public may be alarmed to learn about previous weak decisionmaking and increase any existing doubt about the quality of current policymakers. But if any lessons learned

**The Stockholm International Peace Research Institute (SIPRI) has developed a well-established procedure to estimate countries' levels of military expenditure. This article discusses a methodology to similarly establish a consistent and comprehensive way of estimating the budgetary costs of military engagements.**

help to improve conflict cost forecasting, this can be valuable on its own terms. After all, decisions to participate in conflict repeat themselves over time. Contributing to improvement in decisionmaking is thus beneficial. Without (or only with impaired) information, decisionmaking becomes ad hoc and may be driven more by media and public opinion than by evidence.

The question of transparency brought up by the difficulty of estimating conflict costs is similarly two-sided. From a campaigning perspective, politicians like to argue in favor of improved transparency, even as political economy models would argue that there is no inherent benefit to openness for the individual politician.<sup>4</sup> After all, increased transparency is associated with increased scrutiny of politicians' job performance, which is generally a negative rather than a positive factor. Conversely, politicians associated with opposition parties may find that an evidence-based critique of a government's policy generates more traction with voters than critique based solely on insinuations and expectations.

In contrast to these (perhaps cynical) views concerning the role of politicians, one may take a more practical view: Because it is easy to criticize a government when it is not clear what are the exact costs and benefits of its policies, increased transparency makes it easier for government to defend them. If a particular military campaign has cost a government, say, €10 billion, this may be a price worth paying. But if the price is unknown, critics can use this as an argument against a military engagement. (For proper comparison, however, the analysis of the *benefits* of a military engagement must be of similar quality and be as trustworthy as the analysis of its costs.)

### *The general public*

The public's role as the ultimate paymaster of war is not trivial. Unfortunately, presently it is difficult for individual voters to obtain the information necessary to judge policies as they are being implemented. If such information were available, voters could better monitor and reward or punish policymakers. Such power is a necessary part in a well-functioning democracy. It is the public's right to have this information, and the public should insist on being provided with it.

Yet the public must also understand certain limitations of such research. Even with perfect transparency, part of the analysis will always still be based on estimations. For example, the cost of an ongoing conflict includes estimations of its future expenses, and these will depend on the development of the specific conflict under scrutiny. Further, benefits of military engagements can exist but may not be quantifiable to the same degree, detail, and precision as conflict costs. For example, many countries' marginal contribution to the success of a military engagement is practically zero as the participation of yet another small country in a larger, coalition-based war such as in Afghanistan, Iraq, or Libya will not influence its ultimate outcome. The benefits of participation for a small country are rather intangible, possibly including categories such as the goodwill on behalf of major powers such as the United States of America.

### *Literature on conflict cost analysis*

The budgetary cost of any specific conflict is typically studied using an accounting approach. This approach faces various challenges in data availability and government transparency. This is not to be confused with the study of the overall cost of conflict, where counterfactual analysis is used to estimate the difference between the economic state of a country involved in war and one that is not. An example of this literature includes Abadie and Gardeazabal, who look at the Basque conflict in Spain. Using different approaches, Collier, Brauer and Tepper-Marlin, and de Groot, Bozzoli, and Brück all find that the global economy would benefit significantly from the absence of conflict.<sup>5</sup>

### *Overall military expenditure*

The literature on military expenditure is broad and diverse. The major player in this field is SIPRI whose yearbooks provide the most objective and internationally comparable data on military expenditure. Even for SIPRI, however, it is a challenge to provide consistent, comparable data for all countries in the world, and for some major countries only rough expenditure estimates are available.<sup>6</sup> A large part of the literature addresses the United States only. This is not surprising as the U.S. accounts for about 43 percent of world military expenditure. Other work looks at the impact of military expenditure on national economies, such as on economic growth, or at the probability of a conflict being stimulated by military expenditure, or its relation to income or other forms of inequality, or its role in war recurrence in postwar societies.<sup>7</sup>

The important distinction between these works and studies that look at the cost of specific wars is that the former generally do not attribute military expenditure to specific conflicts. As a result, while data on military expenditure are useful as inputs for certain types of conflict analyses, this literature does not answer questions regarding the cost of any specific conflict.

