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Eli Berman
Joseph Felter
Ethan Kapstein
Erin Troland

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Predation, Economic Activity and Violence: Evidence from the Philippines
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ABSTRACT

This paper explores the relationship between economic activity and political violence through the lenses provided by several different mechanisms. *Investment as a predictor of future violence* implies that low private sector investment today provides a robust indicator of high violence tomorrow. *"Rent-capture" or predation* asserts that economic programs and business investment will increase violence by increasing extortion by insurgents. *"Hearts and minds"* counterinsurgency has been asserted to link economic activity to political violence in three ways, through an opportunity cost mechanism by which improved economic conditions reduce the cost of rebel recruitment; through a "hope and gratitude" effect by which development assistance generates support for government, reducing cooperation with rebels; and thirdly, though an improved governance mechanism. We lay out these mechanisms in a framework with strategic interaction between rebels, communities, government and firms within an information-centric "hearts and minds" counterinsurgency model. We test the mechanisms in the context of the Philippines in the first decade of this century, using a new dataset that combines violent incidents with indicators of economic activity. The data support the predation thesis, while refuting the predictions of the predictive investment mechanism, the opportunity cost mechanism, and the gratitude effect.

Eli Berman
Department of Economics, 508
University of California, San Diego
9500 Gilman Drive
La Jolla, CA 92093
and NBER
elib@ucsd.edu

Joseph Felter
CISAC and Hoover Institution
Stanford University
Encina Hall, C222
Stanford CA 94305-6165
felter@hoover.stanford.edu

Ethan Kapstein
LBJ School of Public Affairs
University of Texas at Austin
PO Box Y
Austin,TX 78713
and NBER
ekapstein@austin.utexas.edu

Erin Troland
University of California
San Diego Department of Economics
9500 Gilman Drive #0508
La Jolla, CA 92093-0508
etroland@ucsd.edu

I. Introduction

Since the end of the Second World War, the United States has fought major counter-insurgency campaigns in Vietnam, Iraq, and Afghanistan, and less intensive conflicts in Central America, Somalia, and parts of the Middle East. Other countries have also fought these types of wars, including Britain (in Aden, Cyprus, Kenya and Malaya), France (in Algeria and Indochina), and the Philippines (throughout its island chain). Central to government strategy in many of these conflicts has been the view that military power alone cannot overcome insurgent violence; other instruments, including economic programs, must also be deployed.

Informing government strategy is the belief that insurgents are motivated to fight by some form of grievance, a grievance that may be more or less widely shared by the population at large. Counterinsurgents thus aim to counter the uprising and associated violence using a wide array of policy tools, including military force, diplomacy, and economic development. The question that this paper raises is whether economic tools are, in fact, effective as part of an overall counterinsurgency strategy or whether they could, ironically, induce even greater levels of insurgent activity.

We explore the relationship between economics and violence by developing a unified model that incorporates a variety of mechanisms through which economic activity may affect violence. Our model builds on the three-sided strategic model developed by Berman, Shapiro and Felter (2011, henceforth BSF). In BSF, information is the key channel through which economic activity affects violence. Civilians are induced to provide intelligence on insurgent activity in exchange for government-provided public goods. We add new features (income and insurgent taxation) that allow us to include three additional mechanisms present in the violence and economic activity literature. These mechanisms include opportunity costs, gratitude, and predation by insurgents. Finally, we extend the model to include a new player (firms), allowing us to incorporate a fourth mechanism (investment).

Broadly, three of these mechanisms predict a negative correlation between violence and economic activity, while one of them predicts a positive correlation. The opportunity costs mechanism posits that providing better outside opportunities (i.e. employment) increases the cost of participation in the insurgency. The gratitude mechanism suggests that civilians will be grateful to the government for increased economic activity, and thus withdraw support for the insurgency to reward the government for its efforts. Both of these mechanisms are often grouped under a "hearts and minds" class of theories, in which non-combatants can be "won over" through the provision of public goods and/or better economic opportunities. Next, the investment mechanism posits that the

level of private sector investment today provides a robust indicator of violence tomorrow. These three mechanisms share roughly the same prediction, that increased economic activity means decreased violence. The final mechanism, rent capture/predation, has the opposite prediction. This mechanism argues that lucrative economic programs and business investment open up taxation and capture opportunities for insurgents. As a result, insurgents may use violence to secure their ability to tax and control such activity. Thus, the predation mechanism predicts a positive correlation between violence and economic activity.

After laying out these four mechanisms in our unified model, we test their predictions in the context of the Philippines using a new dataset on insurgent violence and economic activity. Throughout most of its modern history, the Philippines has suffered from insurgent violence at the hands of a variety of rebel groups with differing political and religious orientations. These groups include Communist revolutionaries operating throughout the country, Muslim separatists in the southwestern provinces of Mindanao island seeking independence from Manila, and extremist groups with ties to international terrorists organizations and the conduct of kidnap for ransom and other illicit activities in the southern Philippine islands of the Sulu Sea (on the Communist insurgency see International Crisis Group 2011; on the Islamic insurgency see International Crisis Group 2008).

To measure violence, we use a new dataset on violent incidents from 2001-2008. We test the four mechanisms stated above which relate economic circumstances to insurgent activity. The Philippines is among the few countries during the period of this study in which economic development programs were fully integrated into military operations via the Armed Forces of the Philippines' "National Development Support Command" (NADESCOM), whose mission included the deployment of economic programs to counter insurgent violence and activity. For measuring economic activity, data on investment and income are very difficult to come by at a subnational level in developing countries. In the Philippines we are fortunate to have access to a proxy, detailed data on the value of building permits, which are available at the province level. Building permits might plausibly proxy for investment or income, or most likely both. New construction requires permitting, so in that sense permits measure investment. Ongoing renovation of existing structures also requires permitting, so that the value of permits will also reflect the value of existing real estate (land and structures) which would in turn be proportional to local economic activity. We report specifications appropriate for both interpretations of the value of building permits.

Regardless of specification, our results are consistent with a theory of predation. Our results reject other mechanisms that would link violence to economic activity as the sole force at play. These include investment as a predictor of violence reduction, and the "hearts and minds" mechanisms of opportunity costs and "gratitude." The model presented encompasses all of these possibilities, and distinguishes between them and an information-centric theory of counterinsurgency presented in BSF, which is neither refuted nor supported by the data.

The paper is in six sections. Following this introduction we provide a brief literature review. We then outline in more detail an omnibus theory of economic activity and violence which encompasses all the mechanisms mentioned above. Section four describes the data. Section five reports empirical analysis and section six concludes.

II. Economic Activity and Insurgent Violence: What's the Connection?

A commonly held view in both the academic and policy literatures on insurgency is that economic development (broadly defined here to include economic activity by both the public and private sectors) can help promote a "stable" political environment in which government authority is generally recognized and respected. In the context of Afghanistan, for example, a U.S. Army War College study argues that "development is a means of turning Afghans away from the insurgency and thereby creating a stable environment in which the Afghan government can exert its authority" (Malkasian and Meyerle 2009, 6). Similarly, a report to the U.S. Senate Committee on Foreign Relations states that "foreign assistance can be a vital tool for promoting stability in Afghanistan" (U.S. Senate, 2011, 1). This type of assertion can be found among policy-makers with respect to every postwar conflict that has involved insurgent violence, from the Malayan uprising of the 1950s to the Iraq and Afghan wars (Marston and Malkasian 2008). Yet these sources are typically vague about the mechanism by which economic activity reduces insurgent violence.

The academic literature attempts to be more specific, developing several distinct channels which relate economic activity to insurgent violence. First, a primary objective of the counterinsurgents, in some cases, may be to encourage the civilian population to divulge useful information and intelligence about the insurgency. To achieve this objective, counterinsurgents may use economic instruments targeted at a tactical level to motivate or reward such behavior. This strategy might be termed "information-centric counterinsurgency" (COIN), as developed formally by Berman, Shapiro and Felter (2011) . Second, and related, is the so-called "hearts and minds" or

"gratitude" theory of COIN. This theory suggests that the civilian population can be "won over" to the government's side by the general provision of public goods and the expectation of economic growth. Third, is an "opportunity cost" of insurgency, suggesting that the greater the economic growth and the better the job prospects, the more costly it becomes to engage in the insurgency. Fourth, far from impeding violence, some scholars argue that economic activity encourages insurgent violence by inducing insurgents to engage in rent-seeking behavior or predation (Hirshleifer, 1989; Collier and Hoeffler 2004). Finally, it has been posited that economic activity (in particular by private investors) provides a leading indicator of future levels of violence; the higher the economic activity, the lower the future violence.

It should be further noted that the effects of economic development on an insurgency are held to operate both through insurgents and through noncombatants: economic development changes the calculation of potential insurgents about the costs and benefits of engaging in violent activity, while the population at large may be more willing to cooperate with the government if they believe that their future will be more promising if they do. As political scientists Savun and Hays have argued in the context of foreign assistance, "Foreign aid can promote economic growth and development which reduces the level of grievances, mobilization and willingness of individuals to join" terrorist organizations and insurgent groups, or perhaps even to provide support to such outfits (Savun and Hays 2011, 1).

Unfortunately, as this brief theoretical review suggests, there is at present no consensus on the causal chain that relates economic activity to insurgent violence, while the empirical studies performed to date permit conflicting interpretations of that relationship. Take as an example the connection between labor markets and the insurgency. It has long been held in the social policy literature that high levels of unemployment can fuel political instability and even regime change (Kapstein 1999). When applied to the case of insurgency, this literature suggests that policy-makers should invest in development programs that make intensive use of unemployed workers, and in particular unemployed youth. In Afghanistan among other countries, foreign aid has in fact been used for that very purpose (U.S. Senate 2011).

Yet careful empirical research provides arguments both for and against that particular causal relationship. Iyengar et.al. (2011), for example, find that increased spending on labor-intensive development programs is associated with decreases in violence, while Berman, Shapiro, Felter and Callen (2011) find no such relationship between unemployment levels and insurgent attacks. In

short, the relevant theoretical and empirical studies have not yet forged a consensus on the economics-insurgency connection.

In this paper we develop and test four hypotheses regarding that connection, building on several strands of the economics literature. The first strand, which we label the "predictive investment," draws on research on financial markets, and particularly the efficient market hypothesis (Fama 1970). It posits that domestic investors process all relevant information about the economy's future trajectory (including policy information) before making their allocation decisions, and that increasing levels of investment in country x and time t reflect, all things being equal, relative optimism about the country's economic future.

Kapstein and Converse (2008), for example, find that domestic investment in newly established democracies is lower in those democracies which are overturned within their first five years of existence than in those which endure for the longer-run; in other words, domestic investors appear to have some knowledge about the future degree of political instability. Fielding (2003) examines investment levels in Israel and Palestine over time and finds that investment in construction and capital goods falls during those periods of the greatest "intifada" (or Palestinian uprising) violence. He further argues that a credible commitment to peace would significantly increase investment levels in those sectors. Looking at the case of Iraq, Chaney (2007) examines the price of sovereign bonds and finds that prices reflect the views of investors about the country's future political stability. Similarly, Coyne et.al. (n.d.) test the relationship between equity market prices and violence in Sri Lanka, and they find that the stock market provides a robust predictor of future peace and violence in that country. In a recent paper, Besley and Mueller (2012) link housing prices to the frequency of killings in Northern Ireland. They find that once British forces brought some stability to Northern Ireland, housing prices began to increase. These price increases continued as British forces maintained a presence in the region, thus making a credible commitment to investors. This interaction between military forces and investors promoted a reduction in violence, which further drove prices upward. In short, all these studies share the view that investment decisions made today generally provide an accurate reflection of political stability in the future. In the context of the present study, predictive investment suggests the following hypothesis:

H1: Increased investment at time t_0 predicts decreases in violence at time t_1 .

