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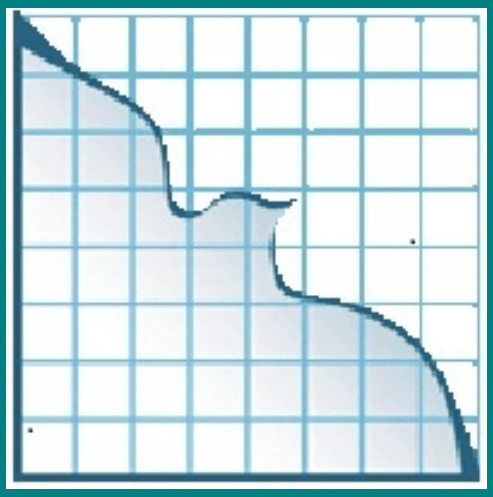

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SYMPOSIUM: CONFLICT AND PEACE IN NIGERIA

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NONPARASITIC WARLORDS AND GEOGRAPHIC DISTANCE

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Abstract

The explicit consideration of geography in the conflict theory literature is still relatively rare. In this article, two warlords are modeled as being located at opposing ends of a hypothetical line. The model includes variables denoting distance and difficulty of terrain. Each warlord allocates resources to the extraction of natural resources, to the production of goods and services (hence, nonparasitic), and to conflict with the opposing warlord. Two forms of a contest success function, a primary tool in the literature, are used to show that the warlord closer to the point of conflict will invest less into the hiring of warriors and more into the production of goods and services, yet will win a larger proportion of total goods and services produced within the economy.

Since the second world war, at least 158 distinct armed conflicts have been recorded, with close to 41 million civilian and military deaths, a toll that exceeds the entire current population of Argentina. Conflicts differ in terms of scope, structure, and method and the conflict theory literature thus distinguishes among conflict types: intrastate, interstate, extrastate, nonstate, insurgency, civil war and so on. State-to-state style conflicts were more prevalent before the 1960s; since then we observe an increasing number of civil and nonstate armed engagements. Typically characterized by two or more contesting groups within a single state, one of the contestants is either an established ruling group, or no established ruler exists, or nonstate groups are fighting among each within the theater of a much larger civil war against an established ruler. Ninety-five such nonstate conflicts have been identified between 1816 and 2007, and one can expect this number to rise given the current destabilizing conflicts in Syria, Iraq, Pakistan, South Sudan, and elsewhere. Due to certain ambiguities in many of these nonstate conflicts, other conflict scenarios that do not involve well-defined armies, such as organized crime and gang warfare, hold many of the same microeconomic foundations.[1]

Close to 1.5 billion people (roughly 21 percent of the global population) live in countries that suffer from varying levels of violent conflict due to organized crime, political struggle or, in general, high crime and murder rates due to political instability. While some nonstate conflicts erupt between warlords who use an economy's resources strictly for their own gain, there are others where warlords use these resources for conflict *and* investment in the future of the economy as a whole. Such cases can be found, in varying degrees, in the conflicts taking place in developing economies, as well as in the history of organized crime syndicates such as the yakuza and the mafia.[2]

A warlord economy is an economy or state where individuals, known as warlords, compete against each other by offering protection and battling over rents, such as from oil, diamonds, and other natural resources, instead of engaging in the production of marketable goods and services. There has recently been an interest in studying the relationship between nonstate and civil war-like conflicts and geographical factors. These studies are less inclined to forecast how conflicts will arise and instead focus on where and how these conflicts are fought. The intensity and duration of such conflicts are shown to be dependent not only on the total geographical area but also on the conflict's proximity from the capital city (or the area with the highest population density) and the border. Two sets of results are found. First, conflict is more likely to erupt in rural areas and along national borders. Second, along the lines of Kilcullen's hypothesis regarding an increasing trend of urban guerrilla warfare, there exists a correlation between a warlord's proximity to the capital and the likelihood of conflict. These two opposing results emphasize the difference between two variations of civil conflict: wars waged as an insurgency of a group against an established government presence, and a territorial conflict among warlords where no established government holds control. In addition, stronger and more skilled insurgency groups are prone to be closer to the capital while weaker groups are based further away.[3]

While the importance of geographic distance on conflict has been shown empirically, current theoretical models do not often consider such effects. Early models of insurgency have focused on both territorial expansion and the effect that conflict has on geographic location of insurgence. The effect that the geographic location of conflict may have on wartime

decisionmaking has been given much less attention. In an early study, Kenneth Boulding put special emphasis on the role that distance and geography have on firm competition, international relations, the definition of "boundaries," and the role of long-range artillery. Merging sociological concepts of conflict with theoretical models by Hotelling and Richardson, Boulding proposes a loss-of-strength gradient, a measure of an agent's force or potency over distance, and argues that this gradient decreases as distance to one's home location increases. Of the few recent formal studies on the effect of geography on decisionmaking within a conflict, the work by Scott Gates is of special importance. Gates constructs a principal-agent model to study how an insurgent leader and an established ruler each construct a system of rewards and punishments to retain support. The model is built upon a geographical framework in that both the insurgent leader and the established ruler are located at distinct areas with varying distances from possible supporters. Under general conditions, Gates shows that more distant supporters are rewarded more than those closer to the associated leader.[4]

The model presented in the present article adds to the literature by narrowing in on how conflict location affects expenditures on war efforts and the production of goods and services.

This article considers the role of geography in the interplay between competing warlords. Two forms of a contest success function—a primary tool in the conflict theory literature—are used to show, *inter alia*, that of two warlords, the one whose base is located closer to their point of conflict will invest *less* into the hiring of warriors and *more* into the production of goods and services and correspondingly wins a larger proportion of the total amount of goods and services produced within the economy.

A model of warlord conflict

Type of conflict

Models of civil and nonstate conflicts usually assume that at least the usurper, if not the incumbent as well, acts in a purely parasitic manner, that is, using an economy's resources to win political and/or economic control and never investing within the economy itself. A rich set of "guns-and-butter" models exists where leaders' decisions involve both the expenditure of resources toward production of goods and services and/or the appropriation of goods and services. One key distinction between contests within a guns-and-butter economy and other possible contests is the notion of how the value of the "prize"—the political and/or economic goal over which players are fighting—is developed. One class of models involves exogenous prize contests in which the players' actions do not affect the value of the prize. The other class involves endogenous prize contests where players' actions directly or indirectly affect the value of the contest's prize.[5]

The theoretical literature pertaining to guns-and-butter economies primarily focuses on battlefield conflicts. Players are imagined as standing at different ends of a line. A key facet is that state government is either too weak to enforce law or has effectively ceased to exist. Individuals then need protection from the predator-prey system that arises and this gives rise to warlords who offer protection from competing warlords. The work presented here is an endogenous guns-and-butter model and depicts warlords as *non*parasitic, i.e., showing concern for the value of the production of goods and services in the economy.[6]

Structure of the economy and conflict

Conflict models define each warlord as having control over a territory, endowed with natural resources, and commanding a group of loyal subjects. The models rarely, if ever, consider geographic distance between warlords as affecting their decisionmaking. Likewise, the budget constraints found in many models do not reflect warlords' true costs. For example, natural resources, such as diamonds, oil, and timber, need to be extracted in order to be sold. The cost of extraction should be taken into consideration explicitly, through wages, and implicitly, through the use of labor. Both then affect a warlord's resource balance. Loyal subjects within a warlord's populace may also seek immediate monetary compensation as opposed to a fraction of the warlord's spoils after conflict has ceased.[7]

The model presented here considers an economy where two warlords, *A* and *B*, each are in control of distinct and separate territories, l_A and l_B, respectively, connected by a straight line of fixed length on an interval [0,1], where $l_A = 0$ and $l_B = 1$. Each warlord's strategy set includes three economic activities: (1) producing goods and services, (2) extracting and selling natural resources, and (3) appropriating goods and services produced by the opposing warlord through force. Within each territory, the ruling warlord is endowed with three important resources used to perform the mentioned economic activities: (1) a population of loyal subjects, N_A and N_B, (2) a preexisting budget, Y_A and Y_B, and (3) a cache of unextracted natural resources, R_A and R_B.[8]

It is assumed that each member of a warlord's population performs one, and only one, of two activities: fight as a warrior, W_A and W_B, or work as a natural resource extractor, E_A and E_B. This results in a population constraint for each warlord, $N_A = W_A + E_A$ and $N_B = W_B + E_B$. Each warlord pays every

warrior a wage, c_w, and every extractor a wage, c_E, using his preexisting budget and the proceeds from sales of extracted natural resources. That is, warlords' subjects expect immediate compensation in lieu of a proportion of the conflict's spoils. After extraction, natural resources are sold to external buyers who pay a fixed exogenous price per unit of m_R.[9]

Let $\hat{R}_A$ and $\hat{R}_B$ be the amount of natural resources that warlords *A* and *B*, respectively, choose to extract. Three explicit assumptions are imposed on the model.

Assumption 1: Warlords are incapable of extracting all of the natural resources, $\hat{R}_A < R_A$ and $\hat{R}_B < R_B$.

Assumption 2: Each unit of natural resources is extracted by a single unit of extractors, $\hat{R}_A = E_A$ and $\hat{R}_B = E_B$.

Assumption 3: The price received for a natural resource unit is greater than the cost to extract it; that is, $m_R > c_E$.

Assumptions 1 and 3 are necessary to ensure an interior solution and to avoid negative prices. Assumption 2, apart from making the model less complex, speaks to the technology of natural resource extraction: It is completely labor-intensive without the use of capital.

In contrast to Assumption 3, the production of goods and services by each warlord is a function of the capital, K_A and K_B. To facilitate production within his territory, each warlord can invest by purchasing capital from an external seller at a constant cost, c_k. Further, goods and services produced by either or both warlords are sold to external buyers who pay a fixed, exogenous price per unit, *m*. Therefore, the total value of the economy is based upon the market value of both warlords' production combined, that is, $(m) \cdot (K_A + K_B)$.[10]

A revenue constraint for each warlord can now be constructed. It consists of two revenue streams—the preexisting budget and sales of extracted natural resources—as well as of the three explicit expenses of warrior wages, extractor wages, and payments on capital investment:

$$(1)\ Y_A + (m_R \cdot \hat{R}_A) = (c_w \cdot W_A) + (c_E \cdot E_A) + (c_k \cdot K_A),$$

and, symmetrically, for warlord *B*. For aesthetic purposes, let $\sigma = m_R - c_E$. By applying Assumption 2, one can combine the population and revenue constraints such that warlord *A*'s income maximization decision is constrained by

$$(2)\ N_A + \frac{Y_A}{\sigma} = \left(\frac{c_w}{\sigma} + 1\right) \cdot w_A + \left(\frac{c_k}{\sigma}\right) \cdot K_A$$

and, symmetrically, for warlord *B*.

As opposed to extracting natural resources and financing production, each warlord also has the ability to take revenues earned by the opposing warlord through force. The area where conflict is to take place—the conflict point, denoted by l_c—is exogenously set. The conflict point may be interpreted as the location of the highest economic and/or political importance, for instance, a capital city, a center of production, or a major port. Recalling that the geography of the economy is defined as $l_A = 0$ and $l_B = 1$, warlord *A* is then located at a distance from the point of conflict of $(l_c - l_A) = l_c$, whereas warlord *B* is located at a distance of $(l_B - l_c) = (1 - l_c)$.

Given his distance from the conflict point, each warlord sets out to appropriate a portion of the economy's total production of goods and services by dedicating resources toward the so-called impact function, I_A and I_B. Each warlord's impact on the conflict is based on three factors: (1) the number of warriors hired by each warlord, (2) the distance between each warlord's territory and the conflict point, and, (3) an exogenous scalar, $\phi > 0$, that represents the cost of geographic distance (a higher value indicates an increased cost of travel and troop mobility).