### *Cost of war*

Measuring the cost of a specific conflict is not the same as measuring military expenditure. One important distinction is that one must separate the share of military expenditure going to a particular conflict from its nonconflict share. Another is that not all of the conflict costs are reflected in military expenditure. For example, societal consequences resulting from wartime mortality would certainly be a cost of conflict but are not ordinarily considered a military expense. As a result, analyses of conflict costs differ from analyses of military expenditure.

A range of studies have used primarily accounting methodologies to analyze the cost of specific wars. For example, William Nordhaus assembled data on the costs to the United States of a number of its wars. (Unless otherwise indicated, this section

uses base year 2002 dollars.) Thus, the American civil war supposedly cost about USD62 billion (104 percent of annual GDP), WWII about USD2,900 billion (130 percent), and the Vietnam war about USD500 billion (12 percent). The first Gulf war in 1990/91 was “cheap” at only USD76 billion (1 percent).<sup>8</sup>

A particularly well-studied example is the U.S.-led invasion of Iraq in 2003. Nordhaus made an ex ante projection of the likely cost of this invasion. Recognizing that his numbers are uncertain due to the unclear nature of both the costs and the conflict scenarios, he arrives at figures in the range of USD100 billion to USD1,900 billion. He includes military spending per se as well as costs related to occupation, reconstruction, humanitarian assistance, the likely impact on the macroeconomic environment, and on the crude oil and associated markets. At a similarly early stage, Davis, Murphy, and Topel projected a cost of USD103-872 billion (base year 2003), including channels such as direct military expenditure, occupation, fatalities, reconstruction, and humanitarian assistance. Although most ex ante estimates by the American government itself are not in the public domain, a study by the House Budget Committee’s Democratic Staff expected the total cost of the war to lie between USD48-93 billion.<sup>9</sup>

With the start of the Iraq war, additional estimates were made. For the period 2003-2015, Wallsten and Kosec expected the cost of the war in Iraq for the United States to be at most USD672 billion. They also note that for this period, the U.S. would avoid costs of about USD125 billion (both in base year 2000 dollars). Probably the most famous forecast of the total U.S. cost of the Iraq war is Stiglitz and Bilmes’ number of USD3 trillion (base year 2008). Edwards provides a thorough overview of the existing literature and discusses some of the most poignant problems. He focuses on the difficulty of including all cost channels and properly identifying all of the healthcare and veterans-related costs. Orszag makes a particularly succinct point about the difficulties of separating the costs of ageing and wartime service.<sup>10</sup>

The next section proposes and discusses a method for analyzing the cost of specific military engagements. Tested for the case of Germany’s involvement in the Afghan conflict, it can be of use to those who would like to perform a similar analysis.<sup>11</sup> For the case of Afghanistan, a rather large difference emerged between what the German government presented as the cost of the involvement and the true economic cost. In fact, the cost was estimated at about two to three times the size of the government’s claim.

### **A model for budgetary conflict cost analysis**

This section, as is the whole article, is based on the experience of researching Germany’s involvement in Afghanistan, itself a broadening of the work of Bilmes and Stiglitz. The analysis concerns itself with so-called nonterritorial conflict, that is, conflict taking place outside a country’s own territory. Examples include the wars in Afghanistan and Iraq, but also the Vietnam war and, from a U.S. perspective, even the

second world war. This type of war differentiates itself from other conflicts, such as civil or international conflicts, by not having a strong direct impact on the domestic economy for instance through capital destruction. Often, this concerns economically advanced countries that enter foreign conflicts on the basis of an international coalition.<sup>12</sup>