A second theory we examine, predation, is the polar opposite to the investment theory. Building on the work of Collier and Hoeffler (2004), Sambanis (2003), and Ross (2004), Crost, Felter and Johnston (2012) argue in the case of the Philippines that "if insurgents expect that development projects will weaken their position, they have an incentive to prevent their successful implementation, which may exacerbate conflict." Observing economic activity in their midst, the insurgents will seek to disrupt it before the government can earn the associated political rents. Alternatively, insurgents may "shake down" the investment projects as a way of gaining income. In either case, more violent episodes may be expected to occur alongside economic development programs.

As Crost, Felter and Johnston (2012) note, there seems to be substantial anecdotal support for this theory, in the form of frequent attacks on both aid workers and infrastructure projects. In 2010 alone, for example, over 100 relief workers were killed in Afghanistan (*New York Times*, 13 December 2010). Further, major infrastructure projects have been targeted by insurgents, who have also successfully targeted the government and foreign assistance community for protection money as the price of allowing those projects to move forward (*New York Times*, 1 May 2011). In essence, these projects have been "taxed" by the Taliban. Stating this "predation or rent-capture" theory as a testable hypothesis, we may state:

H2: Increased economic activity, including investment, will be associated with increased insurgent violence.

Two other mechanisms, "opportunity cost" (Dube and Vargas 2010) and "gratitude" [1] theories, share the opposite prediction, that increased economic activity will reduce rebel violence.

H3: Increased economic activity, including investment, will be associated with decreased insurgent violence.

[1] Kilcullen (2009) explains from a skeptical perspective: "There is also a belief, unfounded in reality, that development assistance generates gratitude, or "hope," in the population and thereby of itself encourages them to support the government. Field experience in both Afghanistan and Iraq, however, has shown that insurgent intimidation easily overcomes any residual gratitude effect, while historical studies have shown that in civil wars and insurgencies, popular support tends to accrue to locally powerful actors rather than to those actors the population sees as more congenial..." (p. 67). In what follows, gratitude and opportunity cost mechanisms will have similar testable implications.

The class of theories that incorporate the behavior of noncombatants, including opportunity costs and gratitude, are often called "hearts and minds." The recent literature has emphasized approaching them as a three-sided game, in which insurgents, counterinsurgents, and communities of noncombatants all act strategically (U.S. Army 2007; BSF). That class also includes information-centric counterinsurgency, which predicts that only particular types of targeted economic activity (i.e. small-scale, local development projects) will be violence reducing. These small-scale programs, however, have high requirements for detailed local knowledge about the population and its grievances, which may be difficult to acquire in conflict zones.

In order to accommodate all of these possible mechanisms from the literature we expand the three-sided game of BSF in several ways, introducing firms and investment in order to allow predictive investment, allowing extortion by rebels in order to incorporate predatory violence, and including taxation by government for completeness.

III. Theoretical Framework: Counterinsurgency Predation, Opportunity Costs, and Gratitude

To understand how economic activity might be related to insurgent violence we must first examine the motivations and constraints of insurgents, counterinsurgents, and communities of noncombatants. In this section we expand the information-centric model of BSF to explicitly include three additional mechanisms by which economic activity could affect violence: opportunity costs, gratitude, and predation by rebels. An extension integrates a fourth mechanism, by which investment might predict violence. To preserve symmetry and realism we balance predation by insurgents with taxation of community members by government, allowing us to discuss the effects of changing tax rates. Violence by rebels and enforcement activity by government –both observable in the Philippine data, will be equilibrium outcomes of a three-way strategic interaction between rebels, community, and government, building on a model of street gangs proposed by Akerlof and Yellen (1994). That framework is illustrated schematically in Figure 1. We state a minimal model, referring the reader to BSF for motivation and proof of repeated material.

[Insert Figure 1 about here.]

A. Assumptions

1. Players and Actions

The government, G, seeks to reduce violence through counterinsurgency effort and service provision. A rebel group, R, seeks to impose costs on government by attacking it (attacks that target civilians are considered in BSF, Appendix A)[2], offsetting its costs by collecting rents. A utility maximizing community, C, can help deliver control of territory to government by anonymously sharing information about rebels.

2. Sequence of Play

Information sharing by the community requires no preparation, while service provision, counterinsurgency efforts and rebel violence are less flexible, requiring pre-deployment of people and resources, so we assume that C can move last. Play proceeds in four stages:

(#1) Nature draws community norms favoring rebel (over government) control of their territory, n, from a uniform distribution $U[n_L, n_U]$; n is private to C. Nature also draws a level of income for community members, y, (with $y > 0$). To capture predation, we assume that rebels extort income at a rate $0 < \theta_R < 1$, while government taxes at a rate $0 < \theta_G < 1$. (Assume that n_L and n_U span enough of the real line to allow $n_L \leq v + g + (\theta_R - \theta_G)y \leq n_U$.[3])

(#2) G chooses a level of public goods to provide, g, and a level of enforcement (counterinsurgency) effort, m. R simultaneously chooses a level of violence, v, to attempt against G.

(#3) C decides how much information, i, to share with G, having observed the actions of G and R.

(#4) Uncertainty regarding control of territory, a, is resolved, and payoffs occur.

3. Technology of control

Control of territory is represented by a binary variable, a, which is one if the government controls the territory, and zero if it is controlled by rebels. The probability of government control is

$P(a=1) = h(m)\, i$,

where m is enforcement (counterinsurgency) effort by G, ($m \geq 0$), $h(m): R^+ \rightarrow [0,1]$ is a monotonically increasing, concave contest success function, with $h(0) = 0$ and $h \rightarrow 1$ as $m \rightarrow \infty$. Here i is the level of information that C chooses to share with G, ($1 \geq i \geq 0$). (All variables are real

[2] Violence has to occur in equilibrium, rather than just the threat of it, since we observe violence in the data. Violence is inefficient in a Coasian sense; for it to occur there must be incomplete contracting ability between rebels and government (Fearon 2004; Powell 2006). This is not a very restrictive assumption; governments and rebels often have trouble credibly committing to bargains.

[3] That will be equivalent to assuming that the support of n is broad enough to allow neither side to fully determine information sharing through its actions.

numbers unless otherwise specified.) Consistent with current doctrine, this makes some minimal information sharing a necessary condition for government control (U.S. Army, 2007, 1-23). Rebel control does not exclude government forces; it implies that attempted rebel violence against those forces will cause them damage. In contrast, attempted rebel violence in government controlled areas fails to do harm. (That stark assumption is relaxed in BSF, Appendix A.)

4. Payoffs

Community: The community has a representative member with income y. She consumes her net (of taxation) income $c = (1- \theta_G)y$ under government control, and $c = (1- \theta_R)y$ under rebel control. Utility is given by

$$U_C(y,a,g,n,v) = u[\,(1- \theta_G)y + g - n\,]\,a + u[(1- \theta_R)y - v\,](1-a).$$

If a=1 (government control) then the community consumes $(1- \theta_G)y \geq 0$, and benefits from government services, $g \geq 0$, so it attains utility $U_C = u[(1- \theta_G)y + g - n]$, where u[.] is continuously differentiable and monotonically increasing. Services are local public goods such as safety, justice, education, health, welfare, garbage collection, utilities, or infrastructure. Community norms favoring rebel control, n, generate disutility when the government is in control.

Alternatively, if a=0, rebels may successfully carry out violence, $v \geq 0$, against government targets. Successful violence also increases the rate at which rebels can extort the income of community members, $\theta_R(v)$, which is an increasing and concave function. Under rebel control, community members will attain utility $U_C = u[(1- \theta_R)y - v\,]$. Rebel violence, v, is not directed against community members per se, but they suffer from it nonetheless, because they are accidentally affected by crossfire (so-called "collateral damage"), or because they empathize with government employees or value government targets.[4]

Under rebel control the community does not benefit at all from government services, g, either because the government withdraws services when it cannot protect its employees and contractors, or because it conditions local public good provision on control, as collective punishment. *Conditionality* might be unusual for a social welfare maximizing government, an NGO or international organization such as the World Bank (Crost, Felter, and Johnston 2012), but would be

[4] BSF generalize to allow rebel violence to affect the community when a=1, in two ways (in an appendix): they introduce violence directed at the community; and allow the community to suffer disutility from government suppression of that violence.

standard practice for a government concerned about insurgents.[5] The Philippine government, for instance, conditioned cash transfers on noncooperation with insurgents (Crost et al, 2012).

This is a "rational actor" model, in the tradition of Popkin's (1979) description of Vietnamese peasants; noncombatants choose based on a rational calculation of self-interest, rather than an overwhelming ideological commitment to one side or another. Ideological commitments are subsumed in norms, n, but on the margin economic conditions, extortion and taxation can also influence noncombatants' decisions.

Incorporating the uncertainty that C faces about a, C's payoff is the expected utility function

$$(1) \qquad EU_C(y, g, v, n, m) \Big|_n = u[(1-\theta_G)y + g - n]\, h(m)\, i + u[(1-\theta_R)y - v](1-h(m)\, i).$$

Rebels: Rebels use violence to impose costs on government, either in an attempt to extract concessions, or in an effort to overthrow the government altogether (Tilly, 1978). These attacks would typically involve ambushing a patrol, or attacking a checkpoint. Let G's cost of rebel violence be $A(v)(1-a)$, which accounts for the damage caused by an attack. R's benefit from violence is then $U_R = A(v))(1-a)$. We assume that $A(0) = 0$ and that A is an increasing, concave function. R also gains extortion income, $\theta_R(v)y$. Rebels' cost of violence is $B(v,y)$, which is increasing and convex in v. We integrate opportunity costs of violence into the model by including income, y, in rebels' cost of violence, $B(v,y)$. Opportunity costs imply that increased income makes the marginal cost of violence increase, as rebels must pay more for recruits with an increased value of time, i.e., a positive cross-partial, $\frac{\partial^2 B}{\partial v\, \partial y} > 0$.[6] Gratitude, the idea that the community will resist recruitment by rebels if the government behaves in a way that allows it high income, will have the same prediction of a positive cross-partial, $\frac{\partial^2 B}{\partial v\, \partial y} > 0$.[7] We discuss the implications for data below.

Rebels then face an expected payoff function,

$$(2) \qquad EU_R(y,v,a) = E[A(v)(1-a) + \theta_R(v)y(1-a) - B(v,y)] = [A(v) + \theta_R(v)y](1-p) - B(v,y),$$
$$\text{where } p \equiv h(m)\, E(i).$$

[5] Conditionality of development programs is implied by the COIN field manual in the discussion of economic development: "Ensure that noncompliance with government policies has an economic price. Likewise, show that compliance with those policies is profitable. In the broadest sense, counterinsurgency operations should reflect that 'peace pays'." (U.S. Army 2007, 5-49, p.173). Survey evidence reveals that a majority of CERP implementers in Afghanistan practice conditionality (BSF, note #15).

[6] We will assume that all functions are twice continuously differentiable in all terms from here on in.