Three essential properties of the impact function are held to be true. First, any increase in the number of warriors hired to fight will increase the warlord's impact on the conflict. Second, following Boulding's concept of the law of diminishing strength (the loss-of-strength gradient), an increase in the distance between the conflict point and a warlord's territory will result in a negative effect on the warlord's impact, that is, to move troops is costly. Finally, an increase in the cost of travel per se also has a negative effect on each warlord's impact. To clarify: moving troops is one thing; moving troops over mountainous terrain is another. To add robustness to the model, two explicit impact functions are used: the Gates-logit model and the subtractive model. The former is based on Gates (2002) where a warlord's impact function takes the difference between the natural logarithm of warriors hired and his distance from the conflict point:[11]

$$(3)\ l_A = ln(W_A) - \phi \cdot (l_c - l_A)^2$$

and, symmetrically, for warlord *B*.

The subtractive model is similar to the Gates-logit except that the impact function takes the difference between the number of warriors hired (without the logarithm) and the distance from the point of conflict:

(4) $l_A = W_A - \phi \cdot (l_c - l_A)^2$

and, again, symmetrically for *B*.

Using these two formulations, the contest between the two warlords is determined by a contest success function (CSF). The literature focuses on two general types of CSFs: ratio and difference. A detailed treatment of the two CSF forms is available as an online supplement to this article (Hionis, 2015). In brief, the ratio form CSF is primarily used to model contests with an "all or nothing"' premise: If a contestant were to supply no resistance or effort toward a conflict, he would effectively lose everything. Conversely, the difference form CSF is used to model situations where both contestants can survive but with different portions of the prize. In addition, the exponential function in the difference form below allows for diminishing returns to conflict inputs due to factors such as geography and terrain. Given the model's focus on the effect of geographic distance on decisionmaking, the CSF to use here is the difference form because it reflects the imperfections that distance and terrain can contribute to conflict.[12]

Let π_A and π_B be the CSFs for conflict between warlords *A* and *B*, respectively. The explicit form of the CSF for warlord *A* is defined as $\pi_A = 1/\left(1 + e^{\alpha \cdot (I_B - I_B)}\right)$, where *e* is the exponential function, α is an exogenous mass effect variable, and $\pi_A = 1 - \pi_B$. Importantly, the CSF is not interpreted as the probability that warlord *A* will defeat warlord *B*; instead, π_A reflects the share of the total production of goods and services within the economy that warlord *A* is able to acquire and retain. (Warlord *B* acquires the remaining $1 - \pi_B$.)

Income gained by each warlord is the total amount of production profits he is able to defend plus the amount he is able to take from the opposing warlord. Let V_A and V_B be the income gained by each warlord, respectively, from production and from warfare. Using the difference CSF form, warlord *A*'s income equation is $V_A = \pi_A \cdot m \cdot (K_A + K_B)$ and similarly for *B*. Given warriors hired and capital invested by warlord *B* (i.e., W_B and K_B), warlord *A* then seeks to maximize his share of income made on the total production within the economy subject to his population size such that

$$(5)\ \max_{W_A, K_A} V_A s.t.\ N_A + \frac{Y_A}{\sigma} = \left(\frac{c_w}{\sigma} + 1\right) \cdot w_A + \left(\frac{c_k}{\sigma}\right) \cdot K_A.$$

Symmetrically, given W_A and K_A, warlord *B* seeks to maximize his share of income made on the total production within the economy subject to his population size. (The online supplement lists and explains all the model's variables.)

Solutions[13]

Symmetric exogenous resources

Begin by examining the symmetric case where warlord *A* and *B* each are endowed with the same population and equal preexisting budgets, that is, $N_A = N_B = N$ and $Y_A = Y_B = Y$. In addition, let W_A^*, W_B^*, K_A^*, and K_B^* signify the number of warriors hired and capital invested, respectively, by warlords *A* and *B* under equilibrium.

> Proposition 1: Let $N_A = N_B = N$ and $Y_A = Y_B = Y$. If Assumptions 1 to 3 hold, then both the Gates-logit and the subtractive models show that $W_A^* = W_B^*$, $K_A^* = K_B^*$, and $\pi_A^* = \pi_B^* = ½$ when $l_c = ½$.

In words, the proposition states that when the conflict point is located equidistant from either warlord's territory, both warriors hire the same number of warriors and invest in the same level of capital. Given this symmetry, it is not surprising to find that each warlord will obtain the same amount of the total production of goods and services within the economy.

The second proposition illustrates the effect of moving the conflict point away from the midpoint, i.e., closer to either warlord's territory.

> Proposition 2: Let $N_A = N_B = N$ and $Y_A = Y_B = Y$. If Assumptions 1 to 3 hold, and if l_c moves away from $l_A = 0$ toward $l_B = 1$, then both the Gates-logit and the subtractive models show that $W_A^* > W_B^*$ and $K_A^* < K_B^*$, yet the total number of warriors hired and the total amount of capital invested remains constant.

Proposition 2 asserts that the increased distance between a warlord's territory and the conflict point has an increasing effect on the warlord's hiring of warriors and a decreasing effect on his capital investment. Conversely, the warlord who is closer to the point of conflict does not need to hire as large an army of warriors—because of the shorter distance each warrior needs to travel—and thus can spend more of his resources on the production of goods and services. In contrast, the warlord who is further from the conflict point must amass a larger army and has less to spend on the production of goods and services. The proposition further states that while each warlord's individual decisions regarding production and conflict are influenced by geography, the total number of warriors hired and the total amount of production of goods and services are not. This results directly from the symmetric increase and decrease of these variables as the conflict point moves.

Whereas the second proposition focuses on distance, the

next proposition summarizes the effect of terrain on each warlord's decisionmaking.

> Proposition 3: Let $N_A = N_B = N$ and $Y_A = Y_B = Y$. If Assumptions 1 to 3 hold, then both the Gates-logit and the subtractive models show that for warlord *A*, an increase in ϕ will have an increasing effect on the number of warriors hired when the conflict point crosses the midpoint toward warlord *B*'s stronghold, and a decreasing effect when the conflict point is moved closer to warlord *A*'s territory. (And, vice versa, for for warlord *B*.)

Put differently, when the conflict point is located closer to warlord *A*'s stronghold, an increase in the harshness or difficulty of the terrain will cause warlord *B* to increase the number of warriors hired due to the increasingly adverse effect that distance has on warlord *B*'s warriors. Since, from Proposition 2, warlord *A* will hire fewer warriors when the conflict point is closer to his territory, an increase in ϕ will cause warlord *A* to decrease the number of warriors hired because he is aware that warlord *B* will have a harder time in the conflict. Conversely, when the conflict point is located closer to warlord *B*'s stronghold, an increase in ϕ will cause warlord *B* to decrease the number of warriors hired while warlord *A* increases their number.

Even though the warlord further away from the point of conflict hires more warriors than the opposing warlord, both models conclude that this warlord does not necessarily win a larger proportion of the total production of goods and services within the economy. This is stated in the next proposition.

> Proposition 4: If Assumptions 1 to 3 hold, the CSF under the subtractive model is unaffected by changes in the conflict point and, hence, is constant at $\pi_A^* = \pi_B^* = ½$. But under the Gates-logit model, the CSF is affected by changes in the conflict point such that the warlord closer to the conflict point wins a larger proportion of the total production of goods and services within the economy.

According to Proposition 4, the two models differ on how geographic distance affects each warlord's CSF. Specifically, the subtractive model holds that geography has no effect, and the total production of goods and services within the economy is split equally between the two warlords. The Gates-logit model, in contrast, results in an adverse geographic effect: As the conflict point moves closer to a warlord's territory, that warlord will experience an increase in his CSF such that his winning proportion of the economy's production increases. Propositions 2 and 4 express that a warlord benefits by being closer to the conflict point both because he invests less in fighting and because he is able to obtain a larger portion of the economy's total amount of goods and services produced.

Propositions 1 through 4 present theoretical evidence in support of some of the previously mentioned empirical studies. Specifically, the model implies a theoretical rationale for Kilcullen's "age of the urban guerilla": Civil, nonstate, and insurrectionist conflicts within the developing world are moving out of jungles and mountains and into cities. Since high-density or harsh terrain causes distant and more rural warlords to increase spending on conflict relative to production, this suggests that policies that seek to increase infrastructure and development—decreasing the value of ϕ—may lead to an increase in the value of production in the economy as a whole.

Asymmetric exogenous resources

While exogenous, the effects that asymmetric (unequal) population sizes and preexisting budgets have on each warlord's decisionmaking are important to notice.

> Proposition 5: If Assumptions 1 to 3 hold, then both models agree that the number of warriors hired by each warlord—and, hence, the total number of warriors hired within the economy—under equilibrium increases when the population size and/or the preexisting budget of either warlord increases. The models also agree that each warlord will increase his production of goods and services when either his own population size and/or preexisting budget increases and/or when the opposing warlord's population size and/or preexisting budget decreases. In regard to the total production of goods and services within the economy, the subtractive model shows that the total production of goods and services within the economy is unaffected by changes in either warlord's population size and/or preexisting budget while the Gates-logit model finds that an increase in either warlord's population size and/or preexisting budget will increase the total amount of production within the economy.

Proposition 5 is in the same vein as what is known in the literature as the paradox of power: Against the conventional wisdom of divergence, the contestant with fewer resources will fight harder by allocating a larger number of resources toward the conflict than will the better endowed contestant and, given certain conditions, will grow stronger and be left in a relatively better-off position.[14]

Likewise, both models show that as the size of either warlord's population grows and/or the preconflict budget

increases, the wealthier warlord will invest more in the production of goods and services while the poorer warlord decreases his production. At the same time, the wealthier warlord and the poorer warlord both increase the number of warriors hired. Unlike the concept of the paradox of power, however, neither population size nor the preconflict budget of either warlord affects the CSF or either warlord's overall control of the economy's output. That said, Proposition 5 does express the central idea that the poorer warlord has an advantage in conflict over producing goods and services.

From a position of promoting a policy of peace, Proposition 5 can be a troubling conclusion, because increased funding or support for one warlord will not decrease the level of conflict but aggravate it. The subtractive model agrees that the decrease in the poorer warlord's investment in the production of goods and services is identical to the increase in the richer warlord's: changes in population sizes and preconflict budgets have no effect on the total production within the economy. The interpretation of this scenario is that an increase in one warlord's, say warlord *A*'s, population size will have him invest more in both warfare and the production of goods and services. To keep up with the escalated conflict effort by warlord *A*, warlord *B* puts more resources into hiring warriors and dedicates less toward the production of goods and services. As a result, the total production of goods and services within the economy is unaffected by either warlord's resources.

The Gates-logit model result disagrees: Here, the increase in production of goods and services by the wealthier warlord exceeds the decrease in production by the poorer warlord and, hence, population sizes and preconflict budgets do have an increasing effect on total production within the economy. Therefore, if one assumes that the Gates-logit model reflects the mode of a specific conflict, then increasing support for one warlord will result in an expansion of the economy's production even as civil conflict continues. Even though increasing one side's resources may not be the most desired method of ending a conflict, it can be implied that a divergence of resource endowments will occur over time: The wealthier warlord will continue to amass more resources—whether through foreign investment, the sale of goods and services, or the sale of extracted natural resources—while his poorer counterpart's resources dwindle as the conflict game repeats.

Conclusion

In a seminal paper, Jack Hirshleifer states: "As in all attempts to model complex phenomena, the necessity of making a host of special assumptions limits the applicability of the results obtained [and] in particular ... [t]he effect of distance or other geographical factors have not been considered ... and are not really fundamental." Although he eventually acknowledged it, at the time Hirshleifer ignored Kenneth Boulding's geographic model, pioneered decades earlier. Moreover, Hirshleifer's statement that geographic factors may not be "really fundamental" appears rather incorrect.[15]

This article presents two models wherein two nonparasitic warlords, who are geographically connected, must decide on the amount of resources to be dedicated to conflict and the amount to be dedicated to production. In general, both models conclude that the warlord located closer to the conflict point hires fewer warriors yet wins a greater proportion of the total production within the economy. But it is also shown that some effects on a warlord's decisionmaking process depend on the explicit form of the CSF.