The decision of what factors to include in a conflict cost analysis and what factors to ignore is driven by (1) practicality and data availability, (2) logic, and (3) the level of transparency of the government in question. With respect to the first point, for an analysis to be feasible, one must have reasonable expectations about the level of detail that can be expected. While some data may be easily available, many are not. With respect to the second point, it is crucial to consider the whole spectrum of possible cost channels. After all, the whole point is to identify which channels there are and how these may be included in an analysis. Finally, regarding transparency, it should be noted that governments are not eager to have anyone scrutinizing their expenditure. They have strong incentives to obscure their true spending, particularly during elections or when a military engagement does not have much popular support. One may naively expect democratic governments in developed countries to value accountability and transparency, but this is rarely the case in practice.

Using prior war years, it is possible to arrive at realistic estimates of different cost categories on a per soldier basis. It is the responsibility of the researcher to develop a set of realistic scenarios for future war years, and this includes withdrawal dates and troop and fighting intensities (and thus injury and death rates). Using assumed troop intensities for the future, one can use prior-year per soldier estimates to create approximate future war budgets. The design of realistic scenarios is very important. One way to overcome criticism is by using alternative scenarios that display the inherent uncertainty involved in military planning.

This section discusses the four main cost channels separately. First, the costs that accrue to the defense department are discussed, followed by the costs borne by other government departments. The third subsection addresses the role of war financing, and the fourth looks at costs accruing to the economy at large.

### *Ministry of Defense*

The Ministry of Defense (MoD) probably makes the largest contribution to any particular war. Depending on the size of the conflict and the type of political system, it is likely that a government must either submit a spending bill to parliament beforehand or is accountable to parliament afterwards. In either case, it is necessary to check whether claimed expenses are the true expenses. In the case of Germany, only the budget appraisals were publicly available, and it could not always be verified that claimed and true expenditures matched within the various budget categories.<sup>13</sup> On top of that, often only a limited number of budget categories are included in the spending bills presented to parliament. Generally included in appropriation bills are

typical costs such as conflict-specific military equipment, wage increases required by deployed military personnel, and deployment costs. (Table 1 summarizes the cost categories discussed in this subsection and their potential data sources.) The most important item that is *not* necessarily included is the cost of military personnel. The argument for not including basic personnel costs is that the soldiers deployed in war would otherwise have been hired as well. While this is true in the case of short and unexpected conflicts, Brzoska argues that for a long-lasting conflict, soldiers' wages should also be part of the costs attributable to conflict as the base number of soldiers employed is larger than otherwise would be the case. Following Petersohn, the number of soldiers stationed in the war zone must be multiplied by a factor of six to ensure that individual soldiers do not serve more than one tour of duty per six month period and to account for the fact that for each soldier currently on duty, there is one who just returned and one who is about to be deployed. The approximate costs of employment differ greatly by country and any estimation should of course be adapted to the situation at hand.<sup>14</sup>

Next, while the cost of mobilization usually is taken into account, that of demobilizing often is not. As it is difficult to estimate the cost of demobilization from the outside and ex ante, it is useful to look at established examples such as the cost borne by other countries withdrawing under similar circumstances. For the case of the Afghan war, for instance, Verhagen and van Middelkoop estimated that the Dutch withdrawal cost amounted to approximately €229 million. This can function as a benchmark figure for other countries withdrawing from similar conflicts.<sup>15</sup>

The role of equipment purchases is another factor that is strongly dependent on the local situation. Military purchases made specifically for a particular war should be included in the MoD's war budget, but equipment purchased for another purpose, even if used in the conflict, should probably not be counted. But if equipment is lost during war, its cost must be included, and if equipment depreciates faster in war than it otherwise would, depreciation costs also are part of the war burden. Unfortunately, transparency in regard to equipment purchasing is limited, so rough approximations may be necessary to come up with useful numbers.