[7] Gratitude could alternatively be modeled more narrowly, such as reciprocation for provision of a specific service by government. In that sense this test has low inferential power.

Note that $p = P(a=1)$ for rebels, for whom i is a random variable.

Government: The government bears the costs of violence as well as the costs of enforcement, m, and of service provision, g, while collecting revenue $\theta_G y$ if it achieves control. It has expected costs

$$(3) \qquad EC_G(y, v, m, g, a) = E[A(v)(1-a) + D(m) + H(g) - \theta_G y\, a]$$
$$= A(v)(1-p) + D(m) + H(g) - \theta_G y\, p.$$

This government is not a social welfare maximizer. This is not necessarily a normative criticism but rather an extreme assumption about the objectives of government that allows us to focus on the optimal behavior of a government whose first priority is repressing violence. This assumption may fit a government more concerned about externalities of violence than it is about the welfare of residents – especially non co-ethnics or those in the periphery, or it may describe a dictatorship or dysfunctional democracy.

We assume that $D(0) = H(0) = 0$. We further assume that the cost functions D(.) and H(.) are monotonically increasing. Convexity is a reasonable assumption for D(.) and H(.), for a government facing increasing marginal costs in revenue generation on the one hand and diminishing returns in service provision and counterinsurgency technologies on the other. We also assume that $A(n_U) > D'(0)$, which will mean that the fixed costs of m are not so high that communities maximally predisposed to not share information are never cost effective to engage at all.

B. Equilibrium

We focus on subgame perfect Nash equilibrium in pure strategies, solving by backwards induction, starting with the community (step #3).

Community: The community chooses i on the closed interval [0,1] to maximize expected utility,

$$\max_{0 \le i \le 1} EU_C(y, i, g, n, v, m) \Big|_n = u[(1-\theta_G)y + g - n]\, p(m,i) + u[(1-\theta_R)y - v](1-p(m,i)).$$

Note that since the probability of control is proportional to information shared, public good provision and information are complements, as are counterinsurgency effort and information. Since C chooses i, $\frac{\partial p}{\partial i} = h(m)$, so the first order condition for C is

$$0 \geq \frac{\partial EUc}{\partial i} = u[(1-\theta_G)y + g - n]\, h(m) - u[(1-\theta_R)y - v]h(m),$$

which implies that either $m = 0$ or that the best response function of the community is

$$(4) \quad i^* = \begin{cases} 0 \text{ if } u[(1-\theta_G)y + g - n] \le u[(1-\theta_R)y - v] & \leftrightarrow \; n \ge g + v + (\theta_R - \theta_G)y \\ 1 \text{ if } u[(1-\theta_G)y + g - n] > u[(1-\theta_R)y - v] & \leftrightarrow \; n < g + v + (\theta_R - \theta_G)y \end{cases}$$

(where the equivalent conditions to the right follow from u(.) being strictly monotonic). In words, a community will optimally share information about rebels, $i^*=1$, if their norms are not so strong that they counteract the sum of three effects, services that are provided when government has control, violence that is suffered under rebel control, and lost income due to the differential between rebel extortion and government taxation. The last could be positive or negative.

[Insert Figure 2 about here.]

Figure 2 illustrates this logic, graphing the expected utility of community members against information revelation, i, on the horizontal axis (when $m > 0$). The expected utility of the representative community member is a linear function of i. The upper line illustrates the case in which that slope is positive, while the lower line shows the case where the slope is negative. C's best response, i^*, is to fully share information when U_C is increasing in i, (the positive slope in the Figure) and not to share any information otherwise. A slope of zero defines the noncooperation (or "no snitching") constraint, the conditions under which the community is indifferent between sharing information with the government or staying quiet. High levels of government service provision, violence, and a high differential between the rebel extortion rate and the government tax rate all increase the incentives of C to share information, while norms favoring noncooperation reduce that incentive. Note that regardless of its attitude towards the welfare of the community, G has good reason to provide services and keep taxes low, in order to influence information flow.

It will be useful to define $p^* \equiv p(i^*, m)$, the probability of government control, anticipating optimal information sharing by the community. If $m > 0$ then

$E(i^*) = P(i^*=1) = P(n < g + v + (\theta_R - \theta_G)y) = F(g+v + (\theta_R - \theta_G)y) = (g + v + (\theta_R - \theta_G)y - n_L)f$,

where $f = \frac{1}{n_U - n_L}$, the density of the uniform distribution, so that

$$(5) \qquad p^* = (g + v + (\theta_R - \theta_G)y - n_L)\, f\, h(m) \text{ if } m > 0,$$
$$\text{or } p^* = 0 \text{ if } m = 0.$$

Government: Continuing backwards through the sequence of play to step #2 (in which government and rebels make simultaneous choices), the government anticipates the optimal behavior of C and minimizes expected costs by optimally choosing m and g, trading off reductions in expected damage against the marginal costs of counterinsurgency and service provision. G solves

$$\min_{g\geq 0, m\geq 0} \; EC_G(y, v, m, g, p^*) = A(v)[1-p^*] + D(m) + H(g) - \theta_G y p^*.$$

The first order condition for m is $0 \leq \frac{\partial EC_G}{\partial m} = -[A(v) + \theta_G y](g+v+(\theta_R - \theta_G)y - n_L) f\, h'(m) + D'(m)$, which for an interior solution equates the marginal cost of counterinsurgency effort to the marginal benefit in reduced expected violence costs and increased expected tax revenue.

Claim: $m=0$ cannot be a Nash equilibrium if $A(n_U) > D'(0)$.

Proof: (See BSF).

Note that $A(n_U)>D'(0)$ is a very weak condition. This resolves the ambiguity in step #3 so that i^* is determined by equation (4) and p^* by equation (5).

Solving for enforcement, $\frac{\partial^2 EC_G}{\partial m^2} = -[A(v) + \theta_G y]\,(g+v+(\theta_R - \theta_G)y - n_L)\, f\, h''(m) + D''(m) > 0$. (Recalling that xx >n_L by assumption.) Thus m has a unique interior solution $m^* > 0$, given v and g, defining a best response function for enforcement $m^*(v, g)$.

The government also chooses a level of services, g^*, that solves the first order condition $0 \leq \frac{\partial EC_G}{\partial g} = [A(v) + \theta_G y] f\, h(m) + H'(g)$, which for an interior solution equates the marginal cost of services to the marginal benefit in reduced expected costs of violence and increased expected tax revenue.

$\frac{\partial^2 EC_G}{\partial g^2} = H''(g) > 0$, which ensures a unique interior solution at some $g^*>0$, defining a best response function for government services, $g^*(v, m)$.

The best response functions of government enforcement and service provision are both increasing in violence. To see this, note that

$\frac{\partial^2 EC_G}{\partial m \partial v}\Big|_v = -A'(v)\,(g + v + (\theta_R - \theta_G)y - n_L)\, f\, h'(m) - [A(v) + \theta_G y] f\, h'(m)(1+\theta_R'(v)) < 0$,

so $\frac{\partial m^*}{\partial v}\Big|_g > 0$, by the implicit function theorem. Moreover, $\frac{\partial^2 EC_G}{\partial g\, \partial v}\Big|_m = -A'(v) f\, h(m) < 0$, so that $\frac{\partial g^*}{\partial m}\Big|_v > 0$, (implicit function theorem again), and m and g are strategic complements since $\frac{\partial^2 EC_G}{\partial g \partial m}\Big|_v = -[A(v) + \theta_G y] f\, h'(m) < 0$. Intuitively, higher damage costs increase returns to suppressing the probability of rebel control and m complements both v and g in increasing p, so that the optimal response to increased violence is to increase both enforcement and service provision.

Rebels: Rebels simultaneously (in step #2) choose a level of violence to maximize expected violence costs imposed on government, anticipating optimal behavior of C.

$$\max_{v\geq 0} EU_R(y, v, g, m, p^*) = [A(v) + \theta_R(v) y](1-p^*) - B(v, y).$$

The first order condition $0 \geq \frac{\partial EU_R}{\partial v} = [A'(v) + \theta_R'(v)y](1-p^*) - [A(v) + \theta_R(v)y]\, f\,h(m) - \frac{\partial B(v,y)}{\partial v}$, indicates how rebels weigh the marginal benefit of increased violence against the increased probability of government control and increased marginal costs. The second order condition, $\frac{\partial^2 EU_R}{\partial v^2} = [A''(v) + \theta_R''(v)y](1-p^*) - 2[A'(v) + \theta_R'(v)y]f\,h(m) - \frac{\partial^2 B(v,y)}{\partial v^2} < 0$, so that v^* is a unique maximum (due to the concavity of A(.) and θ_R, and the convexity of B(.)), given g and v. Thus the first order condition defines R's best response function $v^*(g,m)$. Since A(0) = 0 and A' > 0, v^* must be positive; so rebels will always attempt some violence and such violence will do damage and generate extortionary rents with probability $1-p^*$.

How does the rebels' optimal choice of violence respond to counterinsurgency effort, m?

$\frac{\partial^2 EU_R}{\partial v \partial m}\Big|_g = -[A'(v)+\theta_R'(v)y](g + v +(\theta_R - \theta_G)y - n_L)f\,h'(m) - [A(v) + \theta_R(v)y]\, f\,h'(m) < 0$,

so that $\frac{\partial v^*}{\partial m}\Big|_g < 0$ (by the implicit function theorem). The logic is that m increases the probability of government control, p, reducing both expected marginal benefits (damage and extortion) and expected absolute benefits in the first order condition that determines v^*. Rebel choice of violence will also decline in government provision of services, since

$\frac{\partial^2 EU_R}{\partial v \partial g}\Big|_m = -[A'(v) + \theta_R'(v)y]f\,h(m) < 0$,

which implies that $\frac{\partial v^*}{\partial g}\Big|_m < 0$ by the implicit function theorem. Intuitively, government services increase the probability that C will snitch, lowering the expected marginal benefit to rebels (damage and extortion) associated with a given level of violence and thus reducing the rebel best response, v^*. The best response functions of rebels when choosing violence and of government when choosing enforcement are illustrated in Figure #3.

[Insert Figure #3 about here.]

Existence: Assembling results, we have a closed form solution for optimal information sharing by C in stage #3 and three equations in three unknowns that determine best response functions $m^*(v, g)$ and $g^*(v, m)$ for G, and $v^*(g, m)$ for R in stage #2:

(6) $$i^* = \begin{cases} 0 & \text{if } n \geq g + v + (\theta_R - \theta_G)y \\ 1 & \text{if } n < g + v + (\theta_R - \theta_G)y \end{cases};$$

(7) $$0 = \frac{\partial EC_G}{\partial m} = -[A(v)+ \theta_G y]\, (g+v+(\theta_R - \theta_G)y-n_L)\, f\,h'(m^*) + D'(m^*),$$

$$0 = \frac{\partial EC_G}{\partial g} = -[A(v) + \theta_G y]\, f\,h(m) + H'(g^*), \text{ and}$$

$$0 = \frac{\partial EU_R}{\partial v} = [A'(v^*) + \theta_R'(v^*)y](1-p^*) - [A(v^*) + \theta_R(v^*)y]fh(m) - \frac{\partial B(v,y)}{\partial v}.$$

Though in the general case we cannot solve for closed form solutions for m^*, g^* and v^*, the concavity of EU_R and the convexity of EC_G ensure existence of a Nash equilibrium for the game.[8] Note the broad implication of this result: noncombatants are not enfranchised and the government puts no weight on their welfare, yet they nevertheless receive some degree of services and enforcement in equilibrium. This service-provision effect is common to Akerlof and Yellen (1994), and U.S. Army (2007). It results from the optimal behavior of a government trying to motivate information sharing by noncombatants as a means of suppressing violence in its territory.

