Unit Mechanization and Local Violence Levels in Iraq

Ryan Van Wie **Jacob Walden**
University of Michigan, Ann Arbor, MI 48105
UNITED STATESCOUNTRY

rvanwie@umich.edu jawalden@umich.edu

ABSTRACT

Are some conventional military units better equipped to conduct counterinsurgency operations than others? Do dismounted units with reduced levels of mechanization help or hurt counterinsurgents? If there are divergent unit outcomes at the local level associated with the level of mechanization, then this carries policy implications for how militaries equip, organize, and deploy in counterinsurgency campaigns. Using new data on the composition and disposition of coalition combat battalions in Iraq from 2004-2008, we analyze how varying coalition mechanization levels and troop density impact district violence during Operation Iraqi Freedom. Challenging extant literature, our results indicate that counterinsurgent mechanization and unit force structure are not a critical determinant of district violence. We find continued support that counterinsurgent troop density plays a key role in local stability.

1.0 INTRODUCTION

For decades, scholars studying insurgencies maintained that mechanized forces are disadvantaged at conducting counterinsurgency operations compared to dismounted forces. However, during Operation Iraqi Freedom (OIF), mechanized forces were critical in the initial clearance and pacification of insurgent-held cities like Tal Afar, Ramadi and Sadr City. Are some conventional military units better equipped to conduct counterinsurgency operations than others? OIF offers a unique opportunity to study heterogeneous mechanization levels. U.S. and U.K. light, motorized and mechanized units routinely deployed and fought in Iraq. Using Carrie Lee's Iraq Order of Battle database documenting the disposition of coalition military forces in Iraq, we analyze if certain units are better equipped for counterinsurgency. We introduce a new variable, Dismount Ratio, that operationalizes combat battalions' mechanization levels as a ratio of troops to armored vehicles within each Iraqi district. Drawing on Iraqi district-level insurgent attacks data, we analyze the relationship between Dismount Ratio and local violence. Challenging the existing insurgency research, we suggest that district violence trends did not systematically vary based on unit type. Rather, overall unit employment strategy seems to be a more important determinant for local security.

2.0 THEORY

2.1 Mechanization Hypothesis

In a large-*N*, interstate analysis, Lyall and Wilson (2009) introduce the "mechanization hypothesis" which states that "increasing mechanization of state militaries has steadily undercut their effectiveness by truncating their ability to collect local information." Their theory supports an information-centric approach tied to soldier-civilian interactions through military mechanization levels. Their causal logic posits that as the counterinsurgent mechanization levels increase, soldiers patrolling in vehicles have less exposure to local civilians and subsequently lose access to valuable intelligence sources. Counterinsurgents, suffering from "information starvation" are subsequently hindered from effectively targeting insurgent cells.[1]

[1] Lyall and Wilson, "Rage against the Machines: Explaining Outcomes in Counterinsurgency Wars."

2.2 Tactical Superiority Hypothesis

A forthcoming study by Carrie Lee provides a different proposition regarding the utility of mechanized forces during counterinsurgency in Iraq: "*the protective environment and discriminate nature of firepower from reinforced fighting vehicles allow soldiers to continue gathering intelligence in a contested environment...Without armored units providing protection and indirect fires, infantry units are less effective, less efficient."*[2] Lee points to a case study examining the 3rd Armored Cavalry Regiment's successful performance during counterinsurgency operations in Tal Afar to highlight the importance of mechanized forces in reasserting government control. Unlike Lyall and Wilson, however, she does not provide large-*N* evidence that challenges the mechanization hypothesis.[3]

2.3 Competing Hypotheses Framework

Lee's critique is supported with narrative evidence from counterinsurgency practitioners in Iraq who argued mechanized forces were vital during OIF.4 Further analysis is warranted to resolve these conflicting arguments. We test both theories using a competing hypotheses framework:5 Mechanization Hypothesis: dismounted units, leveraging enhanced local intelligence, will more effectively target insurgent cells and be associated with lower levels of insurgent violence, relative to mechanized units. Tactical Superiority Hypothesis: mechanized units, dominating local tactical engagements, will be associated with lower levels of insurgent violence, relative to dismounted units.