The base model can be extended in a number of important directions. Beyond standard extensions of most microeconomic models (imperfect information, more complex production and consumption functions, repeated games, and so on), the primary extension to be pursued is to abandon the assumption that all of a warlord's production of goods and services are available for appropriation. Instead, the model can be adjusted such that only a portion, dependent on the location of the conflict point, of a warlord's production is under threat of appropriation. Along the same lines, a fair criticism of the model lies in the assumption that each warlord's cache of unextracted natural resources is safe from appropriation.

Since the base model shows that there are no clear advantages to being far away from the conflict point, another adjustment would be to allow the location of each warlord's stronghold to be endogenous. Further, one could advance current research on the choice of weaponry and, hence, destruction by applying the added variable of geographical distance. It is imperative, then, that more research be put into understanding both what defines the conflict point and where warlords choose to establish their territorial stronghold.[16]

Notes

1. Argentina: See Fearon (2005). Distinct conflict types: To date, there is no official and generally accepted criterion for how a conflict is defined. While it is true that any criteria set will consist of certain arbitrary values/levels, the conversation goes beyond mere semantics. In an exhaustive study, Sambanis (2004) presents a recoding of conflict by answering three questions: What are the thresholds of violence to distinguish conflicts? How does one establish the beginning and end of each conflict? Who are the main players and what political power is wielded by each? While I contend that many nonstate conflicts could also fit into the standard of intrastate and civil conflicts (most insurgencies and civil wars involve parties that disagree as to who has political authority to begin with), I follow the code established by Sambanis and the Correlates of

War (COW) project in referring to specific types of conflict. Nonstate conflicts identified: Sarkees and Wayman (2010). Microeconomic foundations: Fearon and Laitin (2003).

2. Close to 1.5 billion people: Economist (2011).

3. Definition of warlord economy: Skaperdas (2002). Larger geographical areas: Rustad, *et al*. (2011). Intensity and duration: Buhaug and Gates (2002); Buhaug, *et al*. (2009). Urban guerrilla warfare: See Kilcullen (2013). Likelihood of conflict: Buhaug and Röd (2006). Insurgency/weaker groups: Buhaug, *et al*. (2009).

4. Current warlord models: See Buhaug and Gates (2002); Buhaug, *et al*. (2009); Rustad, *et al*. (2011). Territorial expansion: See Findlay (1996); Wittman (2000). Location of insurgence: See Brito and Intriligator (1990,1992). Boulding: See Boulding (1962), especially chapters 4, 12 and 13. Gates: See Gates (2002).

5. A rich set of models: See Garfinkel and Skaperdas (2007).

6. Predator-prey system: Some studies have shown that warlord economies can form and function almost identically to the way organized crime syndicates do. For details, see Reno (1998) and Skaperdas (2001).

7. Conflict models: See Skaperdas (2002). Budget constraints: See Skaperdas (2002); Konrad and Skaperdas (2012).

8. Warlords are referred to in the masculine form. While the vast majority of known warlords are male, there have been cases where women have assumed the role. A notable example has been that of Uganda's Alice Auma/Lakwena. For details, see Eichstaedt (2013).

9. Extracted natural resources: Earlier forms of the model allowed for asymmetric warrior and extraction wages between the two warlords. After an insightful comment from a reviewer, this asymmetry was removed due to the fact that population mobility is restricted and would add little to the model's goals. Future research into such an extension is warranted, however.

10. Invest: This model interprets capital as a basic input into the production of goods and services and does not consider intertemporal issues. Total value of the economy: The model does not include local consumption of the goods and services being produced on the part of either of the two warlords and their respective populations. Therefore, all goods and services being produced within the economy are being sold to an external purchaser, regardless of any and all conflict that may occur.

11. Law of diminishing strength: Boulding labels this condition "the further, the weaker." See Boulding (1962) pp. 229-233. Increase in the cost of travel: Specifically, it is assumed that $(\delta I_A)/(\delta W_A)>0$, $(\delta I_B)/(\delta W_B)>0$, $(\delta I_A)/(\delta l_A)<0$, $(\delta I_B)/(\delta l_B)>0$, $(\delta I_A)/(\delta \Phi)<0$ and $(\delta I_B)/(\delta \Phi)<0$.

12. Ratio and difference: For a detailed axiomatic treatment of the CSFs foundations, see Skaperdas (1996); Jia and Skaperdas (2012). Lose everything: Tullock (1980). Different portions of the prize: Hirshleifer (1989). Difference form: See Gates (2002); Buhaug, *et al*. (2009).

13. For the technical reader, the full treatments, descriptions, and proofs of the pure strategy Nash equilibrium found under the Gates-logit and subtractive impact functions are available in Hionis (2015). This section presents a summary of the main results.

14. Paradox of power: Hirshleifer (1991).

15. Quote: Hirshleifer (1991, p. 198). Eventually: Hirshleifer (2000).

16. Advance current research: See Garfinkel and Skaperdas (2000); Chang and Lou (2012).

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WAGE DIFFERENTIALS AND ECONOMIC RESTRICTIONS: EVIDENCE FROM THE OCCUPIED PALESTINIAN TERRITORIES

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Abstract

The article examines the wage impact of Israel's constraints on economic activities and infrastructure development in the West Bank's Area C. We provide evidence to show that Area C workers suffer a wage penalty of about 8 percent relative to workers in Areas A and B. The results also show that when controlling for worker characteristics, the magnitude of the Area C wage differential drops by about half. We then extend our analysis to compare average wages between Area C workers and other rural workers and show that the wage difference is statistically insignificant. This indicates that the Area C wage differential we observe can be attributed primarily to a rural environment effect rather than to Israeli economic restrictions placed on Area C *per se*. This result indicates that the effect of Israeli restrictions on Area C wages is neutralized. We show that negative labor supply shocks (commuting) serve as a potential transmission mechanism. Specifically, we show that Area C residents are more likely to commute than their peers in other rural areas.

According to the Oslo peace accords, signed between Israel and the Palestine Liberation Organization (PLO) in 1993, Israel assumes full control over 60 percent of West Bank areas, referred to as Area C (see Figure 1). Area C, mostly rural, is economically important to the Palestinians. The fertility of its agricultural land, the availability of aquifers, and its rich mining reserves are vital to Palestine's economic development. Yet the government of Israel has constrained Palestinian economic activities in this area in general and, in particular, infrastructure development such as construction. Currently, Israel bans expanding construction, which deters development projects in about 70 percent of the area.[1]

This article considers one aspect of the impact of Israel's development restrictions on Palestine's economy, namely, the impact on Area C wages. We view Area C restrictions as a disincentive to attract firms or to expand existing businesses, thus adversely affecting labor demand and leading to lowered wages. Wage effects of course also depend on labor supply. Drawing on extensive panel labor force data from the Palestine Census Bureau of Statistics (PCBS), we provide evidence to show that Area C workers suffer a wage penalty relative to workers in areas A and B. While Area C wage differentials in part reflect the rural character of the area, the results also indicate that the adverse effect of the Israeli restrictions on Area C wages is neutralized, with labor supply shocks (commuting) serving as the potential transmission mechanism.

The next section provides an overview of development restrictions in Area C. This is followed by a simple theoretical model that relates development restrictions to wage changes. The empirical strategy, including data descriptions and model specifications, and the empirical findings are then discussed. The final section summarizes.

Figure 1: Areas A, B, and C. *Source*: Political Geography Now. *Source*: www.polgeonow.com. Used by permission.

Overview of development restrictions in Area C

Since 1993 the West Bank has been divided into three distinct areas: A, B, and C. Area A covers about 18 percent of the West Bank and includes major populated areas such as the cities of Bethlehem, Hebron, Jericho, Nablus, and Ramallah. Area B consists of 22 percent of the West Bank, including large rural areas. The remaining West Bank land, Area C, is mostly rural and sparsely populated at around 180,000 people (about 7 percent of the West Bank's population).[2]

What distinguishes Area C is that its security and many aspects of civil services, including planning, construction, and infrastructure, are fully under Israeli control. The Palestinian Authority (PA) is responsible for providing education and health services for Area C residents. The partition of the West Bank was meant to be transitory. According to the Oslo peace accords, Israel was to transfer all control to the Palestinian Authority within a few years of signing the 1993 peace accord. Yet in the name of security, Israel still maintains full control over Area C, causing severe economic underdevelopment. In particular, Israeli authorities prohibit any type of infrastructure development. A number of restrictive measures have been devised for Area C, such as designating around 40 percent of Area C as state land where Palestinians are not allowed to carry on any construction or development activities at all. Israel has exclusively allocated this land to build and expand Israeli settlements. An additional 30 percent of Area C, mainly in the Jordan valley, are designated as military zones and nature reserves. Other restrictive measures include the banning of any construction within 70 meters along each side of regional roads that are intended to serve Israeli settlements in the West Bank. As for the remaining 30 percent of Area C, Israel imposes severe restrictions on construction activities, except for already built-up communities.[3]

A World Bank report from 2008 shows that during the 2000-2007 period, less than 6 percent of the 1,624 construction requests made for Area C were approved.[4] This has exposed Area C residents to high risks of housing and infrastructure demolition for facilities that did not receive prior approval from Israeli authorities. (In fact, during the same period, about 1,660 facilities were demolished.) Israel's Area C restrictions extend to public infrastructure projects which are often delayed or refused. The report notes restrictions' adverse effects on Palestine's agricultural and other economic sectors. Notably, the significant number of roadblocks, checkpoints, and the long stretch of the separation wall has reduced farmers' access to agricultural land and to markets, leading to increased transportation costs. The report further discusses the limitations of industrial development in Area C. Permits to develop industrial facilities rarely are granted. This has hampered industries such as stone and marble, construction, and tourism.

The West Bank is divided into three areas, the so-called Areas A, B, and C. The government of Israel has placed certain restrictions on economic activity within Area C. This article studies the effect, if any, that these restrictions may have on wage differentials between Palestinian workers in Area C relative to workers in Areas A and B. The main finding is that wage differentials are due, in part, to the predominantly rural character of Area C but that, in addition, Israeli restriction have also induced labor demand and supply shocks leading to interarea migration and commuting that, in turn, affect wage rates across all three areas.

An even more recent World Bank report shows that restricted access to education for Palestinians who live in Area C increases their poverty rate. Also, restricting access to agricultural land in Area C reduces both the amount of land that is cultivated and its productivity. The report suggests that lifting these restrictions and exploiting Dead Sea minerals would revive the Palestinian economy by an annual USD2.2 billion, equivalent to about 23 percent of 2011 GDP.[5]

Theoretical model, data, and empirical strategy

The model

The effect of development restrictions on Area C can be modeled within a straightforward labor supply and demand framework. We assume that, prior to any development restrictions, workers across areas A, B, and C operate in similar labor markets. Accordingly, we assume that an equilibrium wage would prevail at a common wage level of w^*.

We then conceive of Area C development restrictions as disincentives for businesses who otherwise would wish to operate in this area. The restrictions result in an adverse labor demand shock that is expected to decrease the average wage in Area C to w', where $w' < w^*$. In the short run, the level of w' depends on the magnitude of the negative demand shock, as well as on labor demand and supply elasticities. In the long run, the decrease in Area C's average wage would induce Area C workers to migrate or commute to other areas, thus leading to a negative shift in Area C's labor supply as well. This would then result in an increase in the average Area C equilibrium wage from w' to w". Whether this wage increase restores the initial equilibrium ($w" = w^*$) depends on the relative magnitude of the demand and supply shifts, holding demand and supply elasticities constant. (A formal exposition of this simple theoretical argument is displayed in the Appendix.)[6]

Data

We use individual-level, quarterly PCBS labor force data over the 2001 to 2008 time period. We exclude Gaza's workers as

Area C is in the West Bank. We also exclude observations for workers who report their place of work as Israel or Israeli settlements in the West Bank. The quarterly average share of this worker category is 11 percent of the total workforce. Using pooled-OLS regressions, we find that working in the Israeli labor market earns a Palestinian worker, on average, a 72 percent wage premium.[7] Thus, the reason behind excluding these workers is to avoid an estimation bias that would mask any urban-rural wage differential. Excluding those who work in Israel, reduces the sample size to 60,766 observations in Areas A, B, and C, and 2,371 of which represent Area C workers and commuters.