Depending on the country's budgetary structure, veterans' benefits may be a large contributor to war costs, even though these costs are only incurred in the future. For the United States, Bilmes and Stiglitz find that the future cost of veteran care (healthcare in particular) contribute a great deal to the cost of a current conflict. For the United States, pensions as well as future healthcare coverage are considered as advantages associated with jobs in its armed forces. That implies that a greater use of military forces also leads to increased future spending. Although this can be a large cost category, it is important to use local legislative sources to analyze what responsibilities the state has toward its veterans: In some cases, states may simply be contributing to private pension plans, which do not incur future uncovered expenditure or may not require specific additional healthcare benefits for veterans.

Related to this, states do bear costs resulting from deaths and injuries. Injury and

**Table 1: Summary of conflict-related costs accruing to the Ministry of Defense**

<i>Cost category</i>	<i>Possible data source</i>	<i>Notes</i>
Appropriations bills	MoD; Treasury; Parliament	Values in appropriation bills are ex ante estimates
Ex-post accounting of appropriations bills	MoD; Government Accountability Office; Parliament	
Cost of military personnel	Expert views	Only to be included in long-running conflicts
Demobilization	Expert views; experiences from other countries	Cost accrues in future
Equipment purchase and depreciation	MoD; expert views	Some will be included in appropriations bills
Veterans' benefits	MoD; legal statutes; expert views	Cost accrues in future; can vary among cases
Deaths and injuries	MoD; legal statutes; health care providers	Refers to MoD cost only, societal/human costs

death rates in conflict differ widely across conflicts, but also among different types of military engagements. For example, Brück, de Groot, and Schneider find that approximately four percent of German soldiers were injured in Afghanistan, whereas Bilmes and Stiglitz conclude that approximately 40 percent of soldiers return from the battlefield with injuries (including post-traumatic stress disorder). But even between wars, death and injury rates differ a lot. During the Vietnam war, some 60,000 U.S. soldiers were lost, out of a total of 2.6 million, while in Afghanistan some 1,800 U.S. soldiers lost their lives. The human cost of such deaths are difficult to express, but the necessary expenditure associated with them such as widow/er's benefits are matters of government policy. Likely, injuries (particularly those leading to permanent disability) are much more costly from a budgetary point of view, including future costs, and these must also be taken into account.<sup>16</sup>

**Table 2: Summary of conflict-related costs accruing to non-MoD government offices**

<i>Cost category</i>	<i>Possible data source</i>	<i>Notes</i>
Development cooperation	Expert views; Treasury	The inclusion of this category is highly situation-dependent
Civil deployment	Expert views; Treasury; Parliament	Differentiation between national and international deployment
Security	Expert views; Home Affairs	Situation-dependent and difficult to estimate exactly
International cooperation	Expert view; Treasury	Situation-dependent and difficult to estimate

#### *Other government expenditure*

Underappreciated in the literature on conflict cost analysis are costs associated with departments other than the MoD (see Table 2). Such costs accumulate through various channels, the importance of which depends on the type of war and on country-specific factors. Channels include the effects on development cooperation, civilian deployment (through policing, for example), increased domestic insecurity, direct payments necessary to appease neighboring countries, and increased medical expenses if not already covered by military budgets.

The role of development cooperation and civil deployment of police forces are a well-known way through which inherently military missions can be covered by development budgets. SIPRI's analyses of military expenditure do try to account for this by estimating the share of development and security budgets actually employed by the military, but to do this on a per conflict basis is more challenging. When specific data is unavailable, it may be necessary to make estimations of such costs. It can either be assumed that a conflict country, or its neighbors, requires a percentage increase in the amount of development aid, or that there is an absolute amount of aid required to overcome some of the difficulties in international relations. In any case, the existence of such transfers may not be immediately recognized by governments, even if they do take place.

With regard to security, little information is available. The conflicts in Afghanistan and Iraq were supposed to reduce the occurrence of terrorism and make the world a safer place. However, while terror organizations may have decreased in size, threats made by its members are now directed at all countries involved in the wars. For this reason, it may be reasonable to argue that participation in the Afghan and Iraq conflicts has had negative consequences and thus increased security expenditures. However, items such as increased vigilance at international airports, expansion of intelligence agency workloads, and increased security at public events are difficult to quantify. It is necessary to remember that the sum total of expenditure on the security apparatus is huge, so that even a relatively small increase entails significant costs.