3.0 DATA

We employ per capita district-level insurgent violence as our dependent variable as reported in the Significant Action (SIGACTs) database.[6] SIGACTs are normalized by total district population (weekly SIGACTs/1,000 residents) for ease of interpretation across districts (defined as *percapSIG*). SIGACTs data are imperfect. Based on differing reporting procedures, units did not uniformly capture all violent incidents in their assigned areas of operation. If certain units conduct fewer patrols, corresponding SIGACTs would similarly decrease, as units simply have fewer opportunities to make contact with the enemy. Despite these shortcomings, Weidmann notes that SIGACTs remain one of the best data sources to measure local violence in empirical conflict studies.[7]

Leveraging the unique task organization of U.S. Army, Marine Corps, and U.K. Armed Forces battalions we operationalize unit mechanization levels. We utilize Lee's forthcoming Iraq Order of Battle Dataset which includes monthly district locations for every coalition combat battalion in Iraq from 2004-2008.[8] This database only includes combat units and excludes service and support units. We introduce a unit distribution weighting scheme that considers a district's overall counterinsurgent composition for a given week and accounts for units

[2] Lee, "Counterinsurgency Myths and Methods: Evidence from the Iraq War."
[3] For a Large N, inter-state analysis showing that combined arms militaries are associated with shorter civil wars and insurgencies, see: Jonathan Caverley and Todd Sechser, "Military Technology and the Duration of Civil Conflict." *International Studies Quarterly* 61, 3 (2017): 704–20.
[4] Chris McKinney, Mark Elfendahl, and H.R. McMaster, "Why the U.S. Army Needs Armor: The Case for a Balanced Force", *Foreign Affairs*, May/June 2013 and Gentile et al., *Reimagining the Character of Urban Operations for the US Army: How the Past Can Inform the Present and Future*, (Santa Monica: RAND, 2018), and Peter Mansoor, *Baghdad at Sunrise: a Brigade Commander's War in Iraq*, (New Haven: Yale University Press, 2008).
[5] Heuer Jr, Richards J. "Analysis of competing hypotheses." Psychology of Intelligence Analysis (1999): 95-110.
[6] Eli Berman, Jacob Shapiro, and Joseph Felter, "Can Hearts and Minds Be Bought? The Economics of Counterinsurgency in Iraq." *Journal of Political Economy* 119, 4 (2009): 766–819.
[7] Nils B. Weidmann, "A closer look at reporting bias in conflict event data," *American Journal of Political Science* 60.1 (2016): 206–218.
[8] Lee, "Counterinsurgency Myths and Methods: Evidence from the Iraq War."

that are split between two or more districts. For all 9,222 district-week observations, pooled combat soldiers are divided by pooled combat vehicles to create an aggregated district *Dismount Ratio*. Districts that do not have an associated *Dismount Ratio*, implying no U.S. or U.K. force presence, are excluded.

To control for district troop strength, we introduce a total force ratio *Troop Density* that measures soldiers per 1,000 local residents. We approximate this district-level ratio using the same unit distribution factor we applied to the *Dismount Ratio*. The coalition routinely massed forces in the most violent districts (i.e. Sunni Triangle and Baghdad) and implemented economy of force missions in relatively pacified areas (i.e. the Kurdish north). An endogenous relationship between *Troop Density* and local violence will create a coefficient that is biased towards increasing violence.

Building on previous micro-level scholarship in Iraq, our control variables are drawn from the Empirical Studies of Conflict Iraq Civil War Dataset, obtained, aggregated, and cleaned by researchers at Princeton University using U.S. Department of Defense records.[9] We control for district level population density and unemployment rate. We also include a six month lagged district violence variable to proxy for long term insurgent capability. In Table 1, we list descriptive statistics of SIGACTs, *Dismount Ratio*, *Troop Density*, and controls.