C. Comparative Statics for Increased Income

We can now investigate how insurgent violence will respond to an increase in income in a three-sided game. An answer requires first determining how income shifts best-response functions, and then examining the new equilibrium. Holding g constant, the m^* curve is upward sloping, and the v^* curve is downward sloping. Since g and m are strategic complements, and g and v are strategic substitutes, the best response curve m^* must also be upward sloping without conditioning on g, since an increase in v would generate an increase in g^*, which would only reinforce the complementary increase in m^*. Similarly, v^* must be a decreasing function of m when not conditioned on g, since an increase in m would generate a complementary increase in g^*, which would in turn further reduce v^*. Those best response functions, unconditional on g, are illustrated in Figure #4.

1. Government

How would the government's choices of service provision, g, and enforcement, m, respond to an increase in income? Service provision will increase in y, since $\frac{\partial^2 EC_G}{\partial g\,\partial y}\Big|_{m,v} = -\theta_G f h(m) < 0$, so that (invoking the implicit function theorem) $\frac{\partial g^*}{\partial y}\Big|_{m,v} > 0$. (Additional tax revenue increases the marginal benefits of raising p^* without affecting the marginal cost.)

As for enforcement,

$$\frac{\partial^2 EC_G}{\partial m \partial y}\Big|_{v,g} = -\theta_G(g + v + (\theta_R - \theta_G)y - n_L)fh'(m) - [A(v) + \theta_G y](\theta_R - \theta_G)fh'(m) < 0$$

if $\theta_R > \theta_G$.

Here, additional tax revenue unambiguously increases the marginal benefit of increasing p^* as long

[8] See Mas-Collel et al, proposition 8.D.3.

as the government taxes at a lower rate than the rebels extort. (Should the government tax at a higher rate than the rebels, then high income disincentivizes information sharing by the community in the second term.) Under that sufficient condition ($\theta_R > \theta_G$)) $\frac{\partial m^*}{\partial y}\Big|_{g,v} > 0$. Since *m* and *g* are strategic complements, and both are increasing in *y* conditional on *v*, they both must be increasing in *y*, which is to say that $\frac{\partial g^*}{\partial y}\Big|_{v} > 0$ and $\frac{\partial m^*}{\partial y}\Big|_{v} > 0$.

2. Rebels

Turning now to the effect of income on rebels' choice of violence, the sign of $\frac{\partial v^*}{\partial y}\Big|_{g,m}$ is given by the sign of the cross partial derivative

$$\frac{\partial^2 EU_R}{\partial v \partial y} = \theta_R'(1-p^*) - [A' + \theta_R' y\,]\,(\theta_R - \theta_G) f\,\mathrm{h}(m)\,] - \theta_R f\,\mathrm{h}(m) - \frac{\partial^2 B(v,y)}{\partial \mathrm{v} \partial y}.$$

The first term reflects the contribution of increased income to extortionary rents, and is positive. The second term captures the loss of marginal damage and marginal extortion due to increased *p*,* which is negative if $\theta_R > \theta_G$, as income incentivizes information sharing with government when rebels extort at a higher rate than government taxes (if $\theta_R < \theta_G$ then the opposite would be true and the second term would be positive). The third term is unambiguously negative as it reflects the increased cost of rebel extortion when income grows. The fourth term reflects how the costs of the marginal act of violence increase with income. It is negative under the assumptions of opportunity costs or gratitude. Taken together, the sign of $\frac{\partial v^*}{\partial y}\Big|_{g,m}$ is indeterminate. It will tend to be positive when the extortion term dominates (at low *p*,* high θ_R') or when $\theta_R - \theta_G$ is small or negative. For example, $\frac{\partial v^*}{\partial y}\Big|_{g,m}$ is unambiguously positive if opportunity costs and gratitude effects are nonexistent, and $\theta_R = 0$, which is to say that rebels do not extort at all.

3. Equilibrium Effects of Income

Figure 4 illustrates these comparative statics. The solid curves *m** and *v** illustrate a baseline equilibrium at point A, as in Figure 3 (but with slightly steeper slopes to reflect the endogenous adjustment of *g*). The serrated curve *m*′* reflects the effect of increased income on enforcement, assuming that rebel extortion exceeds government taxation($\theta_R > \theta_G$). That shift in isolation would lead to a partial equilibrium at point B, with a higher level of monitoring and a suppression of violence.

[Insert Figure #4 about here.]

Points C and D illustrate two possible general equilibrium outcomes when income is increased, corresponding respectively to contraction or expansion of the rebels' strategic best response in violence, $v^*(m, g, y)$. A contraction (to the left) of violence would occur if opportunity costs / gratitude, were the dominant forces, if rebel extortion θ_R were high relative to government taxation, θ_G , if p^* were high, or if θ_R' were low. That would result in an equilibrium at a point like C, with very low violence and relatively low levels of monitoring.

In contrast, if the marginal return to violence in predation were the dominant force (the term $\theta_R'(1-p^*)$), or rebel extortion rates were low relative to those of government ($\theta_R << \theta_G$), or the effects of opportunity costs / gratitude were negligible, then we would see an expansion of $v^*(m, g, y)$ (i.e., a shift to the right) in response to an increase in income, to create an equilibrium at a point like D. That equilibrium necessarily has higher levels of monitoring than the equilibrium before the increase in income, and may have higher levels of violence as well.

Anticipating the empirical results below, note that as long as we assume $\theta_R > \theta_G$, the only way for violence to increase in equilibrium, in response to increased income is for the rebels' best response function $v^{*\prime}(m, g, y)$ to expand in response to increased income, which is to say that $\frac{\partial v^*}{\partial y}\Big|_m > 0$.

The figure also illustrates the other theoretical possibility, in which we allow the sufficient condition $\theta_R > \theta_G$ to fail. In that case it is possible that enforcement declines in response to an increase in income $\frac{\partial m^*}{\partial y}\Big|_{v,g} < 0$. That would happen because in the cross-partial derivative $\frac{\partial^2 EC_G}{\partial m \partial y}\Big|_{v,g} = -\theta_G (g + v + (\theta_R - \theta_G)y - n_L) f\text{h}'(m) - [A(v) + \theta_G y](\theta_R - \theta_G) f\text{h}'(m)$ the disincentive to share information due to relatively predatory taxation by government (the second term) exceeded the service provision and violence reduction effect (the first term) in absolute value. As shown in the figure, that reduction in monitoring would imply an increase in violence in equilibrium, as long as the v^* curve expanded or showed a small contraction at most. Note that $\theta_R - \theta_G$ would be negative in that case, and would contribute to an expansion of v^*, since the second term of the cross-partial $\frac{\partial^2 EU_R}{\partial v \partial y}$ would become positive in the analysis of the rebels' best response above. Diagnosing the difference between a shift from A to D and one from A to E would require observation of monitoring (counterinsurgency) activity, m, which is beyond the scope of the current paper.

D. Extension: Integrating private sector investment

A novel feature of the Philippine data is the availability of building permits, which measure private sector investment. While the theoretical literature on insurgency has treated it as a three-sided contest, firms represent a fourth element, which might play an important role by generating economic activity, and through the predictive investment mechanism described above. Extending the earlier schematic, consider the four-sided game illustrated in Figure 5, in which private firms make investments, which may be taxed by government or extorted by rebels. In this subsection we extend the model to include firms, in order to examine the predictive investment mechanism in the context of an information-centric model of insurgency and counterinsurgency.

We augment the assumptions in section A above by introducing firms into the sequence of play. Firms (F) act in stage #2, at the same time as G and R, choosing a level of investment *I*, which generates a revenue payoff in $x(I)$ stage #4. Firms' profit is $x(I)(1-\theta_G) - I$ under government control, and $x(I)(1-\theta_R) - I$ under rebel control. For instance $\theta_R = 1$ would be equivalent to full expropriation. Government payoffs are augmented by $x(I)\theta_G$ if a=1; rebel payoffs are augmented by $x(I)\theta_R$ if a=0.

Firms face expected profits

$$E\,\Pi(y,v,a,I) = x(I)[(1-\theta_G)p + (1-\theta_R)(1-p)] - I,$$

where $x(I)$ is increasing and concave in *I*, with $x'(0) > 1$. Firms invest to maximize expected profits, anticipating either taxation or rebel predation, our formalization of the predictive investment mechanism. Firms solve

$$\max_{0 \le I} E\Pi(y,v,a,I) = x(I)[(1-\theta_G)p^* + (1-\theta_R)(1-p^*)] - I,$$

which yields a first order condition

$$0 \le \frac{\partial}{\partial I} E\Pi(y,v,a,I) = x'(I)[(1-\theta_G)p^* + (1-\theta_R)(1-p^*)] - 1. \quad (8)$$

The concavity of $x(.)$ guarantees a negative second derivative and a unique interior maximum at some non-negative level of investment *I,* so that (8) holds with equality.

Existence: Collecting first order conditions for the four players, an equilibrium will be characterized by five equations in five unknowns.

As before, we have a closed form solution for optimal information sharing by C in stage #3

$$i^* = \begin{cases} 0 & \text{if } n \ge g + v + (\theta_R - \theta_G)y \\ 1 & \text{if } n < g + v + (\theta_R - \theta_G)y \end{cases}. \quad (6)$$

In stage #2, we have four equations in four unknowns that determine best response functions $m^*(v, g, I)$ and $g^*(v, m, I)$ for G, $v^*(g, m, I)$ for R in and $I(m, v, g)$ for F, in stage #2:

(7′) $0 = \frac{\partial EC_G}{\partial m} = -[A(v) + \theta_G (y+x)] (g+v+(\theta_R - \theta_G)y-n_I) f h'(m^*) + D'(m^*)$,

$0 = \frac{\partial EC_G}{\partial g} = -[A(v) + \theta_G (y+x)] f h(m) + H'(g^*)$,

$0 = \frac{\partial EU_R}{\partial v} = [A'(v^*) + \theta_R'(v^*) (y+x)](1-p^*) - [A(v^*) + \theta_R(v^*) (y+x)] f h(m)) - \frac{\partial B(v,y)}{\partial v}$, and

(8) $0 = x'(I^*)[(1-\theta_G)p^* + (1-\theta_R)(1-p^*)] - 1.$

Compared to the equilibrium in part B, note that first order conditions for government and rebels now include an additional source of tax / extortion revenue from investment, $x(I)$. Though in general we cannot solve closed form solutions for m^*, g^*, v^* and I^*, the concavity of EU_R and EΠ and the convexity of EC_G ensure existence of a unique Nash equilibrium for the game.[9]

Comparative Statics of Investment and Violence:

With investment in the model, we can illustrate the Converse-Kapstein predictive investment mechanism by examining how investment will respond to an anticipated increase in violence by rebels. To solve $\frac{\partial I^*}{\partial v}\Big|_{m,g}$ we require the cross partial $\frac{\partial^2 E\pi}{\partial I \partial v}\Big|_{m,g} = x'(I^*)[\theta_R - \theta_G) f h(m) - \theta_R'(v)(1-p^*)]$. Recalling that the second derivative of expected profits in investment in negative, by the implicit function theorem, the slope $\frac{\partial I^*}{\partial v}\Big|_{m,g}$ will have the same sign as this cross-partial derivative. Examining its two terms inside the brackets, the second indicates the Converse-Kapstein predictive investment mechanism, that violence will reduce the return to investment by increasing the ability of rebels to extort returns to those investments. The first term reflects a countervailing force, since violence also reduces the probability of rebel control, which would reduce returns to investment should rebel extortion rates exceed government taxation rates. In that sense violence induces investment. (Note also that if government taxed at a higher rate than rebels, violence would unambiguously reduce investment as it would increase the probability of "taxation" at a lower rate.) If the second term dominates then optimal investment will be downward sloping in violence, as illustrated by the curve I* in Figure 6.