For cost categories that can only be approximated for past years, forecasting future expenditure may be even harder. For example, it is inherently difficult to estimate what the impact of a particular conflict is on the expenditure for domestic security. On the basis of expert views and existing sources, it may be possible to estimate a current annual value. One can then assume a constant per soldier cost basis and use this to calculate future spending.

#### *Financing*

The role of financing government war expenditure is hotly debated. One could argue that the cost of financing is zero since it simply replaces other expenditure or because such costs are already implicitly included in the expenditure items themselves. This would, however, misrepresent the importance of government financing at the national level.

Governments can finance war expenditure through two channels: current or future taxation or expenditure shifting. In the first case, this requires either new or higher taxes, now or later, thus hurting economic growth; in the second case, this involves the transfer of expenditure from nonmilitary to military functions. If the allocation of government funds is *ex ante* optimal, a move from more to less productive use of funds is implied. For example, if one must reduce expenditure on education in order to finance war, this probably leaves the country worse off. In the case of borrowing, one must pay for an infinite stream of interest payments unless and until the loan principal is paid off. Both can only be done through future taxation. The current debt burden of the United States, to which the Afghan and Iraq wars have contributed significantly, is a case in point.

Unfortunately, governments do not commonly link specific revenue sources directly to specific expenses. For that reason, one intermediate solution can be to assume that war expenditure is financed in the same way as is the overall government's expenditure, usually a split of approximately 90 percent taxation and 10 percent borrowing, say. Under that assumption, it is possible to look at the effect of each of these avenues of financing separately. For convenience, assume that the taxation-financed share of government expenditure crowds out more effective general

**Table 3: Data requirements and possible sources with respect to financing needs**

<i>Data requirement</i>	<i>Possible source</i>	<i>Notes</i>
Current financing structure	Ministry of Finance	Baseline for financing model
Expected future interest rate	Expert views; Treasury	
Multiplier difference	Expert views	

government spending. In this case, the economic impact of government expenditure is less beneficial for the economy in a Keynesian sense. This impact can be quantified by taking the difference of the multiplier on military expenditure and the multiplier on nonmilitary government expenditure. According to Stiglitz and Bilmes, a reasonable estimate for the United States is that this difference is approximately 0.4. In smaller, more open economies, where leakage is greater, the difference may exceed this estimate. One would conclude that for the taxation-based part of financing the expense of war, the economic impact of crowding-out amounts to an additional 40 percent of expenditure. The borrowed part of the expenditure can be treated as future interest payments, with the economic (crowding-out) impact of the repayment taking place at some future time.

#### *The economy at large*

The economy as a whole suffers a number of further costs, not reflected in either the government's coffers or through war financing (see Table 4). The largest of these results from the way a war can impact the global economy. The war in Iraq, and possibly this holds for Libya as well, has been argued to have had a significant effect on oil prices and perhaps has entailed significant environmental consequences as well. But an important distinction must be made concerning one's analysis: A researcher interested in the impact of a conflict should include the shock effects that occur through oil prices, but when interested in the impact of a country's participation in a conflict, this effect should only be included if the war would not have taken place in that country's absence. That is, for coalition-based conflicts, the marginal contribution of different countries to the way a conflict develops is often so small that the global economic impact of this conflict is independent of a country's participation.<sup>17</sup>

When global macroeconomic consequences are included, the estimation of what

**Table 4: Summary of nonbudgetary costs accruing to the overall economy**

<i>Cost category</i>	<i>Possible data source</i>	<i>Notes</i>
Global economy (oil prices)	Expert views; international institutions	Only to be included if country's conflict participation was pivotal
Loss of lives	Expert views; government proceedings	SVL estimations vary widely among regions

would have happened to the global economy are not straightforward. After all, it is difficult to determine a counterfactual that does not include the occurrence of a particular conflict. Stiglitz and Bilmes therefore focus only on the oil price. Using the pre-conflict price to estimate the difference between the real and counterfactual prices during the conflict, they estimate the macroeconomic impact of the Iraq conflict.