Table 1: Descriptive Statistics of Key Variables

	Dismount Ratio	Troop Density	SIGACTs	Unemp. Rate	Population	Population Density	6 month Lag SIGACTs
Minimum	6.18	0.09	0.00	0.00	15959.50	0.00	0.00
Maximum	41.05	75.85	293.00	0.51	1668737.00	13.94	293.00
Range	34.86	75.75	293.00	0.51	1652777.50	13.94	293.00
Median	12.39	2.32	7.00	0.09	272006.52	0.10	8.00
Mean	19.38	4.80	16.59	0.10	424003.19	0.94	17.55
SE Mean	0.13	0.08	0.27	0.00	4278.43	0.03	0.29
Variance	164.67	54.55	667.74	0.00	168808050703.00	6.53	719.73
Std Deviation	12.83	7.39	25.84	0.07	410862.57	2.56	26.83
Coef. Variance	0.66	1.54	1.56	0.70	0.97	2.71	1.53

4.0 MODEL RESULTS

We implement a series of linear models regressing SIGACTs per 1,000 residents on *Dismount Ratio*, *Troop Density*, and district-level controls. We employ OLS and fixed effects models controlling for unobserved district-specific factors and yearly temporal trends. Table 2 reports the regression analysis results as we introduce layers of covariates and fixed effects, with Model 6 fully specified and suggesting null results for the relationship between *Dismount Ratio*, our mechanization variable, and violence per 1,000 residents, SIGACTs. Model 6 adds fixed effects by year as a crude proxy for macro-level changes in violence in Iraq, particularly the Sunni Tribal Awakening and presents far greater explanatory power (R-squared) than any of the models with fewer variables. Model 1 presents a basic set of covariates with no district or year fixed effects. In Models 2 through 6, we layer in these covariates and employ district fixed effects. In Models 5 and 6, we include a 6 month SIGACTs lag to proxy for long term insurgent capability. And in fully-specified Model 6, we include year fixed effects. We use the OrthoPanels package in R to test for the potential effect of Nickell Bias in Model 5 and do not find evidence of lagged time variable bias.[10] We conduct several robust checks in

[9] Berman, et al., "Can Hearts and Minds Be Bought? The Economics of Counterinsurgency in Iraq."

[10] Nickell Bias is caused by the correlation of error terms and regressors when using time-demeaning lagged variable. This usually produces upward bias in the dependent variable and conservative estimates of other regressors. See Pickup, Mark, Paul Gustafson, Davor Cubranic, and Geoffrey Evans. 2017. "OrthoPanels: An R Package for Estimating a Dynamic Panel Model with Fixed Effects Using the Orthogonal Reparameterization Approach." The R Journal 9(1): 60–76. The approach by Lancaster (2002) uses an orthogonal reparameterization of the fixed effects to produce a likelihood-based estimator of the remaining parameters that is exact and consistent as N approaches infinity

a forthcoming full-length article, employing a log transformed SIGACTs variable, an untransformed SIGACTs count variable with a zero inflated negative binomial regression model, and a dynamic panel model.[11] These results are consistent throughout, and the *Dismount Ratio* is not a statistically significant predictor. Our results do not support the mechanization hypothesis or the tactical superiority hypothesis — there is no clear relationship between the *Dismount Ratio* variable for mechanization level and the per capita violence variable, *SIGACT/1,000.*

for T greater than or equal to 2. Our results do not indicate the presence of non-stationarity in our unbalanced panel predictor variables.

[11] Here we attempt to adjust for unobserved, unit-specific and time-invariant confounders when estimating causal effects from observational data – variations in district characteristic sand temporal patterns of violence that the Berman, Shapiro, and Felter confounders do not provide. This introduces a set of assumptions. We make an identifiability assumption, that: time-varying explanatory variables are not perfectly collinear, that they have non-zero within-variance, and not too many extreme values. We believe this holds for these data. We also assume that there are no unobserved factors that impact both troop density *Troop Density* and *Dismount Ratio* along with our dependent variable SIGACTs. We believe district-specific effects are correlated with our independent variables, and we are interested in these unit effects. As additional checks, we follow the work of some previous Iraq mechanization and SIGACTS work in running our model with a logged SIGACTS variable to account for the data's skew and find similar results to our main models. This presents a tradeoff between including 0 count SIGACTS and the skewed data. With our large N we err on including 0-count observations in our main models. As an additional alternative to the logged models, a zero-inflated negative binomial model is better suited to account for the distribution and count data of SIGACTS, and again produces similar results to our main model. Our main model accounts for both 0 SIGACT observations (excluded from logged models) without the two-causal pathways assumption of the zero-inflated negative binomial model.