Before discussing the empirical model, it is informative to indicate spatial differences in worker characteristics between Area C and the other areas. Descriptive statistics (available on request) show that the share of Area C residents who hold 13 years of education or more is 13 percent, about half the share of the other areas. Agriculture is the main employing sector, hiring about 35 percent of Area C workers as compared to 13 percent in other areas. Services, the largest sector in Palestine, is disproportionately concentrated in urban areas, hiring about 41 percent relative to only 24.5 percent in Area C. Area C also tends to differ, slightly, in terms of employment status. Specifically, labor force participation in Area C is 44 percent, 3 percentage points higher than in the other areas, and might reflect a tendency to mitigate Area C's lower average wages. Area C's rate of unemployment is lower by about 1 percent, affecting 8.2 percent of the labor force for the average of the 2001 to 2008 time period.

Empirical strategy

Following the literature, we use regression analysis to capture wage differences, if any, between Area C and the other areas by estimating Mincer's earnings model. In this model workers' wages are a function of their demographic, human capital, and socioeconomic characteristics.[8] It is specified as follows:

$$(1)\quad log\ w_{itj} = \gamma C_i + BX_{ijt} + d_j + q_t + e_{it},$$

where the dependent variable, $log\ w_{itj}$, is the logarithm of the daily wage for worker i in quarter t in district j. A dummy variable, C_i, takes a value of 1 for Area C workers and 0 otherwise, and captures the wage differential, if any, for Area C workers. In some specifications we add an Area C residence dummy variable, which takes a value of 1 for Area C residents and zero otherwise. The rationale behind this is to examine whether commuting to Areas A and/or B may offset any Area C wage differential.[9] As our place of work data is available only at the locality level, we are able to identify only those Area C workers who report their place of work also as their place of residence. However, a recent PCBS survey (from 2011) shows that most of Area C commuters report their place of work in areas A and B.

To investigate the importance of worker characteristics as distinct from location (restriction) effects, we add a vector, X_{itj}, that includes demographic, socioeconomic, and job characteristics. This includes gender, a dummy variable that takes the value of 1 for females and zero for males. Another dummy variable classifies workers based on marital status. It takes the value 1 for married workers and zero otherwise. We also interact gender with marital status (married × female).

We include workers' age in the model to reflect experience, and age squared to account for life cycle wage earnings. Educational attainment is controlled for by adding workers' years of education. To account for any cross-industry wage differences, a set of dummy variables codes for the type of industry in which people work. The industry vector includes (1) agriculture, hunting, and fishing; (2) mining, quarrying, and manufacturing; (3) construction; (4) commerce, hotels, and restaurants; (5) transportation, storage, and communication; and (6) services and other branches. The reference (omitted) industry is agriculture. We also add seven occupation dummies to control for observable career-skill differences. The groups are legislators, senior officials, and managers; professionals; technicians, associates, and clerks; skilled agricultural and fishery workers; craft and related trade workers; plant and machine operators and assemblers; and elementary occupations. The reference group is elementary occupation.

An employment status vector distinguishes workers based on their type of employer. This includes eight categories: public sector; formal private sector; informal private sector; foreign government; UNURWA; international organization; not-for profit organization; and others. The last one is the reference group. Another employment status dummy variable distinguishes between part-time and full-time workers, the former being the reference group.

The empirical work further includes district fixed effect dummies to control for cross-district differences that vary little over time. In addition, we include a set of regional dummies to (partially) account for wage differentials among cities, rural towns, and refugee camps. Finally, time (quarter) dummies are added to capture any national shocks such as the breakout of the second *intifada* in September 2000 or national demand shocks due to the frequent financial difficulties that have faced the Palestinian Authority (PA) on account of Israel's frequent withholding of the PA's tax returns.

The estimation strategy consists of multiple steps. The first is to estimate the wage differential for Area C workers relative

to those working in Areas A and B. In this regression, we add an Area C residence dummy to explore, as explained, the potential effect of commuting to Areas A and B. Moreover, we estimate a separate regression in which the sample is limited to Area C residents (Area C workers and commuters). This is to sort out any area-related unobserved differences in characteristics between Area C as compared to Area A and B workers.

Due to data limitations, we are unable to control for workers' unobserved characteristics, such as their innate ability, that might affect wage differences across workers. To estimate the extent to which any Area C wage differential is attributed to unobserved worker characteristics, we thus use the Oaxaca-Blinder decomposition technique that separates the wage gap into an explained part (workers' endowment effect) and an unexplained part (unobserved workers' characteristics).[10]

To address our main research question—whether Area C restrictions impose a wage penalty (lower wages) beyond the urban-rural effect—we restrict the sample to rural workers. In this analysis, an Area C wage differential is estimated relative to non-Area C rural workers (that is, Area B rural workers). A negative, and statistically significant, coefficient for the Area C work dummy variable would then suggest that an Area C negative wage effect pertains only to Area C workers. We also conduct a robustness analysis to learn how sensitive the results are to model specification. Specifically, we address selection issues which might bias the estimates if the distribution of employed individuals is not random or if there are other factors that might affect the probability of joining the workforce.

Table 1: Area C wage differential models: Pooled-OLS estimations

Variable/model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Area C residence	–0.05	0.00			
	(–0.99)	(0.04)			
Area C work	**–0.08**	**–0.05**	**–0.07**		0.06
	(–2.09)	(–1.75)	(–2.58)		(1.12)
Rural area				**– 0.13**	
				(–11.23)	
Years of education		**0.04**	**0.04**	**0.03**	**0.03**
		(22.34)	(6.68)	(22.28)	(11.49)
Age		**0.03**	**0.03**	**0.03**	**0.04**
		(10.75)	(3.07)	(10.73)	(7.42)
Age squared		**–0.00**	**–0.00**	**–0.00**	**–0.00**
		(–7.69)	(–2.08)	(–7.62)	(–6.08)
Married		**0.06**	0.06	**0.06**	–0.04
		(6.15)	(1.63)	(6.40)	(–1.53)
Female		**–0.36**	**–0.32**	**–0.35**	**–0.60**
		(–25.7)	(–5.51)	(–25.5)	(–15.5)
Married × female		**0.09**	0.06	**0.10**	**0.26**
		(5.81)	(1.09)	(6.17)	(5.75)
Dummy variables					
Industry	No	Yes	Yes	Yes	Yes
Occupation	No	Yes	Yes	Yes	Yes
Employment status	No	Yes	Yes	Yes	Yes
Urban/rural/refugee	No	Yes	Yes	Yes	No
District	Yes	Yes	Yes	Yes	Yes
Quarter (time)	Yes	Yes	Yes	Yes	Yes
Constant	**4.74**	**3.43**	**3.27**	**3.44**	**3.50**
	(104.3)	(45.5)	(22.5)	(45.7)	(22.7)
N	60,756	60,722	2,371	60,722	7,412
R-squared	0.10	0.42	0.41	0.42	0.32

Notes: (1) Entire sample I; (2) entire sample II; (3) Area C sample; (4) rural vs. urban; (5) Areas B and C rural observations only. All coefficients are rounded to the second decimal place; *t*-statistics are in parentheses. Coefficients reported in **bold typeface** are statistically significant at the conventional level of 10 percent or better.

Estimation results

Results of the base model

In this section, we focus on Area C wage differential results, although we briefly discuss notable results associated with the control variables as well. One potential problem with the model in equation (1) is that its residuals might be spatially correlated, biasing the standard errors of the estimates downward. To correct for this potential problem, we use Stata's cluster command, which assumes that the error terms are correlated *within* geographic clusters but uncorrelated *across* them. The geographic clusters are defined as workers' locality of residence.

The results are reported in Table 1. Model 1 presents the estimates of a parsimonious version in which $log\ w_{itj}$ is regressed on the Area C work dummy, Area C residence dummy, quarter dummies, and set of geographic dummies (districts and urban, rural, and refugee camp locations). The estimates will be compared to that of the base model (Model 2). The rationale behind this exercise is to explore the extent to which workers' characteristics explain any Area C wage differential. Thus, in Model 1, the coefficient of the Area C work dummy is negative and statistically significant at the 5 percent level, with an estimate of –0.08. This indicates that, on average, Area C workers earn about 8 percent less than Area C commuters and Areas A and B workers. In contrast, the estimated coefficient for the Area C residence dummy, while also negative, is statistically insignificant. This indicates that commuting from residence in Area C to work in Areas A and B offsets any area wage differentials.[11]

When controlling for workers' observable characteristics, the estimate of the Area C residence dummy remains statistically insignificant, while the negative coefficient of the Area C work dummy drops to 0.05 and is statistically

significant at the 10 percent (Model 2). This shows that nearly half of the negative wage differential of Area C workers is captured by differences in workers' observed characteristics.[12] As a robustness check, we re-estimate Model 2 with the sample restricted to Area C observations only (Model 3). The aim is to isolate any unmeasured differences in characteristics between Area C and Areas A and B workers. Using this specification, the coefficient of the Area C work dummy measures the wage differential between Area C workers and Area C commuters. The results of Model 3 show that the Area C work coefficient is negative and highly significant, suggesting that Area C workers earn about 7 percent less than Area C commuters, holding workers' characteristics constant.[13] (Models 4 and 5 are discussed later on in the article.)

As regards the control variables, Model 2 shows that the coefficients of the education and age variables are positive and highly significant. Age also shows a nonlinear effect, with a negative and highly significant coefficient. Further, the results show that the estimated coefficient for female workers, relative to males, is negative and highly significant.

Observed versus unobserved worker characteristics effect

Lack of data has restricted our empirical analysis to compare workers' wages holding observed characteristics constant. Still, unobserved workers' effect might be influential. For example, it could be the case that more able workers are more likely to commute to urban areas, where average wages are higher than in Area C. Consequently, the Area C wage differential might at least in part reflect a sorting effect such that a portion of the observed Area C wage differential reflects unobserved worker characteristics. To shed light on the size, if any, of workers' observed versus unobserved characteristics effect, we use the Blinder-Oaxaca decomposition technique.

The technique is an algorithm for the decomposition of wage differentials, which is based in our case on estimating a separate wage equation for those working in Area C and for Area C commuters. The wage decomposition equation is specified as follows:

$$(2) \quad \begin{aligned} LnW_{AB} - LnW_C = {} & (\overline{X}_C - \overline{X}_{AB})' B_{AB} \\ & + \overline{X}_{AB}(B_{AB} - B_C) + (\overline{X}_{AB} - \overline{X}_C)(B_{AB} - B_B) \end{aligned}.$$

The left-hand side term is the difference in mean log wages between Areas A and B workers and Area C workers. The right-hand side consists of three parts. The first, which is the difference in the endowment effect between the two worker groups weighted by the parameter estimates (B_i) from the Area C commuter model (the reference group), captures the explained part of the model and is attributed to differences in workers' characteristics (the endowment effect). The second term refers to the wage differential that is attributed to differences in the estimated coefficients of both models. And the third part is an interaction term that accounts for the differences in endowment and coefficient effects. The second and third terms together constitute the unexplained part (residual) of the wage differential.