In addition to this macroeconomic effect which, if included, is likely to be huge, there are other costs. For example, estimating the economic value of the loss of life or loss of productivity through injury is a thorny issue, but must be addressed. Stiglitz and Bilmes use the Statistical Value of Life (SVL) assigned by the Environmental Protection Agency to determine the economic cost of lost lives. Expressed in 2008 dollars, this value comes to USD7.2 million per person. From a European perspective, several studies argue in favor of a remarkably lower SVL, with Belgian, Dutch, and German estimates all ranging between €2 and €2.4 million (in 2010 euros).<sup>18</sup>

#### **Further assumptions and challenges**

Knowing all the various contributing factors to the total budgetary cost of conflict is a good starting point, but there are a number of further assumptions required to build a model that estimates the total cost of a specific conflict. When it comes to timing, it is crucial that one considers at which moment all the costs discussed occur. This is most easily envisaged as a spreadsheet with which to allocate all costs (in columns) to past and future years (in rows). Using a reasonable discount rate, one can sum up these costs for the current year, where future costs are weighed less than costs that occurred in the past. For example, the costs of withdrawal can be assumed to be fixed for a given deployment, but its Net Present Value (NPV) would depend on the assumptions regarding the timing of withdrawal.

Everything described thus far depends on more or less questionable assumptions,

**Table 5: Example of results from conflict budget analysis (in 2010€)**

	<i>Lower bound</i>	<i>Point estimate</i>	<i>Upper bound</i>
Withdraw 2011	18.2B	25.5B	32.8B
Withdraw 2014	25.9B	36.5B	47.1B
Withdraw 2020	52.7B	72.6B	92.5B

*Source:* Brück, de Groot, and Schneider (2011).

categories, it is then straightforward to arrive at lower and upper bounds for the point estimates. It may be advisable to set the lowest level of confidence at 0 percent, thus entirely excluding the least certain items from the analysis.

In this article only the cost of war is discussed, but there may be benefits as well. For example, Wallsten and Kosec argue that by initiating the war in Iraq, the United States saved itself the considerable expense of continuing to enforce the no-fly zone.<sup>19</sup> Other benefits could be reflected in the oil price, or in the creation of new export markets. For smaller non-pivotal countries in war, one could argue that their participation in a coalition improves international relations. If the United States wants to legitimize a particular military action, and a country's minor contribution can help doing so, this is likely to improve the relation between this country and the United States. One could see the contributions made by some of the coalition partners in Afghanistan in this light. After all, Iceland's 4 troops, Austria's 3, Ukraine's 22, and Malaysia's 31 are unlikely to have been critical to the overall mission, but the political implications of their support may create leverage for these countries' governments. Such leverage, while hard to quantify, should not be taken lightly.

As an example, the analysis by Brück, de Groot, and Schneider showed that the German involvement in the Afghan war was much costlier than the government publicly acknowledged.<sup>20</sup> Table 5 is an example of what could come out of other research when performing a similar analysis. It shows the lower bound, point estimate, and upper bound of the Net Present Value (in 2010 euros) of the German participation in the war. Three scenarios are included, one in which troops are immediately withdrawn, a more realistic scenario in which troops are pulled out in 2014, and a full-engagement scenario that envisages a doubling of troop levels and a commitment to stay until 2020. Not shown, but important, is the annual cost associated with the conflict. Whereas the government's appropriation bill asks for approximately €1 billion, the true cost of a one-year increase in war-length are between €2.5 and €3 billion, surely a significant increase.