How do rebels respond to increased investment? From the rebels' side the calculation is also subtle. The slope of $\frac{\partial v^*}{\partial I}\Big|_{m,g}$ has the same sign as the cross partial $\frac{\partial^2 EU_R}{\partial v \partial I}\Big|_{m,g}$ since EU_R is concave

[9] See Mas-Collel et al, proposition 8.D.3.

in violence. That cross partial is $\frac{\partial^2 EU_R}{\partial v \partial I} \Big|_{m,g} = \theta_R'(v^*)\, x'(I)(1-p^*) - \theta_R(v^*)\, x'(I) f\,\mathrm{h}(m)$, which reflects how the marginal utility of violence for rebels is influenced by increased investment. The first term captures the revenue effect –more investment generates more rents, which induces violence. The second term reflects the effect of violence on the probability of rebel control; that effect dissuades violence since at higher investment rates the cost of the loss of control is increased. So the net effect of investment on rebel violence is ambiguous, even for predatory rebels. Figure 6 illustrates the case in which the revenue effect dominates, so that the v^* curve is upward sloping in I, which is consistent with the predation hypothesis of Paul Collier and others.

Taken together, Figure 6 allows an illustration of how the correlation of violence and investment might be generated. Should the source of variation be factors that shift violence, such as norms of cooperation with rebels, availability of weapons, or the like, then shifts in the v^* curve will trace out a downward sloping I^* curve, which would imply a negative correlation of investment and violence, as in by Converse and Kapstein (2008). For instance, the Besley and Mueller (2012) results showing reduced violence and increased property prices in Northern Ireland could be interpreted as a shift in the v^* curve down and to the right, as illustrated by point the serated line v*', with a new equilibrium at low violence and higher investment, at point B. The commitment of the Irish Republican Army (IRA) to the peace process increased the cost of violence for that organization B(.), since they can anticipate punishment by the electorate. That, in turn, increases demand for investment, which increases property prices.

On the other hand, should the source of variation be investment opportunities, due to changes in prices of inputs or outputs for instance, these would shift the I^* curve, which would map out an upward sloping v^* curve at points like C and D. Anticipating our empirical findings, note that the only assumption necessary to get a positive correlation is an upward sloping v^* curve, which is to say that the revenue effect dominates the probability of control effect.

E. Distinguishing Income Generation from Development Projects

Before leaving our framework, one more distinction is worth exploring. While the effects of economic development and increased income on violence are ambiguous, note that the effects of development through service provision are not. As we saw above $\frac{\partial v^*}{\partial g} \Big|_m < 0$ (and it's easy to show that $\frac{\partial v^*}{\partial g} < 0$). Why the difference in effects?

The unambiguous violence-reducing effect of service provision, which BSF find to be consistent with the Iraqi data, follows from two characteristics that distinguish it from income. First, services only provide utility to community members when the territory is controlled by government (technically, when a=1 in $U_C(y, a, g, n, v) = u[(1-\theta_G)y + g - n]\,a + u[(1-\theta_R)y - v](1-a)$), whereas income provides utility even under rebel control. Thus, service provision generates stronger incentives to community members to share information than does income. Second, income can be extorted by rebels, whereas services cannot.

These two qualities of services, conditionality of use and immunity to capture by rebels imply that (when the government applies enforcement effort ($m > 0$)) services always raise the probability of government control, whereas income only raises that probability when government taxes less than rebels extort. (That insight follows immediately from examination of the formula for the probability of government control in equation (5), $p^* = (g + v + (\theta_R - \theta_G)y - n_I)\,f\,h(m)$.) We will return to this distinction when discussing contrasting results from the Philippines in the discussion below.

IV. Data

To test these theories, we make use of a unique dataset combining violent incident data with a proxy measure for economic activity, the value of building permits at the provincial year level. Descriptive statistics are provided in Table 1. The building permits data are available from the National Statistics Office of the Philippines website. Buildings permits are a leading indicator of investment in a visible (and thus easily-captured) asset. These data permit disaggregation by sector and value of the construction authorized by the permit. We also use data on real property and business taxes, available online from the Philippines Bureau of Local Government Finance. Population data were purchased from the Philippines National Statistics Office for the 2000 and 2007 Census.

The violence data come from original incident reports generated by deployed units in the Armed Forces of the Philippines (AFP) between 2002 and 2008. The resulting dataset is a complete set of information from every such incident reported to the AFP's Joint Operations Center (JOC). Specifically, the data include information on date, location, initiator (government, insurgent group), casualties, and the type of casualty (government, insurgent, civilian). These data are an invaluable source of information for empirical analysis of violence (Felter 2005; Crost, Felter and Johnston 2012).

One concern with incident data is that economic activity induces troop presence, which in turn increases reported incidents, generating a positive correlation between economic activity and violence by construction. More troops mean more opportunities for clashes with insurgents, which may induce more violence. Alternatively, more troops may simply imply more complete reporting. Regardless of mechanism, that positive correlation would bias our estimated effect of investment or economic activity on violence in a positive direction.

In as yet unpublished research, Berman et al find no evidence of such a bias for CERP programs in IRAQ, by augmenting their estimating equation with a measure of troop strength.[10] Crost, Felter and Johnston (2012) conduct a robustness test for bias due to troop strength by measuring effects on violence in neighboring regions and find no evidence of bias. We replicate their test in reporting results below.[11]

V. Violence and Economic Activity in the Philippines: What Do the Data Say?

The rich data available on insurgent-related violence in the Philippines allow us to test the different competing theories linking economic activity to violence. We can organize these by their testable implications.

A) A theory of forward-looking investors predicts that business investments will occur disproportionately in locations that have a predictable reduction in violence. A testable implication is that a measure of investment will predict reductions in future violence (Besley and Mueller 2012).

B) Two mechanisms of "hearts and minds" theories of counterinsurgency predict that increased income will reduce violence: opportunity costs and gratitude.

C) A rent-capture theory or predation theory of insurgent violence predicts that increased economic

[10] Personal communication with Berman, September 2012.

[11] Crost et al (2012) also express a second concern with these data. AFP units may selectively misreport casualties, exaggerating damage done by rebel groups and understating that done by their own units. This is a lesser concern for us, as our results (below) will turn out to be robust across measures of violence and hold for overall fatalities –which are less susceptible to misreporting. In any case, information gathered for Felter (2005) and Crost et al (2012) suggest that strong institutional incentives mean the magnitude of such selectivity likely small. The JOC relies on accurate reporting to plan future operations. Any misreporting could mean risking the lives of AFP units.

activity, including investment, will be associated with increased violence, as insurgents compete violently to extort increased rents (Crost, Felter, and Johnston 2012, Collier and Hoeffler 2004).

In testing these hypotheses we must contend with some ambiguity as to what building permits measure, since they might proxy for investment, income, or both. We will deal with both interpretations, in turn. If we think of them as a measure of investment, then the discussion of predictive investment and predation in Figure 6 is relevant.

In the cross-section our estimating equation would be

(9) $$v_{it} = \alpha + \beta d_{it} + \varepsilon_{it}$$

where d_{it} represents the level of economic activity (as proxied by building permits).The key coefficient is that of building permits, which will be positive if the revenue effect of predation dominates, and negative if the opportunity costs, gratitude or predictive investment effect dominates. We allow for time invariant province effects to allow for heterogeneous propensities for violence, yielding this fixed effects specification

(10) $$v_{it} = \alpha_i + \beta d_{it} + e_{it}$$

Table 2 reports a test of hypotheses A and C using building permits as an indicator of new investment, reporting both cross-sectional and fixed effect regression results. Column (1) reports the cross-sectional regression, indicating that violence is higher in regions with few building permits. This is a common and unsurprising result, which we attribute to unmeasured attributes of provinces: violence is generally concentrated in underdeveloped peripheral areas. Low road density, for instance, is a predictor of violence (not shown). Column (2) reports a very different finding: once province fixed effects are accounted for, increases in business licenses are associated with increased violence, a pattern inconsistent with hypothesis A but consistent with the rent-capture hypothesis (B). That finding is robust to our measure of violence, be it in the identity of the incident-initiator (in columns (3) and (4)), or the number of fatalities, by category (columns (5) through (8)). This result is also robust to using subcategories of business license value, such as factory licenses, or simply the count of licenses. Figure 7 illustrates this relationship in a scatterplot; it is not driven by a few outlier

provinces. The results clearly refute the opportunity costs, gratitude and predictive investment hypotheses in favor of predation by rebels.

As discussed in Section IV above, a possible explanation for this positive correlation is that economic activity induces a troop presence, which in turn generates more reporting of incidents by construction. We have argued above that this is unlikely, based on the authors' experience with similar data in other countries. Following Crost et al (2012) we also provide a robustness test. Deploying more troops to one province requires taking some away from another. If in a given province increased troop strength creates more reported incidents by construction, then we would expect reported violence to decline in provinces from which the troops were taken. In other words, if troop presence were driving our results, increased economic activity in a given province should predict decreased violence in neighboring provinces. (Of course, if the reallocation were across larger regions, then increased troop strength in the region would induce the opposite effect in neighboring provinces. Crost et al found a statistical zero, which suggests no bias in either direction.) Following Crost, Felter and Johnston (2012), we test this hypothesis and find no effect.[12]

Our model admits some ambiguity about timing. Though in the model firms invest and rebels commit to violence simultaneously, we would like to admit the possibility that firms' investment begins earlier, as it requires longer lead time (though retaining the ability of firms to predict future violence, which is key to the predictive investment hypothesis). Following that logic would indicate an estimating equation in which past investment predicts current violence. Note that the predictive power of investment is only useful above and beyond the predictive power of violence itself, so we include lagged permits in the specification.

$$v_{it} = \alpha_i + \beta d_{i,t-1} + e_{it} \quad (11)$$

Results of estimating that are reported in Table 3. Column (1) reports the coefficient of a simple regression of incidents on building permits, which shows that, as hypothesized, provinces with low building activity have high violence. That correlation may be due to a predisposition of the province to violence, which would both lower investment and raise future violence, so that a more

[12] Specifically, we estimate a version of the results reported in Table 2 with permits in province i, year t on average violence in other provinces in the same geographic region in year t. There are seventeen such regions in the Philippines. All but one of the seven measures of violence yields a statistical zero, the exception being insurgent casualties which yields a small but significant negative coefficient. Results available upon request.

informative specification includes lagged violence as well. Columns (2) through (8) report those results for different types of violent incidents. Comparing column (2) to column (1) indicates the key findings: lagged violence is a very strong predictor of current violence. Including it increases the R-squared from six percent to 69 percent and once lagged violence is included, building permits become a small and statistically insignificant predictor of violence, across all categories. So while predictive investment is reflected in the cross-sectional correlation, it is not a useful predictor once lagged violence is included.