Table 2: Commuters vs workers, Area C

Variable	*Commuters*	*Workers*
Years of education	**0.02**	**0.03**
	(6.99)	(5.44)
Age	**0.03**	**0.04**
	(3.94)	(3.80)
Age squared	**–0.00**	**–0.00**
	(–2.52)	(–3.03)
Part-time	**–0.07**	**–0.18**
	(–1.93)	(–4.08)
Married	**0.08**	–0.02
	(2.43)	(–0.42)
Female	**–0.27**	**–0.41**
	(–7.57)	(–7.29)
Married × female	0.01	**0.18**
	(0.12)	(2.42)
Dummy variables		
Industry	Yes	Yes
Occupation	Yes	Yes
Employment status	Yes	Yes
Urban/rural/refugee	Yes	Yes
District	Yes	Yes
Quarter (time)	Yes	Yes
Constant	**3.17**	2.73
	(19.70)	(10.27)
N	1,689	682
R-squared	0.50	0.40

Notes: All coefficients are rounded to the second decimal place; *t*-statistics are in parentheses. Coefficients reported in **bold typeface** are statistically significant at the conventional level of 10 percent or better.

The results, reported in Table 2, show that the wage coefficient estimates for Area C workers and Area C commuters are similar to the base model (Table 1, Model 3).[14] Nonetheless, the decomposition analysis shows that around 30 percent of the wage differential can be attributed to differences in workers' observed characteristics (Table 3).[15]

Area C wage differentials: Rural or restriction effect?

So far, we have shown that Area C workers do earn lower wages than workers in Areas B and C. Still, we cannot be sure whether Area C's negative wage differential is driven by the restriction effect as opposed to a rural environment effect. This is because almost all Area C localities are in rural areas.

Economists often suggest that urban wage premiums are attributed to the positive effect of urban agglomeration on worker productivity. The agglomeration effect is likely enacted via cities' role in enhancing learning and knowledge spillovers between firms and workers.[16] Another explanation for the urban-rural wage differential is the coordination hypothesis. It states that agglomeration economies facilitate worker-firm matching due to cities' higher job opening rates and reduced time and cost of job search. Yet other researchers highlight the significance of the sorting effect. Here the suggestion is that urban wage premiums are related to the role of cities as centers of consumption and urban amenities and thus are better able to attract skilled workers. Put differently, spatial differences in the stock of human capital and economic activities might contribute to the urban wage premium.[17]

To sort out the urban/rural wage effect, if any, we first estimate an urban-rural wage differential. This shows whether working in rural areas, including in Area C, imposes a wage penalty relative to working in urban areas. Then, to isolate the rural effect from any Area C restriction effect, we limit the sample to rural workers, i.e., those working in Area C and the rural part of Area B. Accordingly, if the Area C work estimate then turns out to be negative, and statistically significant, we conclude that Area C restrictions exert a negative effect on Area C workers indeed.

The results are in Table 1, Model 4. The coefficient for the rural dummy is negative and highly significant, indicating that rural workers earn, on average, about 13 percent less than do their urban counterparts, holding workers' observed characteristics constant. As for the rural-observations only sample, Model 5 shows that the coefficient for the Area C work dummy is positive but statistically insignificant.[18] This suggests that the Area C wage differential reflects a rural environment effect.[19] (We also estimated a separate regression in which we discard worker characteristics to sort out workers' observed effects. The results, unreported, show that the Area C wage differential estimate remains the same.)

The findings confirm our theoretical expectation, namely that negative labor supply shocks in Area C, that is, migrating or commuting to Areas A and B, are likely neutralizing the economic restrictions' negative wage effects (and restoring the initial equilibrium wage relative to non-Area C rural areas).

To further explore the mechanism of negative labor supply shocks in Area C, we estimate a probit model to examine the likelihood that Area C workers commute, relative to non-Area C rural residents. The rationale for restricting the sample to rural areas is, first, to be consistent with the wage model of the rural sample and, second, to purge all unobserved differences between rural and urban residents that otherwise might bias our commuting estimate.

Table 3: Blinder-Oaxaca wage decomposition analysis

Variable	*Log wage*
Area C commuters	**4.20**
	(368.58)
Area C workers	**4.12**
	(223.63)
Log wage differences	**0.08**
	(3.51)
Decomposition of log wage difference	
Explained by differences in worker characteristics	
Endowments	0.02
	(1.46)
Log wage differences due to unobserved effects	
Coefficients	**0.12**
	(4.61)
Interaction	**–0.06**
	(–2.75)

Notes: All coefficients are rounded to the second decimal place; *t*-statistics are in parentheses. Coefficients reported in **bold typeface** are statistically significant at the conventional level of 10 percent or better.

The probit model is specified as follows:

$$(3)\ Commute_{it} = \beta C_i + BX^*_{it} + d_i + q_t + e_{it},$$

where the dependent variable ($Commute_{it}$) takes a value of 1 for non-commuters (those working in the same locality as their place of residence) and zero for commuting workers. The key independent variable is the Area C dummy, C_i, which takes a value of 1 for Area C residents and zero otherwise. The vector X^*_{it} includes a number of socioeconomic and demographic control variables, including years of education, age, age squared, gender, marital status, as well as quarter and district dummy variables (and B is the coefficient for the vector). Similar to the wage equation, the sample is restricted to the 2001 to 2008 time period for rural workers above 14 years of age and who do not work in Israel or Israeli settlements in the West Bank.

The results, reported in Table 4, show that the coefficient of Area C dummy is negative and statistically significant, with an estimated magnitude of 0.24. This indicates that Area C residents are more likely to commute relative to other rural residents, *ceteris paribus*. The estimate of the Area C dummy shows that the probability for Area C workers to commute increases by 6 percent. This result provides some evidence to show that Israeli restrictions on Area C induce workers to

Table 4: Commuting differential between Area C and other rural workers

Variable	*Commuters*	
	Coeff.	*z*-statistic
Area C, years of residence	**–0.24**	– 2.69
Years of education	**–0.03**	–13.04
Age	**0.10**	36.93
Age squared	**–0.00**	–38.97
Married	**2.00**	8.45
Female	**–0.65**	–18.50
Married × female	–0.02	– 0.64
Dummy variables		
District	Yes	
Quarter (time)	Yes	
Constant	**–1.40**	6.75
N	191,179	
Pseudo R-squared	0.14	

Notes: All coefficients rounded to the second decimal place.

Table 5: Heckman's first stage selection model

Variable/model	*(2)*	*(3)*	*(4)*	*(5)*
Years of education	**0.13**	**0.10**	**0.13**	
	(37.15)	(7.1)	(37.14)	
Education categories				Yes
Age	0.00	–0.00	0.00	**–0.00**
	(0.26)	(–1.57)	(0.26)	(–7.88)
Married	**0.93**	**0.97**	**0.93**	**0.46**
	(46.21)	(14.70)	(46.22)	(9.03)
Female	**–0.50**	**–0.53**	**–0.50**	**–0.16**
	(–18.19)	(–6.67)	(–18.19)	(–2.57)
Married × female	**–1.06**	**–1.19**	**–1.07**	**-1.02**
	(–41.13)	(–15.96)	(–41.13)	(–13.53)
Constant	**–2.21**	**–1.86**	**–2.21**	**1.59**
	(–28.77)	(–8.15)	(–28.77)	(4.95)
N	350,467	16,271	350,467	18,010

Note: The models correspond to those in Table 1, i.e.: (2) entire sample II; (3) Area C sample; (4) rural vs. urban; (5) Areas B and C rural observations only. All coefficients are rounded to the second decimal place; *t*-statistics are in parentheses. Coefficients reported in **bold typeface** are statistically significant at the conventional level of 10 percent or better.

commute, thereby probably reducing the negative effect on Area C wages.

Robustness check: Selection bias

The reported estimates are based, of course, on observed wages for employed individuals. This might imply that the sample of working individuals is not random if there were circumstances that affect the probability of joining the labor force in the first place, leading to inconsistent and biased estimates (selection bias). To this for this, we employ Heckman's two stage approach.[20]

Table 6: Heckman's second stage Area C wage differential model

Variable/model	*(2)*	*(3)*	*(4)*	*(5)*
Area C residence	0.00			
	(0.04)			
Area C work	**–0.05**	**–0.07**		0.04
	(–1.75)	(–2.62)		(0.99)
Rural area			**– 0.13**	
			(–11.24)	
Years of education	**0.04**	**0.03**	**0.04**	**0.01**
	(17.00)	(6.36)	(16.88)	(4.31)
Age	**0.03**	**0.03**	**0.03**	**0.04**
	(10.79)	(3.10)	(10.77)	(8.23)
Age squared	**–0.00**	**–0.00**	**–0.00**	**–0.00**
	(–7.72)	(–2.10)	(–7.65)	(–6.09)
Married	**0.07**	**0.07**	**0.07**	**–0.13**
	(5.97)	(2.09)	(6.21)	(–4.99)
Female	**–0.36**	**–0.33**	**–0.36**	**–0.47**
	(–26.64)	(–5.76)	(–26.43)	(–13.55)
Married × female	**0.08**	0.04	**0.09**	**0.44**
	(4.59)	(0.74)	(4.85)	(9.96)
Dummy variables				
Industry	Yes	Yes	Yes	Yes
Occupation	Yes	Yes	Yes	Yes
Employment status	Yes	Yes	Yes	Yes
Urban/rural/refugee	Yes	Yes	No	Yes
District	Yes	Yes	Yes	Yes
Quarter (time)	Yes	Yes	Yes	Yes
Constant	**2.74**	**2.91**	**2.74**	**3.08**
	(42.89)	(20.64)	(42.32)	(29.67)
λ	0.01	0.02	0.02	–0.35
	(0.01)	(0.02)	(0.01)	(–0.03)
N	60,722	2,371	60,722	7,412

Notes: The models correspond to those in Table 1, i.e.:(2) entire sample II; (3) Area C sample; (4) rural vs. urban; (5) Areas B and C rural observations only. All coefficients are rounded to the second decimal place; *t*-statistics are in parentheses. Coefficients reported in **bold typeface** are statistically significant at the conventional level of 10 percent or better.

The first stage model is based on estimating an employment participation model using a probit estimation technique, such that

$$(4)\ L_i = \mu H_i + e_i,$$

where L_i is a latent variable that equals 1 if worker i is employed and zero otherwise.[21] H_i is a vector of explanatory variables that affect the work decision, including years of education, age, gender, marital status, and married × female. The estimates from the probit model will be used to construct the inverse Mills ratio that is conventionally used to correct for

the sample selection bias, if any, in the wage equation.

The estimates are reported Table 5. The models correspond to those in Table 1. All employment participation factors in all of the models are statistically significant. We find that workers with a greater educational attainment are more likely to join the work force, and married individuals are more likely to get employed.[22] The coefficients for age, female, and married × female are negative, indicating a higher values for these variables are associated with a lower probability of joining the labor force, *ceteris paribus*.

The selectivity parameter, λ, is presented at the bottom of Table 6. The sign of λ is positive for all models except for the rural sample model (Model 5). In all models, λ is statistically insignificant, suggesting that sample selection concerns are not driving our original findings. And, indeed, the coefficients in Table 6 are very similar to the OLS model coefficients reported in Table 1.

Conclusion

The objective of this study is to examine the wage impact of Israel's constraints on economic activities and infrastructure development in the West Bank's Area C. We provide evidence to show that Area C workers suffer a wage penalty of about 8 percent relative to workers in Areas A and B. The results also show that when controlling for worker characteristics, the magnitude of the Area C wage differential drops by about half but is still negative. Government policies such as subsidizing educational attainment and funding skills-upgrade programs might be helpful to decrease the wage inequality between urban and rural areas.

We then extend our analysis to compare average wages between Area C workers and other rural workers and show that the wage difference is statistically insignificant. This indicates that the Area C wage differential we observe can be attributed primarily to a rural environment effect rather than to Israeli economic restrictions placed on Area C *per se*. This result indicates that the effect of Israeli restrictions on Area C wages is neutralized. We show that negative labor supply shocks (commuting) serve as a potential transmission mechanism. Specifically, we show that Area C residents are more likely to commute than their peers in other rural areas.

Notes

For research support and funding, we thank the Economic Research Forum and the Global Development Network.