and so it is crucial to conduct a sensitivity analysis of any results. Since the method is basically an accounting analysis, this cannot be done with rigorous statistical methods such as Monte Carlo analysis. However, it can be done by carefully analyzing the level of precision that can be attached to each of the elements in the study. Assigning levels of confidence to each of the

## Conclusion

This article describes steps necessary for a comprehensive and consistent analysis of the budgetary implications of military engagements. This is an important topic because war-related policies seem generally to be made without proper cost-benefit analysis. Knowing the potential cost of a conflict will enable policymakers to decide in a more objective manner whether a military engagement is worth considering. The path to estimation is littered with difficulties and one should realize that the necessary approximations can be quite imprecise. However, even when an analysis is unable to arrive at precise projected cost figures, it is still worth doing since the associated lack of precision and transparency is in itself an important message to convey. Moreover, voters and the taxpaying public deserve to know if there is a significant lack of transparency with respect to the cost of military engagement.

If future research were able to provide comparable numbers across different participants in similar conflicts (for example, for each of the different coalition forces in the Afghan conflict), it would not only be possible to say which countries fight more effectively, but it would also become possible to estimate the global budgetary cost of a specific conflict consisting of a large range of actors. Similarly, if different conflicts could be analyzed using the same methodology, it would be interesting to look at what has happened over time: Did the conduct of war become more expensive or did it become cheaper?

## Notes

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1. The former: See, e.g., Collier (1999); Brauer and Tepper-Marlin (2010); de Groot (2011); Bozzoli, Brück, and de Groot (2012). The latter: Exceptions include, e.g., Nordhaus (2002); Davis, Murphy, and Topel (2009); Edwards (2010). Note that in the present article the words "conflict" and "war" are used interchangeably.
2. Bilmes and Stiglitz (2006); Stiglitz and Bilmes (2008); SIPRI (2011).
3. Stiglitz and Bilmes (2008); Brück, de Groot, and Schneider (2010).

4. Persson and Tabellini (2002); Alt and Lassen (2006).
5. Abadie and Gardeazabal (2003); Collier (1999); Brauer and Tepper-Marlin (2010); de Groot, Bozzoli, and Brück (2011).
6. Foster, Holleman, and McChesney (2008) point out that there is a large difference between the actual military expenditure and officially recognized expenditure. Brzoska (1981) and others argue that even the available data on military expenditure may not be trustworthy.
7. U.S. military expenditure: SIPRI (2011). Economic growth: See, e.g., Dunne, Smith, and Willenbockel (2005); Smyth and Narayan (2009). War probability: Murshed and Mamoon (2010). Inequality: Lin and Ali (2009). War recurrence: Collier and Hoeffler (2004).
8. Nordhaus (2002).
9. Nordhaus (2002); Davis, Murphy, and Topel (2009). [The Davis, Murphy, and Topel study was carried out in 2003 but only published in 2009.] Public domain: See Nordhaus (2002). House Budget Committee's Democratic Staff (2002).
10. Wallsten and Kosec (2005); Stiglitz and Bilmes (2008); Edwards (2010); Orszag (2008).
11. Brück, de Groot, and Schneider (2011).
12. Nonterritorial conflict: de Groot (2011).
13. But for at least one year evidence was uncovered to show that the true expenditure exceeded the appropriations bill by some 25 percent.
14. Brzoska (2007); Petersohn (2008).
15. Verhagen and van Middelkoop (2010).
16. Brück, de Groot, and Schneider (2011); Stiglitz and Bilmes (2008). Vietnam war losses: (VVMF, 2011). Afghan losses: DefenseLink (2011).
17. Oil prices: Stiglitz and Bilmes (2008). Environment: Reuveny, Mihalache-O'Keef, and Li (2010). Marginal contribution: Brück, de Groot, and Schneider (2011).

18. European estimates: de Brabander and Vereeck (2007); Raad voor de Volksgezondheid en Zorg (2006); Spengler (2004).
19. Wallsten and Kosec (2005).
20. Brück, de Groot, and Schneider (2010; 2011).

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