An alternative interpretation of building permits is as a proxy for income, since permits are necessary for renovation, and the value of those permits will be proportional to the value of existing structures, which in turn proxy for income levels. In that light, we can revisit Table 2 and test the two hypothesized "hearts and minds" mechanisms in (B) against the predation hypothesis (C), this time interpreting building permits as a measure of income, y. The relevant analysis in this case is captured in Figure 4, which captures the comparative statics of increased income in violence – enforcement space. Recall that the effects of income on violence are theoretically ambiguous: increased income can lead to increased violence if rebel predation $\theta_R'(1-p^*)$ dominates opportunity costs and gratitude (equilibrium D), or if government taxation were so much more "predatory" than that of rebels that the dominant mechanism was C increasing information sharing with rebels in order to protect their increased income from taxation (equilibrium E).

Returning to Table 2, this time the coefficient on building permits is interpreted as the effect of income on violence, as a test of the two "hearts and minds" mechanisms, opportunity costs and gratitude. As above, inference is straightforward. The cross-sectional correlation between incidents and income is negative but once we include fixed effects to control for the predisposition of provinces to violence the partial correlations are positive, no matter what the form of incidents are, and statistically significant for three of the six categories at the five percent level.

So regardless of how we interpret building permits, as investment or as income, our conclusion is the same: the only hypothesis consistent with the data is predation.

Table 4 repeats that analysis using property taxes as an indicator of income. Property taxes measure the value of existing property, which in turn reflects the net present value of expected economic activity which makes use of property. Those results are less conclusive: the cross-sectional regressions (columns (1) and (2)) indicate a strong negative correlation of economic activity and violence, consistent with the results for business permits. The fixed effect regressions yield statistical zeros, regardless of how violence is measured.

Taken together, the statistical analysis indicates predation from the building permits data, and inconclusive results from the business tax data. Predictive investment, opportunity costs and gratitude cannot be the dominant mechanisms.

VI. **Discussion**

Our results are consistent with predation, which roughly accords with some of the literature on subnational violence, but not with all of it. Why is predation sometimes the dominant mechanism, but not always? The answer is relevant to the design of development programs in conflict-cursed environments where rent capture is a possible motivation for violence. This section attempts to reconcile the literature as it stands, in light of the omnibus model we developed in Section III.

A first step is to take stock of the literature, which has developed quickly in the last few years. This is the fourth paper to find a positive correlation between a measure of economic activity and violence at the subnational level. Berman, Shapiro, Felter and Callen (2011) found that employment rates and violent incidents were positively correlated in Iraq, Afghanistan and the Philippines during periods in which each of those countries were experiencing active insurgencies during this century. Dube and Vargas (2010) looking at Colombian data, found that increases in natural resource prices, particularly oil, predicted increased violence in regions that had significant natural resource extraction. Turning to evidence from a development program, Crost, Felter and Johnson (2012) find that the announcement of a forthcoming government sponsored community driven development project in rural Philippine municipalities predicted increased violence. While these findings should cause concern for development practitioners, note that they are consistent with a prediction of our theory, an optimal violence curve by rebels which is upward sloping in investment (or in economic activity in general) as in Figure 6.

On the other hand, we are aware of five sets of results in which subnational variation in economic activity predicts reduced violence. Miguel et al (2004) that economic activity induced by rainfall was associated with declines in violence. Dube and Vargas (2010) show that in Colombia increased prices for agricultural goods, particularly coffee, predict reductions in violence, a result that they interpret as an opportunity cost mechanism. BSF find that small scale reconstruction program spending by the US military during the Iraq was violence-reducing, which they interpret as evidence for a mechanism of information (tip) provision by noncombatants to forces allied with government. (That interpretation is supported by evidence from Shapiro and Weidmann (2011), who show that cellphone coverage –a plausible conduit for information provision by noncombatants—is associated

with reduced insurgent violence during the Iraq war.) Hanson et al (2011), studying spending on labor in general reconstruction programs in Iraq (not just CERP), also find a violence reducing effect. Crost, Felter and Johnson (2012) have presented preliminary results indicating that conditional cash transfers (under the government's Pantawid Pamilyang Pilipino Program) have a small but significant violence reducing effect in Philippine communities.

How then to reconcile these conflicting results? Two aspects of our model might be helpful. The first is conditionality, which as first introduced in BSF, implies that continued receipt of development assistance is conditioned on recipients (individuals or community) not cooperating with rebels. Conditionality is an aspect of the implementation of the CERP program which BSF found to be violence-reducing in Iraq. Whether the employment spending in the programs analyzed by Hanson et al (2011) was conditional is unclear. The conditional cash transfer program which was violence-reducing in the Philippines also insisted that members of families receiving cash transfers not engage in any illicit or unlawful activities to include cooperating with rebels. Conditionality in this case was both directly and indirectly enforced by mandatory attendance at weekly meetings with assigned monitors tasked with insuring compliance of beneficiaries with program requirements (Crost, Felter and Johnson, 2012). Conditionality would presumably not have been present in the mechanisms that cause investment to vary in the Philippines in this paper, or employment rates to vary (in Iraq, Afgthanistan and the Philippines) in Berman et al (2011). Likewise, there would be no conditionality present in the variation of oil prices in Colombia in Dube and Vargas' data. Careful study of the Crost et al (2012) results indicate that the Kapit-Bisig Laban sa Kahiripan – Comprehensive Integrated Delivery of Social Services (KALAHI-CIDSS) – the community driven development program in the Philippines- did not condition program receipt on noncooperation. Thus the absence of conditionality can explain all of the four negative results, and the presence of conditionality can explain two of the four positive results, the exception being Dube and Vargas' findings that increased wages reduce violence in coca growing parts of Colombia. The hypothesis would be agnostic on the Hanson et al results.

A second helpful concept, which may help explain the distribution of results, is the extortability of economic rents, an idea developed by Collier and Hoeffler (2004). In the two cases in which conditionality was imposed, the CERP program in Iraq and the conditional cash transfer program in the Philippines, the same presence of a capable coercive force that allows enforcement of conditionality might also be capable of preventing extortion by rebels. Turning to the cases in which conditionality is absent, it might be that wages are less vulnerable to extortion than are oil

revenues in rural Colombia (in Dube and Vargas, 2010) or than real estate investments in the Philippines, in this paper. Taking the extortable rents approach would then explain all three of the four positive cases (in which violence is negatively correlated with increased economic activity), with the exception being Miguel et al and the prediction for the Hanson et al results being unclear. Extortable rents would also explain three of the four negative results, the exception being the Berman et al (2011) finding of a positive correlation of employment rates and violence in three countries.

A separate subnational result is what we have termed the "predictive investment" mechanism in Besley and Meuller (2012), in which the expectation of reduced violence increases the value of investments in Northern Ireland. While that result belongs in the literature on subnational correlations between violence and economic activity, it fits easily in our model and does not help address the puzzle of why economic activity (as opposed to the expectation of it) is sometimes associated with increased violence, and sometimes with the reduction.

Tentative conclusions from this rapidly evolving literature suggest that, in addition to the standard conditions required of well-designed programs in secure environments, there are two sufficient conditions for economic development programs to be violence-reducing in insecure spaces: First, economic gains must be conditional on noncooperation with rebels and second, these gains must not create easily extortable rents. These extra conditions clearly bring with them ethical tradeoffs between different aspects of human welfare, forcing a choice between improving economic wellbeing and possibly strengthening rebel groups (or criminal elements) through extortion of economic activity. An important topic for future research would therefore be to discover whether both conditionality and non-extortability are necessary conditions.

VII. Conclusions

Since the end of the Second World War, numerous governments have faced insurgent violence which threatened their regimes. Some governments, and their allies, have used economic programs alongside other instruments as part of their counterinsurgent strategies. Underlying this strategy is often a vaguely articulated view that once a degree of security and stability is provided, people will become hopeful about the future, making investments that in turn spur economic growth. Growth might become self-reinforcing should it increase the opportunity cost of violence for insurgents and motivate noncombatants to cooperate with counterinsurgency operations. In recent years, studies

have attempted to develop the theoretical underpinnings of this political economy of counterinsurgency, along with empirical tests of different theoretical relationships. About half of the empirical studies at the subnational level are inconsistent with the coarse hypothesis that all economic activity will be violence reducing.

This paper examined the connection between investment and insurgent violence, testing a theory of counterinsurgency as a four-sided game, including for the first time firms who make investment choices, rebel extortion and government taxation. This model includes the possibility that investors are forward-looking and that building permits (in the case at hand) provide an indication of beliefs about future levels of violence. This thesis, however, is not borne out by our empirical analysis. The data also reject opportunity cost theory, and a gratitude theory as the dominant mechanisms in play. Our results instead lend support to "predation theory" in which insurgents use economic activity as an opportunity to engage in rent-seeking behavior.

These results from the Philippines are at odds with the findings from some settings but consistent with those from others, such as Afghanistan, Iraq and Colombia. Are these results a function of the characteristics of Philippine insurgents, or a function of the characteristics of the Philippine political economy? Some of the most active Philippine insurgents, for example, have been and continue to be Muslim separatists from the southwestern provinces of Mindanao island and Sulu Sea. The areas where this sizable Muslim minority live are among the poorest and most disenfranchised in the country. It is plausible that these groups see little hope of becoming economically integrated into the mainstream of this mainly Catholic country. At the same time, the Philippine economy has traditionally been dominated by a small number of wealthy families, providing less entry into the "commanding heights" of the economic structure. Such country-specific factors might be of great importance, and so we attempt to analyze them in comparison to the recent literature, which now includes results based on micro-analysis of subnational data in Afghanistan, Colombia and Iraq, as well as in the Philippines. The pattern that increased economic activity is correlated with increased violence is common to those other three countries as well, in various studies.

In the context of larger literature we suggest that these results underline the importance of program design in understanding the channels that link development programs to insurgent violence. This paper adds to a body of evidence indicating that increases in economic activity are just as often violence increasing as they are violence decreasing. Our reading of that literature in light of the model developed in this paper, is that two factors may be sufficient to generate a violence-

reducing effect: first, limiting the extortability by rebels of economic rents generated, and second, conditioning access to the economic benefits of those programs to communities and individuals that cooperate with government. Exploring whether either of those conditions is individually sufficient, perhaps in the context of the omnibus theory developed here, presents the next challenge for future research. That research, we would argue, is not just of scholarly interest but of real policy import as well.