1. Fertility: World Bank (2008). Settlements: B'Tselem's (2013).

2. United Nations (2011).

3. For a description of Area C and the development restrictions there, see B'Tselem (2013). Data in the paragraph are taken from the United Nations Office for the Coordination of Humanitarian Affairs in the Occupied Palestinian territories (OCHA).

4. World Bank (2008).

5. More recent: World Bank (2013).

6. The model assumes zero effects on wages in Areas A and B. We can relax this assumption such that workers who migrate or commute from Area C would increase labor supply in Areas A and B, leading to lower average wages there. The magnitude of the wage decrease in Areas A and B then depends on the share of migrants or commuters relative to the work force in rural areas that are not located within Area C as well as on the labor demand and supply elasticities. If the share of the migrants or commuters were large enough, we would expect that migration and/or commuting would lead to a new wage equilibrium that is the same across all three areas. Here, again, the net effect of Area C restriction can only be determined empirically.

7. In the pooled-OLS regression workers' wage are regressed on a dummy variable that distinguishes workers based on place of work (Israel or Israeli settlements versus local Palestinian labor markets), among other variables (district dummies, industry, and occupation dummies).

8. Existing literature: Daoud (2005); Daoud and Shanti (2011). Mincer: Mincer (year?).

9. Including an Area C dummy also includes all time invariant effects, such as distance to other localities in Area A and B. This captures spatial differences in commuting cost that might affect Area C wage differentials.

10. Blinder (1973); Oaxaca (1973).

11. As noted, one concern over excluding the observations of Palestinian workers in Israel or Israeli settlements is that it may affect the remaining wage equilibrium in Areas A and B. In a separate model, we controlled for their share at the district level. The results, not reported here but available on request, show that the wage coefficients for the Area C dummies did not change appreciably. The estimated coefficient of the share of workers in Israel or Israeli settlements is positive and significant at the 1 percent level. This indicates that increases in the share of these workers raises wages in the local labor market, reflecting the presence of an adverse labor supply shock effect.

12. Arguably, the control variables might capture some of the restrictions' negative effects on wages, that is, lower wages might be driven by restricting economic activities in Area C. If this were the case, the effect would be captured by the industry control variable. We thank an anonymous referee for bringing this point to our attention.

13. Moretti (2013) shows that spatial wage differences might be related to differences in the cost of living. Accordingly, it could be the case that the wage differential between Area C

and Areas A and B in Model 1 reflects differences in the cost of living between these areas. Unfortunately, we are unable to control for the cost of living as data is not readily available at the locality level. Nonetheless, the fact that the estimated coefficient for Area C work, in Model 3 is negative and statistically significant ensures that not controlling for the cost of living does not bias our estimates in a major way.

14. The estimates for the other variables also are similar except for married × female, which becomes statistically insignificant in the Area C work model.

15. The 30 percent difference is calculated by dividing 0.02 (reflecting differences in worker characteristics endowments) by [0.12 – 0.06], which reflect differences due to unobserved effects. See Table 3.

16. Agglomeration: Combes, *et al*, (2008); Rosenthal and Strange (2003). Spillovers: Glaeser (1999); Moretti (2004); Glaeser and Resseger (2010).

17. Coordination hypothesis: Kim (1990); Helsely and Strange (1990); Yankow (2006). Sorting effect: Fallah and Partridge (2006); Combes, *et al*. (2008); Mion and Naticchioni (2009); Matano and Natichchioni (2011).

18. The difference in industry distribution between Area C workers and non-Area C rural workers is minimal. In particular, about 62 percent of Area C workers are employed in the agricultural sector versus 52 percent for non-Area C rural workers. Also, 8.4 percent and 7 percent of Area C workers are employed in the commerce and hotels and other services sector (except for transportation, storage, and communications) as opposed to 4.2 percent and 11 percent, respectively, for the other group. Nonetheless, worker distribution for the other sectors (construction and manufacturing) is similar in both cases. Moreover, in terms of differences in educational attainment, the average years of education for Area C workers is 7.17, around 1.3 year less than for non-Area C rural workers.

19. That the estimate for the Area C work dummy is statistically insignificant does not rule out negative effects of Israeli economic restrictions. Any such effect might be transmitted via other channels that are not captured in our model. We thank an anonymous referee for raising this point.

20. Heckman (1974).

21. In another model, unreported, we estimated a Heckman first stage model in which selection is via workers' decision to join the labor force. This is particularly relevant in Palestine as the labor force participation for females is so low, reaching only about 13 percent in 2008. However, the results show that Area C wage differential results are unaffected.

22. We were unable to run the Heckman model with years of education *per se*. With the specification of the OLS rural model, the log-likelihood of the selection bias model is not concave. To get around this problem, we used nine education categories. The results show that the selectivity parameter (λ) is negative and significant. Still, and confirming the OLS finding, the coefficient for the Area C dummy is statistically insignificant.

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Appendix

Assume that the labor supply and demand of Area C are linear and specified by $S = c + gW$ and $D = a - bW$, respectively, with slopes $b > 0$ and $g > 0$. The slopes reflect the degree of elasticity since the elasticity of the linear demand can be written as $(-1/b) \cdot W/D$. Therefore, for a given wage level, the greater the slope, the smaller is elasticity. Likewise, the elasticity of labor supply can be written as $(1/g) \cdot W/D$.

Utilizing the labor market clearing condition $D = S$, the equilibrium wage can be written as:

$$(A1) \quad W^* = (a - c) / (b + g).$$

The effect of an adverse labor demand shock on the equilibrium wage can be modeled as a decrease in the intercept, a. A comparative static analysis of the equilibrium wage shows that the new equilibrium wage, W', depends on the size of the shock and the magnitudes of b and g. Specifically,

$$(A2) \quad dW^* = 1/(b + g) \cdot (da).$$

The positive effect of an adverse labor supply shock on the new equilibrium wage (W') can be modeled as a decrease in c, such that

$$(A3) \quad dW^* = -1/(b + g) \cdot (dc).$$

Holding b and g constant, whether the initial equilibrium wage is restored then depends on the size of the supply shock.

THE ECONOMICS OF PEACE AND WAR IN THE CHINESE MILITARY CLASSICS

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Abstract

While some classics of Chinese military and strategic thought, like Sun Tzu's *The Art of War*, are well-studied by researchers and business professionals, lesser-known works in China's military canon have been neglected. This article surveys seven major ancient Chinese texts and discusses the contribution of each to the political economy of peace and war. As a rule, the writings stress the importance of nonviolent conflict resolution and advocate the avoidance of war whenever possible. In addition, they also consider the role of the state in war-making, especially its methods of war finance and attempts to encourage or discourage economic activity. They generally warn the state to limit its expenditure and impositions on the population so as to encourage the production of resources for use in military campaigns, should they become necessary.

For several centuries following the decline of the Western Chou dynasty (1045-770 BC), and prior to unification in 221 BC, the territories of what today is China were divided and ruled by a number of competing states. This period in the nation's history is considered one of its most important, as political decentralization encouraged some of China's greatest cultural and economic achievements.[1] Among these are listed numerous works of military strategy, most famously, Sun Tzu's *The Art of War*. Usually dated to the Spring and Autumn (722-481 BC) and Warring States (403-221 BC) periods, these classic military writings provide a window into the social and political upheaval that characterized the age.

Throughout the five centuries from the Western Chou to the founding of the Ch'in dynasty, the scale and scope of warfare in China increased dramatically, and with disastrous results for the populations of combatant states who found their lives and livelihoods destroyed by conflict. War was fierce and nearly constant, and often resulted in the extermination of losing states. This is evidenced by the fact that although more than one hundred kingdoms existed in the Spring and Autumn era, during the Warring States era, the major competitors were reduced to seven: the Ch'i, Yen, Han, Chao, Wei, Ch'u, and Ch'in. Each was eventually conquered by Ch'in, which completed its unification of China in 221 BC. It was in this context of incessant hostility that Chinese military thought developed: Constantly facing the threat of destruction, it became necessary for rulers across China to attract talented advisers whose wisdom would grant a competitive edge and secure the survival of the state.

Scholars of many disciplines have since looked to the Chinese military classics for insight into confrontation and conflict resolution. The most famous of these works, Sun Tzu's *Art of War*, has been translated many times over, and analyzed by practically every branch of the social sciences and humanities, and especially by the business disciplines. The reason for this attention is that *Art of War* contains a system of strategic thought that lends itself to social science interpretations. In particular, there is an emphasis in Sun Tzu's thought on universal principles of strategy that are often cast in essentially economic terms.

However, numerous other works are included in the canon of classic Chinese strategic thought. Like *Art of War*, these lesser-known texts also contain commentary on the economic aspects of peace and conflict. This article surveys their insights in an effort to position Chinese military classics among other important writings on the political economy of warfare. Because Sun Tzu's *Art of War* is the most well-known text, and because it contains and inspires lines of thought common to other classic writings, I discuss it first. I then examine several others in turn: (1) *Sun Pin's Military Methods*, (2) *T'ai Kung's Six Secret Teachings*, (3) *Methods of the Ssu-ma*, (4) *Wu Tzu*, (5) *Wei Liao-tzu*, and (6) *Three Strategies of Huang Shih-kung*.[2] Traditionally, there are seven Chinese military classics: Sun Tzu's *Art of War* and those just listed, excepting Sun Pin's text, plus a book known as *Questions and Replies Between T'ang T'ai-tsung and Li Wei-kung* which dates from the late T'ang or Northern Sung period. However, because *Questions and Replies* focuses on military problems and is largely a summary and discussion of ideas found in the other classics, I have replaced it with Sun Pin's work, which has a more economic tone.

Table 1 lists the name of each text, its traditional author, and its likely era of composition. Importantly, the historical origins of all of the texts are disputed as they are often

Table 1: Texts, traditional authors, and possible dates of composition

Era	*Text*	*Traditional author*
First Period	*Ssu-ma Fa*	Ssu-ma
	Art of War	Sun Tzu
Second Period	*Wu-tzu*	Wu Ch'i
Third Period	*Six Secret Teachings*	T'ai Kung
	Three Strategies	T'ai Kung
	Wei Liao-Tzu	Wei Liao
	Military Methods	Sun Pin

fragmented or have been heavily emended throughout the centuries. Although each work tends to be attributed to a single author, they were most likely compiled over a period of time by followers of the traditional authors (some of whom may even be fictional). Even taking account of recent archeological discoveries, the best one can hope for are broad guesses as to actual author and era. However, following the translator's suggestions, I tentatively assign the classics to three periods roughly corresponding to the beginning, middle, and end of the Warring States era.[3]

Sun Tzu's Art of War

Sun Tzu's classic needs relatively little introduction, as it is well-known in the West. In particular, *Art of War* has been studied most often in relation to business management and business ethics. However, scholars have long argued the relevance of the text for the social sciences generally, and its economic implications are still studied. For the purposes of this article, two points are worth emphasizing: the costs of war and the need to avoid armed conflict.[4]

Art of War emphasizes first and foremost the destructive costs of war and the need to engage in armed conflict only as a last resort. Even in extreme cases, where fighting becomes necessary, wars should be limited to the smallest and least costly scale possible. This point might not be obvious from a cursory reading of the text, however: The opening lines declare that "Warfare is the greatest affair of state, the basis of life and death, the Tao to survival or extinction. It must be thoroughly pondered and analyzed."[5] It might seem as if Sun Tzu glorifies warfare, or at the very least undervalues peace, but a closer reading reveals a fundamental concern with the destructive effects of conflict.

Sun Tzu ponders the money costs of military campaigns as well as the destruction of wealth they entail. He also indicates the tremendous costs to human welfare, both in terms of loss of life and national morale.[6] The greatest costs of war appear

Sun Tzu's *The Art of War* is a widely-known and well-studied classic of Chinese military thought. This article introduces and discusses less well-known classic Chinese military and strategic writings and examines them in regard to the economics of peace and war. As a rule, the writings stress the importance of nonviolent conflict resolution and advocate the avoidance of war whenever possible.

whenever actual conflict occurs, and especially when it is prolonged. Thus, Sun Tzu states that "No country has ever profited from protracted warfare."[7] A long campaign can only bankrupt the victorious nation while destroying the conquered. Extended warfare is essentially self-defeating; a Pyrrhic victory is no victory at all.