Table 2: OLS and Fixed Effect Model Results using SIGACT/1,000

	(1) percapSIG	(2) percapSIG	(3) percapSIG	(4) percapSIG	(5) percapSIG	(6) percapSIG
TForce	0.00506***		0.00311	0.00312	0.00330*	0.00321
	(14.32)		(1.86)	(1.92)	(2.12)	(1.84)
Dismount Ratio	-0.000326***	0.0000193	0.0000726	0.0000529	-0.0000262	0.0000621
	(-4.68)	(0.06)	(0.21)	(0.15)	(-0.08)	(0.22)
Population Density	-0.00460***			0.0271**	-0.0195	0.00579
	(-20.88)			(2.77)	(-1.13)	(0.33)
Unemployment Rate	-0.0840***			0.149*	0.0701	-0.0991
	(-6.50)			(2.05)	(1.17)	(-1.13)
6 Month SIGACT Lag	0.00113***				0.000885***	0.000714***
	(20.31)				(4.41)	(3.93)
2004						0
						(.)
2005						0.0285*
						(2.46)
2006						0.0465***
						(3.71)
2007						0.0361**
						(3.35)
2008						-0.00865
						(-0.94)
Constant	0.0390***	0.0589***	0.0430***	0.00339	0.0437*	0.0136
	(13.80)	(9.29)	(3.92)	(0.19)	(2.04)	(0.73)
Observations	8296	9222	9222	9222	8296	8296
Adjusted R^2	0.251	-0.000	0.028	0.037	0.092	0.572
AIC	-16881.1	-22555.6	-22813.0	-22905.6	-21018.8	-21567.7

t statistics in parentheses

Note: N is reduced by 926 observations by including the 6 month SIGACTs lag on the equation's right hand side.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.0 CONCLUSION

Relatively little research has been conducted on counterinsurgent force employment and capabilities in a local context. Using an OLS model to assess district-week Operation Iraqi Freedom (OIF) war data, our findings support neither of two countervailing hypotheses of counterinsurgent mechanization levels in explaining changes in district violence. In our forthcoming work, we use narrative evidence from OIF in three cases — Fallujah, Ramadi, and Basra — to argue that a unit's mechanization level does not preclude that unit from garnering intelligence from the local population. The historical record, counterinsurgency literature, and our case studies of Fallujah, Ramadi, and Basra suggest that a combination of capable government coercive power,

population-centric security provision, and competent local security forces can create conditions enabling civilians to provide the government with intelligence regarding local insurgent cells. The linkage of security provision and intelligence sharing suggests that the scope conditions of a given case — such as high or low initial violence levels, the strength of the counterinsurgent, and civilian trust — may play a role in determining the relative suggest of a highly mechanized or highly dismounted troop employment strategy.

As with all micro-level research, we are cautious about the generalizability of these results. OIF encompassed varied forms of civil conflict. Kilcullen notes: "Iraq... is a hybrid conflict that involves not only a domestic insurgency including accidental guerrillas and local fighters, but also elements of sectarian and ethnic conflict, international terrorism, foreign fighters, and regional nation-state rivalry."[12] These results are relevant to Iraq and high-intensity insurgencies. Mechanized forces are necessary when dealing with well-armed insurgents, set in deliberate urban fighting positions, protected by complex obstacle belts. Future research could build on this study by identifying if similar trends hold in the micro-setting during low-spectrum civil conflicts. Conversely, identifying these trends in other high-spectrum civil conflicts would lend further validity to these results.

[12] David Kilcullen, *The Accidental Guerrilla: Fighting Small Wars in the Midst of a Big One* (New York Oxford University Press: 2009) page 149-152.