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Figure 1: Counterinsurgency as a Three - Sided Contest

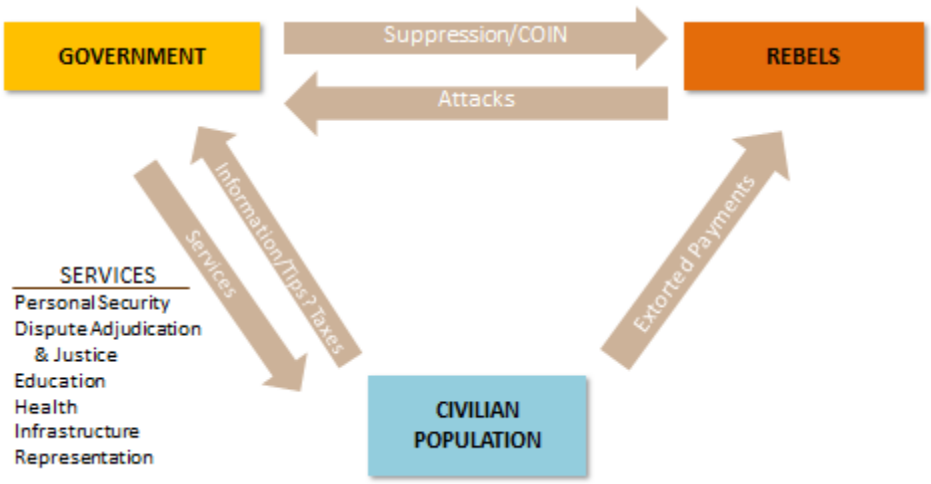


Figure 2: Utility of noncombatant community from information-sharing

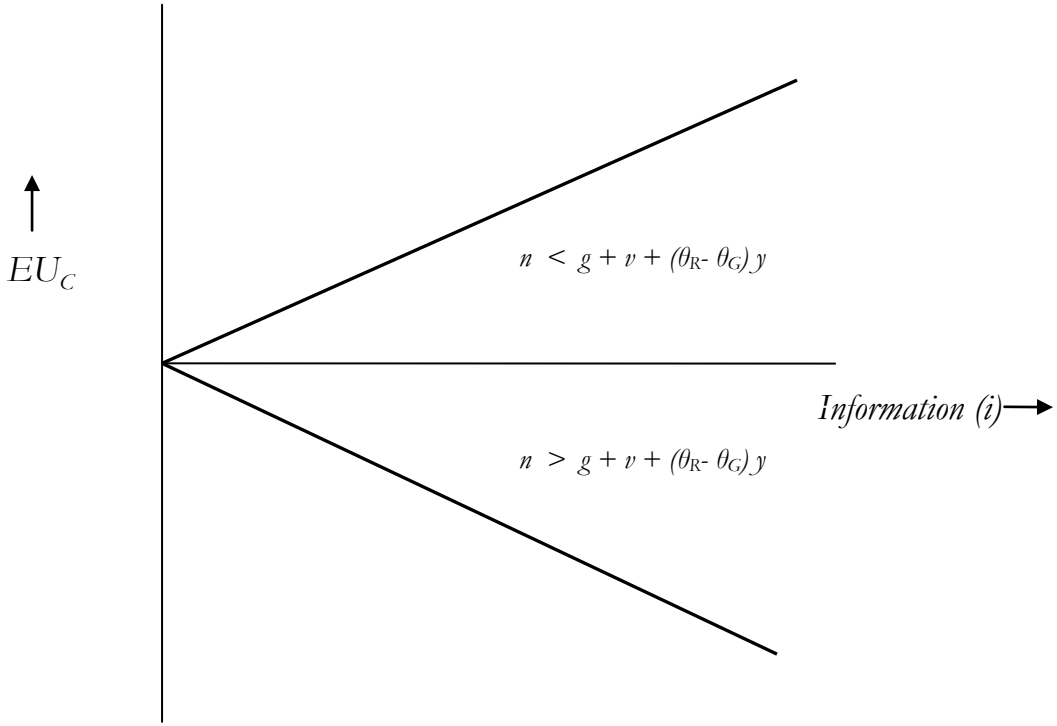


Figure 3: Best Response Functions of Government (m^*) and Rebels (v^*)

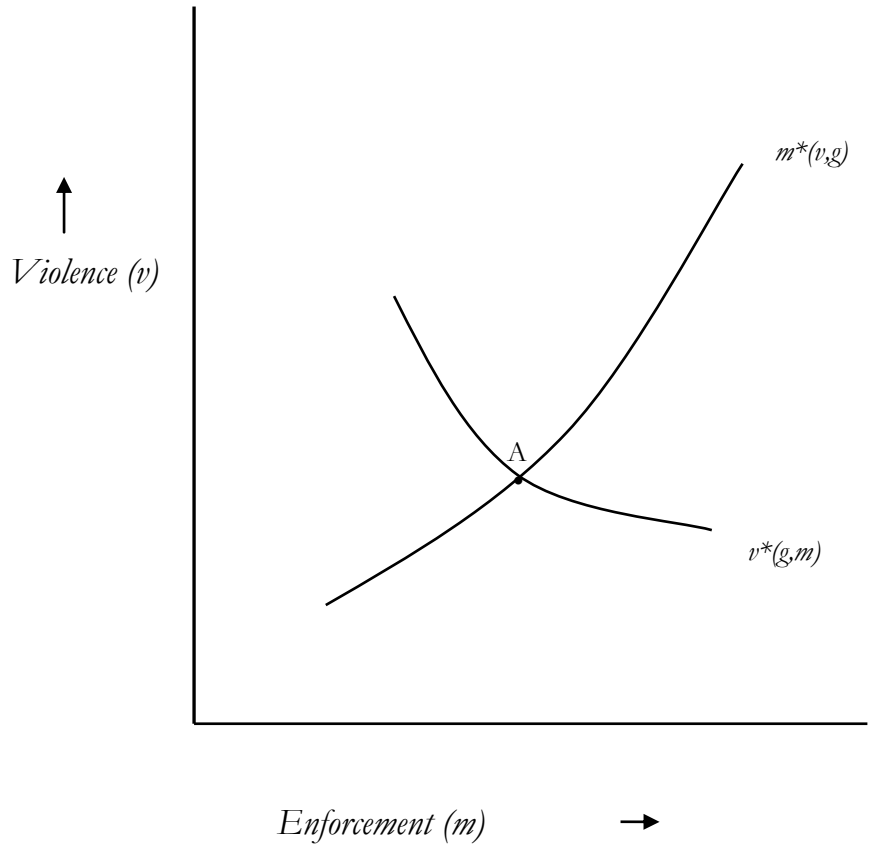
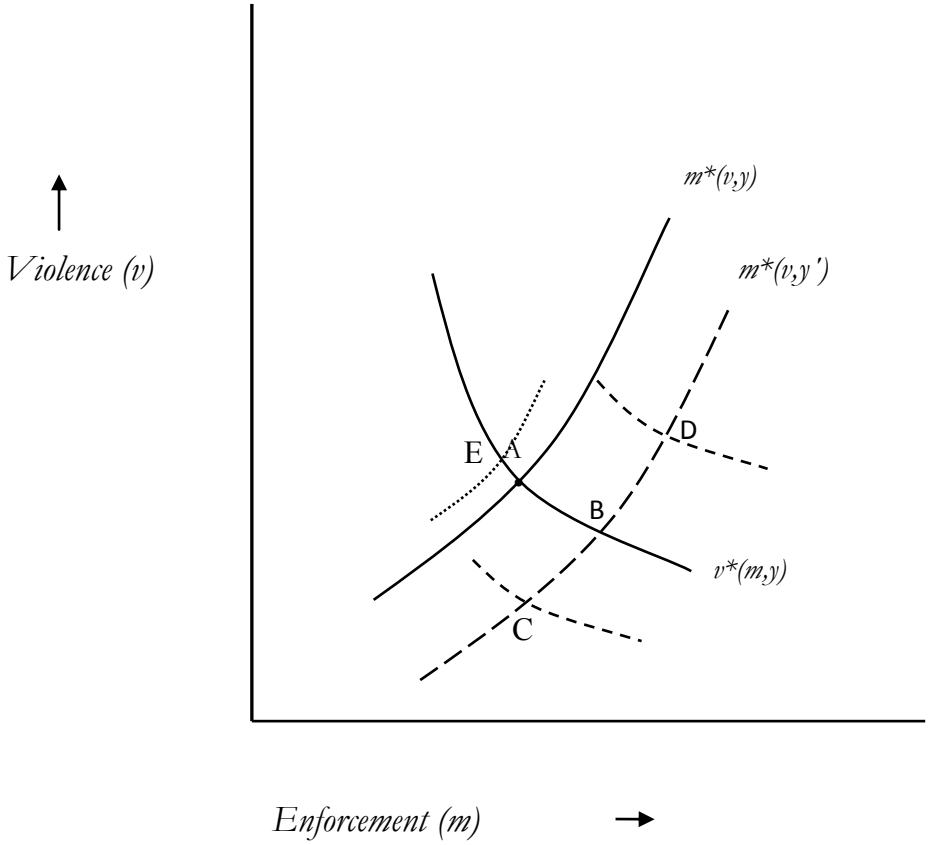


Figure 4: Does Income Decrease Violence?