The text elaborates, explaining that superior strategy takes every opportunity to reduce conflict and destruction:

> In general, the method for employing the military is this: Preserving the [enemy's] state capital is best, destroying their state capital second-best. Preserving their army is best, destroying their army second-best ... Subjugating the enemy's army without fighting is the true pinnacle of excellence ... Thus one who excels at employing the military subjugates other people's armies without engaging in battle, captures other people's fortified cities without attacking them, and destroys other people's states without prolonged fighting. *He must fight under Heaven with the paramount aim of 'preservation.'* Thus his weapons will not become dull, and the gains can be preserved.[8]

These passages highlight one of the fundamental themes in *Art of War*, namely, that the greatest achievement in war is to win without violence: "Subjugating the enemy's army without fighting is the true pinnacle of excellence."[9] In order to do this, the superior strategist must attack the enemy's plans rather than its soldiers or fortifications. The greatest strategies should anticipate the opponent's plans to neutralize them before they can be set in motion. Conflict becomes unnecessary when victory is achieved before the enemy can act. As Sun Tzu puts it: "If I do not want to engage in combat, even though I merely draw a line on the ground and defend it, he will not be able to engage me in battle because we thwart his movements."[10] The superior strategist makes war impossible for his enemies, and in this sense, preserves the state.

Sun Pin's Military Methods

The text attributed to the Warring States strategist Sun Pin is also entitled *Art of War*, although, to avoid confusion, it is also given the name *Military Methods*. Sun Pin is reputed to have

been a blood descendant of Sun Tzu, and there are indeed numerous similarities in their thought. But Sun Pin's writings are not part of the traditional canon of Chinese military classics, probably because for many centuries no surviving copies were known to exist. The historical influence of his ideas has therefore been limited. However, in the early 1970s, fragments of Sun Pin's text were recovered in a Western Han-dynasty tomb in Shantung province. Reconstruction of the fragments, which unfortunately contain many irrecoverable portions of text, has revealed a work very much in the tradition of Sun Tzu. It is in turn being studied in the social sciences, for instance with regard to its economic significance.[11]

In matters of securing peace and avoiding warfare, Sun Pin largely follows the lead of his ancestor, stating that "One who detests warfare is the army's true kingly implement."[12] Nevertheless, as with Sun Tzu, an underlying theme of Sun Pin's thought is that war is sometimes a necessary means of survival for the state.[13] Sun Pin also devotes more space than Sun Tzu to discussing relations between rulers and citizens in wartime. Especially important, he suggests that the state should not be restricted in its efforts to finance warfare:

> Private and state wealth are one. Now among the people there are those who have insufficient longevity but an excess of material goods, and those who have insufficient material goods but an excess of longevity. Only enlightened kings and extraordinary men know this, and therefore can retain them. The dead will not find it odious, those from whom it is taken will not be resentful. This is the inexhaustible Tao. When properly implemented, the people will exhaust their strength. Those near the ruler will not commit thievery, those far away will not be dilatory.[14]

The idea is that the affluent and the dead can be relieved of their wealth without complaint or hardship. However, Sun Pin's ideas for expanding the role of the state might be broader than this passage implies. In one of the damaged portions of text, when Sun Pin is asked how to strengthen the army, he replies "enrich the state."[15] The portions of text that explain this comment are lost, but some commentators have reconstructed the probable meaning: It is likely that Sun Pin is counseling the ruler to support the state by allowing the people enough freedom to prosper and accumulate wealth,[16] a policy that will both strengthen them for military service and generate the wealth necessary to finance expensive campaigns.

T'ai Kung's Six Secret Teachings

Several of the Chinese military classics have received little or no attention in Western social science, an unfortunate fact given the wealth of material they contain. One such work which does not enjoy the wide translation and application as the Sun family wisdom, is translated as *Six Secret Teachings*. Although it purports to be a chronicle from the late Shang and Western Chou dynasties, the conventional version of the text probably dates from the Warring States period.[17] *Six Secret Teachings* recounts the advice of a strategist now known as the T'ai Kung to two Chou kings, Wen and Wu, and describes the strategies that led to their overthrow of the debauched Shang dynasty. This unique historical context, whether the time line for the origin of the text is accurate or not, means it is the only Chinese military classic written from the perspective of a revolutionary endeavor.[18] It also means the text devotes special attention to strengthening the state economically and organizationally in preparation for war, even while claiming that the purpose of war should be to promote social order and peace. As in many of the other military classics, war is thought of as a last resort, to be used when there is no other way to restore harmony.

One reason *Six Secret Teachings* likely derives from the Warring States era is its incorporation of ideas from major philosophical schools that did not exist at the time of the Shang's overthrow. In particular, tenets of Confucianism, Taoism, and Legalism all are present in the text and clearly influence its strategic and economic outlook.[19] Each of these will be mentioned below.

In general, *Six Secret Teachings* attempts to outline ideal methods for constructing a social, economic, and military basis for the growth of the Chou state, to enable it to depose the Shang and return order to the kingdoms. The key to defeating a strong and established enemy state lies in building a prosperous and loyal state of one's own. It must be led by a benevolent ruler concerned with the people's welfare, one who will not only provide for their material wellbeing, but also demonstrate moral superiority over the enemy state. A Confucian influence is clear in this doctrine.

Wise rulers must provide benefits to the populace if they want to encourage loyalty and good service. In the words of the T'ai Kung: "In general, people hate death and take pleasure in life. They love Virtue and are inclined to profit. The ability to produce profit accords with the Tao. Where the Tao resides, All under Heaven will give their allegiance."[20] It is therefore vital to extend profit to the people, and securing prosperity is both good and necessary when building a strong state. If the ruler does not share benefits with his subjects, he cannot hope to win their allegiance: "All under Heaven is not one man's domain. All under Heaven means just that, all under Heaven. Anyone who shares profit with *all* the people under Heaven will gain the world. Anyone who monopolizes its profits will

lose the world."[21]

In terms of public policy, sharing profit generally means limiting state activity and allowing the populace to flourish without fear of interference:

> When the people do not lose their fundamental occupations, you have profited them. When the farmers do not lose the agricultural seasons, you have completed them. When you reduce punishments and fines, you give them life. When you impose light taxes, you give to them. When you keep your palaces, mansions, terraces, and pavilions few, you give them pleasure.[22]

Therefore, a wise ruler will be frugal and will not impose onerous duties on the public, or abuse his office. The T'ai Kung goes so far as to recommend that "Rewards and punishments should be implemented as if being imposed upon yourself. Taxes should be imposed as if taking from yourself. This is the Way to love the people."[23] The idea that the ruler should share in the hardships of the people is emphasized in *Six Secret Teachings* and leads naturally to the idea that rulers will often govern best by governing least. As an example of this type of governance, the T'ai Kung mentions one of the legendary Sage emperors who succeeded by "managing affairs through nonaction."[24]

In other words, a ruler who wants to groom his state for success in warfare must adhere to a generally *laissez-faire* policy, although the concept of laissez-faire as such would have been unknown to the classical strategists. Nevertheless, a relatively free populace can produce the material basis for government: "The ruler must focus on developing wealth within his state. Without material wealth he has nothing with which to be benevolent."[25] There is some similarity between the T'ai Kung's view and Sun Pin's ideas about enriching the state. This makes sense as both texts likely date from the same period. Both have precedents in Chinese philosophy as well, especially in Taoism, some branches of which contain definite anti-state ideas.[26] However, the strategists have different ends in mind: The military authors wish to use prosperity as a potential source of war finance and as a tool for encouraging loyalty to the state, goals the Taoists did not share.

Six Secret Teachings also offers advice on how to promote trade in a way that works to the state's advantage. The T'ai Kung instructs King Wen to safeguard the ruler's "three treasures," which are "great agriculture, great industry, and great commerce."[27] Each of the treasures refers to a different type of economic activity: agriculture to farming, industry to the artisans, and commerce to the merchant class. The emphasis on trade might appear to be an endorsement of the division of labor and commercial society. However, in the T'ai Kung's opinion, because each of these roles is vital, individuals should not be allowed to move between classes, lest they become distracted and abandon their "natural" duties.[28] Even though the T'ai Kung advocates a certain degree of economic freedom, then, he believes there should be limitations on the self-determination of the people. In addition to regulating the major professions, ministers should not be wealthier than rulers, and no city should be larger than the capital.[29] Again, it is important to remember that the advice in *Six Secret Teachings* is designed to produce a victorious war machine, which in the T'ai Kung's view requires restrictions on production and the division of labor.

Three Strategies of Huang Shih-kung

Traditionally, *Three Strategies of Huang Shih-kung* is also attributed to the T'ai Kung. Allegedly, it collects his strategic thought from a period toward the end of his life, following the Chou defeat of the Shang, the preparation for which inspired *Six Secret Teachings*. The two texts can therefore be thought of as bookends to the T'ai Kung's career, with *Three Strategies* focusing on peacetime administration following the conflict. As usual, the validity of the traditional authorship and dating is highly doubtful. Nevertheless, it is still useful as a way of framing the discussion.

Three Strategies has a more pronounced Taoist influence than some of the other classics, although it bears the heavy imprint of Confucian and Legalist thought as well. It emphasizes the importance of peace while leaving room for Confucian-style wars of rectification. In terms of economic policy, *Three Strategies* extensively develops the idea of a state in harmony with itself and the world, from the ruler down to the lowest-ranked common people. Conventional strictures about rewards and punishments as incentives are included throughout, along with extended discussions of the importance of employing worthy men while punishing the corrupt who sow confusion and discord and threaten the stability of the state.

Also prevalent is the notion that material welfare is the basis for a strong state and can only be cultivated if government restricts its predation:

> To treat the people as they should be treated means concentrating on agriculture and sericulture and not disturbing the people during their vital seasonal occupations. It means keeping taxes and impositions to a minimum, not exhausting their wealth. If you impose few labor services, if you do not cause the people to be overly labored, then the state will be prosperous and the families

> will enjoy pleasure. Only thereafter should you select officers to control and supervise them.[30]

Laws and regulations were viewed by the Taoists as artificial creations embodying a decline from virtue,[31] and this passage reflects the Taoist belief in limited governmental and bureaucratic interference in the lives of the people.

The Methods of the Ssu-ma

The text entitled *Ssu-ma Fa*, translated as *The Methods of the Ssu-ma*, was compiled in the fourth century BC, and coincides with the flourishing of military thought associated with strategists such as Sun Tzu and Sun Pin. In antiquity, the term Ssu-ma was a title that came to mean Minister of War, and the text appears to gather the insights of numerous men who held this position. Its original ideas pertain mostly to military administration and therefore give glimpses into the economic outlook of the authors, although fewer than some of the other texts. *Ssu-ma Fa* is the shortest of the military classics, having lost many of its chapters over time.

In accord with the Confucian doctrines of the period, the text discusses the importance of a righteous ruler who cultivates his Virtue, in turn leading to peace and harmony within the state. This is a common theme throughout the military classics, as mentioned below in the discussions of *Wu Tzu* and *Wei Liao-tzu*. However, in some ways the *Ssu-ma Fa* is more bellicose than other military writings, arguing that war is the true basis of political authority and is required to maintain the state. The need to govern thus implies the need for war, and governance is used as a justification for campaigns of rectification. According to *The Methods*, while campaigns are destructive, they are the means to an end: "If one must attack a state out of love for their people, then attacking it is permissible."[32]

Like *Six Secret Teachings*, *The Methods* recommends that rulers as much as possible avoid imposing burdens of warfare on the people, especially through disturbing agricultural production or by imposing corvée labor. This principle applies both to one's own populace and to that of the enemy: Foreign peoples must be protected during military campaigns and their persons and property be left undisturbed.[33] This policy seems to reflect, in part, humanitarian thinking in the Confucian vein, but also indicates the more Legalist notion that people must be made comfortable so that they will submit to new rule. Furthermore, numerous passages mention the need to ensure the loyalty of the people so that they can be effectively used by the state (an idea further discussed in the next section). The *Ssu-ma Fa* is therefore less useful as a guide to achieving peace than are some of the other military classics that stress the disadvantages of war and the importance of winning without fighting.