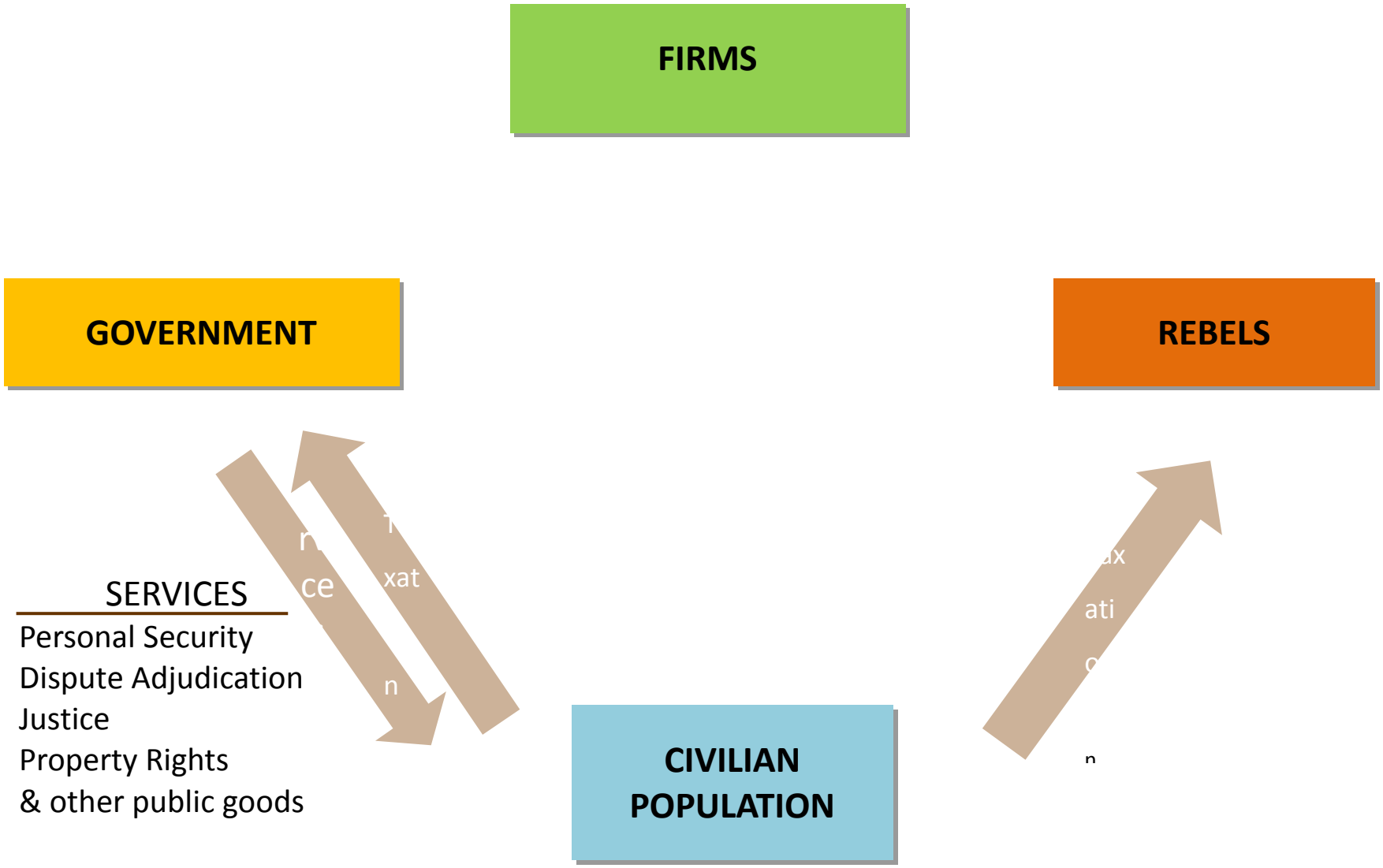


Figure 5: Counterinsurgency as a Four - Sided Contest

Figure 6: Investment and Violence in Equilibrium

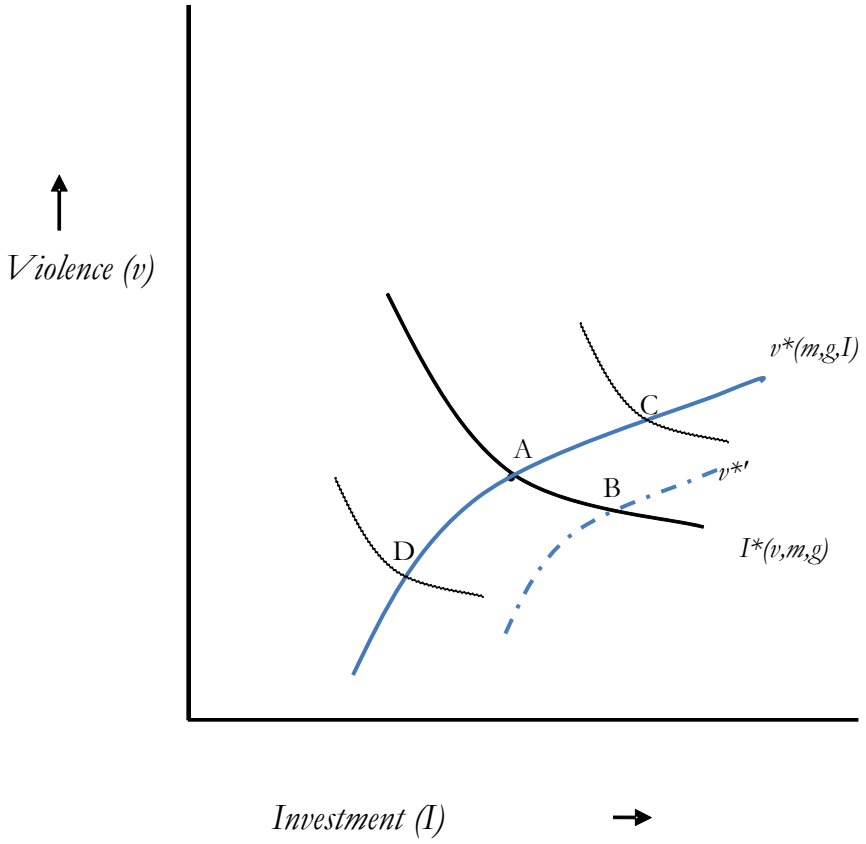


Figure 7: Incidents and Building Permit Value - Long Differences

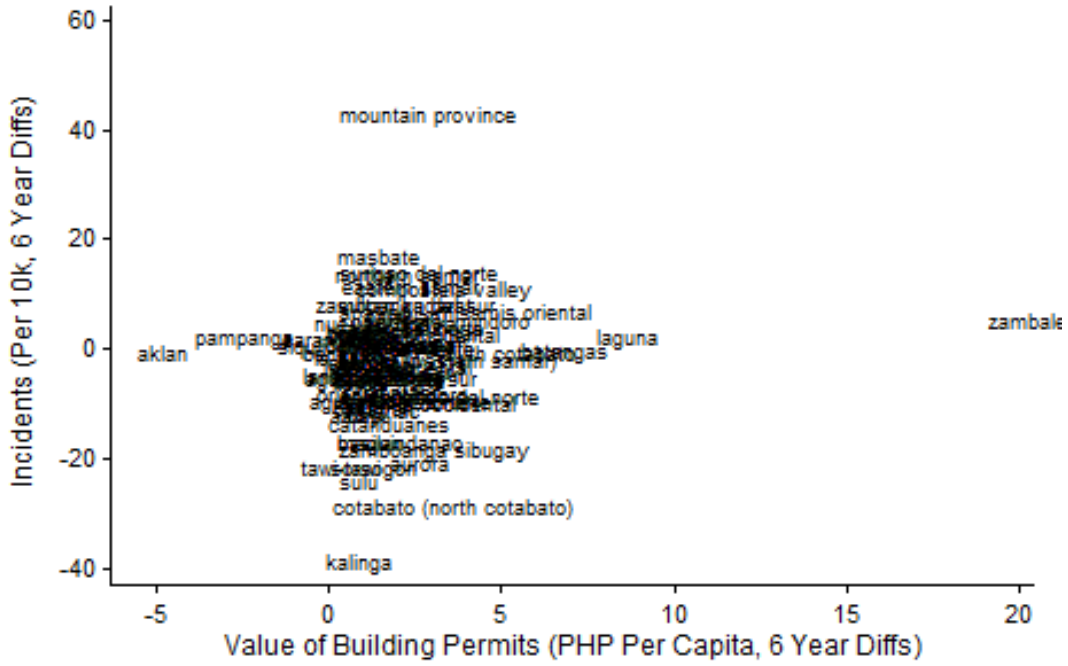


Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Incidents / 10K	.6373028	.8980837	0	14.44623
Insurgent initiated	.2300126	.3796753	0	4.839129
Government initiated	.4003411	.5838322	0	9.535932
Fatalities / 10K	.2008023	.3609534	0	4.981457
Government	.0760792	.1558669	0	2.490728
Civilian	.0507195	.0981647	0	1.067455
Insurgent	.0740035	.1703508	0	1.916331
Building permits	.0000161	.000016	0	.000184
Value of permits	.0575042	.1004702	0	1.277501
of which, factories	.0279685	.0746399	0	1.236224
Property taxes	172.8278	390.2825	0	4475.573
Business taxes	140.0631	424.047	0	6657.301

Note: Each observation is a province – year, for years 2001 through 2008. N=664 for all variables except business permits, which are available only for 553 province – years, 2002-08. Licenses and taxes are per-capitized. All population figures are extrapolated based on the censuses of 2000 and 2007. Table 1 provides descriptive statistics, covering 664 province-year observations from 2001 through 2008. Incidents per ten thousand average 0.64, with the maximum of 14.4 recorded in Basilan in 2001. An unusual aspect of the Philippine data is that civilian casualties account for only a quarter of recorded fatalities, with government and insurgent fatalities making up about 37% each. Permits and taxes are all reported per capita.

Table 2: Violence and Building permits

Left hand side variable:	(1) Incidents	(2) Incidents	(3) Insurgent initiated	(4) Govt. initiated	(5) Fatalities	(6) Govt. fatalities	(7) Civilian fatalities	(8) Insurgent fatalities
Value of building Permits	-1.973***	0.386**	0.144	0.231**	0.270**	0.140***	-0.00719	0.137*
	(0.593)	(0.191)	(0.130)	(0.113)	(0.124)	(0.0499)	(0.0463)	(0.0797)
Constant	0.640***	0.548***	0.234***	0.314***	0.240***	0.0787***	0.0514***	0.110***
	(0.0996)	(0.0557)	(0.0211)	(0.0429)	(0.0220)	(0.00840)	(0.00559)	(0.0154)
Province Indicators		x	x	x	x	x	x	x
Observations	553	553	553	553	553	553	553	553
R-squared	0.064	0.676	0.708	0.597	0.667	0.655	0.440	0.531

All specifications include a complete set of year indicators. Robust standard errors in parentheses, clustered on province. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Current Incidents on Past Investment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Incidents	Incidents	Insurgent initiated	Govt. initiated	Fatalities	Govt. fatalities	Civilian fatalities	Insurgent fatalities
Lagged Value of Building Permits	-2.089***	-0.186	0.0153	-0.211	-0.0516	-0.0324	0.0132	-0.0324
	(0.744)	(0.201)	(0.0796)	(0.144)	(0.0767)	(0.0385)	(0.0427)	(0.0351)
Constant	0.944***	0.768***	0.240***	0.528***	0.0634**	0.0638***	-0.00104	0.000586
	(0.108)	(0.0613)	(0.0250)	(0.0451)	(0.0270)	(0.00949)	(0.00836)	(0.0152)
Observations	474	474	474	474	474	474	474	474
R-squared	0.043	0.692	0.711	0.629	0.656	0.635	0.426	0.538

All specifications include a complete set of year indicators. Robust standard errors in parentheses, clustered on province. Building permits lagged one period, see equation 11. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Violence and Taxes

	(1) Incidents	(2) Incidents	(3) Incidents	(4) Insurgent initiated	(5) Govt. initiated	(6) Fatalities	(7) Govt. fatalities	(8) Civilian fatalities	(9) Insurgent fatalities
Property Tax (per capita)	-0.000517***		0.00010700	0.00010400	-0.00003810	0.00006550	0.00000933	0.00002680	0.00002940
	(0.000116)		(-0.0000808)	(-0.0000739)	(-0.0000965)	(-0.000091)	(-0.0000198)	(-0.0000343)	-0.00003880
Business Tax (per capita)		-0.000405***							
		(-0.0000963)							
Constant	0.790***	0.764***	0.706***	0.317***	0.394***	0.227***	0.0901***	0.0695***	0.0672***
	(0.138)	(0.135)	(0.0710)	(0.0297)	(0.0493)	(0.0252)	(0.0102)	(0.0109)	(0.0106)
Observations	664	664	664	664	664	664	664	664	664
R-squared	0.060	0.045	0.657	0.707	0.576	0.672	0.645	0.461	0.551

All specifications include a complete set of year indicators. Robust standard errors in parentheses, clustered on province. *** p<0.01, ** p<0.05, * p<0.1 .

Appendix Table 1: Change in Violence on Level of Building Permits

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Incidents	Incidents	Insurgent initiated	Govt. initiated	Fatalities	Govt. fatalities	Civilian fatalities	Insurgent fatalities
	-1.973***	0.136	0.0932	0.0354	0.250***	0.0938***	0.0498	0.106**
	(0.593)	(0.114)	(0.0718)	(0.0818)	(0.0825)	(0.0327)	(0.0364)	(0.0528)
Constant	0.640***	-0.261***	-0.140***	-0.120***	-0.0289	-0.0236**	-0.0346***	0.0294
	(0.0996)	(0.0709)	(0.0331)	(0.0433)	(0.0271)	(0.0118)	(0.0129)	(0.0185)
Change in Violence		x	x	x	x	x	x	x
Observations	553	553	553	553	553	553	553	553
R-squared	0.064	0.059	0.067	0.042	0.053	0.030	0.042	0.058

All specifications include a complete set of year indicators. Robust standard errors in parentheses, clustered on province. *** p<0.01, ** p<0.05, * p<0.1