Wu Tzu

Wu Ch'i (c. 440-361 BC), whose life bridged the late Spring and Autumn and early Warring States periods, is considered to have been one of China's first great generals, a reputation reflected by the frequent juxtaposition of his name with Sun Tzu's.[34] His stature as a strategist receives further testimony through the preservation of *Wu Tzu*, a text attributed to him and that allegedly recounts his life and teachings. Like the other military classics, *Wu Tzu* is a hybrid of sorts, combining elements of Confucian and Legalist teachings and focusing heavily on the importance of law and the power of the state. It is therefore similar to the *Ssu-ma Fa* in that it is less interested in encouraging peace as such than in effectively executing war. Just like the other classic authors, Wu Ch'i emphasizes the use of rewards and punishments as fundamental tools for managing the army.[35] However, for him basic incentives are not by themselves sufficient to mold an obedient and effective fighting force.[36] In the Warring States period, Sawyer comments,

> [t]he mass mobilization of farmers to serve as combat infantrymen rather than simply as support troops meant their volitional consent had to be sought as well as coerced. They could easily flee to other states, most of which were beginning to welcome people to bring new lands under cultivation and increase the state's agricultural wealth.[37]

This reality meant that in order to ensure a steady supply of soldiers and domestic resources for war finance, states had to incorporate subtler methods of persuasion, especially those of the moral sort. This can be done, according to Wu Ch'i, by training the people to pursue the Confucian notion of righteousness, especially through observing the forms of propriety—the *li*—which can help encourage a sense of shame in those who ignore the needs of the state.[38] The desire to pursue righteousness and avoid shame can therefore be employed as more fundamental incentives than can simple material rewards and punishments.

The ideal of Confucian righteousness can also be used as a tool for promoting the interests of the state (a more Legalist notion), specifically, its desire to wage war. Military campaigns can be righteous from a Confucian perspective—if, for example, war is intended to restore harmony by deposing a debauched ruler—and using Confucian ideas to convince the people of the importance of the cause helps subvert natural desires to avoid conflict. War was clearly not in the interest of

the population that would be drafted into the army as well as obliged to finance the conflict. Like the *Ssu-ma Fa*, then, *Wu Tzu* is not very helpful as a guide to peaceful relations.

Wei Liao-tzu

Wei Liao is yet another author about whom little is known other than that he appears to have lived in the late 4th century BC. His book, *Wei Liao-tzu*, is similar to the other military classics in that it involves a discussion between the ostensible author and a ruler asking for advice in military matters. In this case, though, Wei Liao is called on to suggest policies that will halt the decay and eventual conquest of a state and return it to greatness.

Military and economic concerns come together naturally for Wei Liao, who suggests that economic conflict is the root of military conflict.[39] Increasing the power of the state therefore requires carefully managing and exploiting the resources of the people; hence, it also means encouraging economic activity of a sort. In one of the few explicit references to the power of markets found in the military classics, Wei Liao notes that weak states must rely on economic activity as a source of war materiel:

> Now if [one's resources] are neither sufficient to go forth to wage battle nor adequate to remain within the borders and defend the state, one must correct [the insufficiency] with markets. Markets are the means to provide for both offensive and defensive warfare. If a state of ten thousand chariots lacks states of one thousand chariots to assist it, it must have markets able to furnish one hundred chariots ...
>
> Looking without seeing and listening without hearing stem from the state not having markets. Now markets are offices for sundry goods. [The government should] buy items which are cheap in the market and sell those that have grown expensive in order to restrain the aristocrats and the people ... [W]hy is it the people have a famished look and the horses an emaciated appearance? The markets have goods to deliver, but the office lacks a controller. Now if you raise the best-trained army under Heaven but do not manage the sundry goods, this is not what is referred to as 'being able to conduct warfare.'[40]

Relatively developed markets are therefore necessary to provide resources to the state.[41] Yet Wei Liao is quick to add that these markets must be controlled by the state as well. Furthermore, the state is an active participant, as seen in the policy of buying cheap and selling dear. This, Wei Liao believes, will allow the state to take full advantage of the productive activity of the people.[42]

To strengthen the state, Wei Liao recommends increasing the population and maximizing agricultural production: "When the land is broad and under cultivation, the state will be wealthy; when the people are numerous and well-ordered, the state will be governed."[43] Once again one sees the notion, common to the classics, that material wealth and wellbeing must be fostered by the state—and impositions limited—so as to provide the material foundation for warfare, establish the state's own benevolence, and encourage loyalty.[44] Productivity might also serve as a basis for peace, because when a state is strong, it need not wage war: "When the state is wealthy and well-governed, although the people do not ... expose their armor, their awesomeness instills order on All under Heaven."[45]

Wei Liao also advises that armies should avoid destroying the lives and livelihoods of the people of opposing nations.[46] While Wei Liao does not frown on economic activity *per se*, he intends it to be regulated and controlled so that the interests of the populace and the state do not drift apart. Although stressing the importance of Confucian virtue in both government and the people, the Legalist theme of a strong authoritarian regime dominates his discussion, which advocates strict ideological and behavioral conformity with the state.[47] For the state to maintain control over its subjects, the people must be rigidly directed to those duties deemed necessary to its survival and strength: "We should cause that, apart from engaging in agriculture, there will be no means to eat, and apart from engaging in battle, there will be no means to attain rank. We should cause the people to bump into each other in competing to go out to the farms and into battle. Then under Heaven we will have no enemies!"[48] Prosperity is intended to strengthen the state and make it attractive to potential immigrants as well. The growing power of the state therefore discourages potential enemies from making war, seemingly promoting a kind of peace; but under an essentially Legalist form of rule, it is the peace of totalitarianism.

Conclusion

Although the classical strategists discuss war more often than peace, they do not take conflict lightly. In fact, economic elements in their thought often lead them to emphasize avoiding conflict whenever possible. For them, the ultimate victory is to win without fighting, and they eschew frequent, lengthy, and wasteful campaigns. The classics should not be read as endorsements of war, but rather as descriptions of how to execute it as quickly and painlessly as possible when it does become necessary. Unfortunately, the advice of the sages was seldom if ever put into practice historically, as the Spring and Autumn and Warring States eras witnessed a persistent

increase in the frequency and violence of war. Simply put, the power to define the necessity of war-making lay in the hands of states. It was possible, and common—especially through the Confucian notion of rectifying the wicked—for states to rationalize warfare based on nebulous conceptions of necessity, often involving the correction of an injustice. For all that they caution against war then, the military classics were unable to prevent it.

One important conclusion from all this is that problems of peace and warfare ultimately revolve around the state, an idea shared by contemporary social science researchers. In economics, for instance, the state is sometimes defined as an institution with a comparative advantage in violence,[49] and economists of several schools contend that states are inherently prone to war.[50] In fact, Charles Tilly (a sociologist) argues that warfare explains the emergence and persistence of the modern nation-state: Because only a relatively prosperous state can afford to bear the (historically increasing) cost of war, economic resources must be organized in such a way that they can be effectively exploited by government.[51] These ideas should not come as a surprise, given Sun Tzu's dictum that war is fundamentally about the state's survival, or the comments of other strategists regarding the need for the state to nurture economic activity for its own use. The Chinese military classics hint that the problems of ending warfare and promoting peace have their explanations in the nature of the state, and they certainly view warfare as a defining characteristic of government. Their ideas dovetail with contemporary research on the economics and sociology of violence, and even anticipate it to some extent.

In addition to their strategic insights, it is also worth studying the military classics as early artifacts of economic thought. Although economics as a distinct discipline did not emerge for many centuries after China's Warring States period, it was at roughly this time that ancient thought around the world began to develop different conceptual frameworks for economic thinking. To take one example, in their efforts to explain the nature of the *polis*, Greek thinkers also emphasized the military arts and agricultural production as fundamental institutions.[52] And similar lines of thought, especially stressing agriculture as the economic basis of society, appear to have been common throughout the ancient world. Old Testament, New Testament, early Christian, and Arabic writings sometimes criticize wealth accumulation through commerce, favoring instead relatively static agricultural societies. Several Roman authors argued along the same lines, including Cicero, whose ideas regarding the honorable profession of agriculture influenced some sixteenth-century cultures.[53]

One especially interesting avenue for future research is the relation between classical strategic thought and the institutional environment in which it flourished. For instance, how did Chinese political institutions influence the development of strategic thought? Did states reward innovation in military strategy at the expense of productive market entrepreneurship, à la William Baumol, and if so, does this help to explain the agricultural and sometimes anti-commercial attitude of the classics? Answers can only come from further research. But whether we find answers or not, it should be clear that the Chinese military classics provide ample opportunities for further discussion, especially in the economics and sociology of conflict, the history of strategy and warfare, and the history of political and economic thought.

Notes

1. Long (2003).

2. An anonymous referee points out that we cannot assume that a modern reading of these texts is consistent with what the historical authors meant. I agree and emphasize that this article is interpretive more than it is strictly historical. My aim is to add to the modern interpretations of the classics found in both Chinese and English-language literatures. Throughout, I rely on the work of Ralph D. Sawyer who has translated the military classics and provided extensive commentary (Sawyer, 1995; 2007). The Romanization and any bracketed material in the quotations that follow are his. Note that I use the names of the traditional authors to refer generically to the numerous individuals who (likely) authored and compiled the texts over time.

3. Sawyer (1995, pp. 73-77; 2007, pp. 16-18). For further discussion of competing theories regarding these historical details, cf. Sawyer (2007).

4. Social sciences: Boorman and Boorman (1964). Economics: See McCaffrey (2014).

5. Sawyer, Art of War (2007, p. 157). Note that when a reference is to a translated text, the text is indicated (here: Art of War). When no text is indicated, the reference is to Sawyer's commentary.

6. Sawyer, Art of War (2007, pp. 159-160).

7. Sawyer, Art of War (2007, p. 159).

8. Sawyer, Art of War (2007, pp. 160-161; emphasis added).

9. Sawyer, Art of War (2007, p. 161).

10. Sawyer, Art of War (2007, p. 167).

11. McCaffrey (2015).

12. Sawyer, Military Methods (1995, p. 101).

13. Sawyer, Military Methods (1995, p. 84).

14. Sawyer, Military Methods (1995, p. 127). A fuller interpretation of the economic content of this passage is found in McCaffrey (2015).

15. Sawyer, Military Methods (1995, p. 156).

16. Sawyer (1995, pp. 159-160).

17. Sawyer (2007, pp. 35-37).

18. Sawyer (2007, p. 27).

19. The basic tenets of Confucianism and Taoism are well known. Legalist philosophy focused especially on expanding the power of the state. Although not a formal school of thought, the Legalists generally opposed commerce and favored a strictly regimented agricultural society dominated by a strong state. Rulers are responsible for economic planning, which they enforce through a system of harsh punishments used as incentives (Fu, 1993, pp. 38-46).

20. Sawyer, Six Secret Teachings (2007, p. 42).

21. Sawyer, Six Secret Teachings (2007, p. 41; emphasis in original).

22. Sawyer, Six Secret Teachings (2007, p. 43). This passage is followed by another outlining the negative effects of the opposite policies (pp. 43-44).

23. Sawyer, Six Secret Teachings (2007, p. 44).

24. Sawyer, Six Secret Teachings (2007, p. 42). Nonaction evokes the Taoist notion of limited government interference with the populace. The Sage emperor's behavior is also described in more detail, for example: "What he allotted to himself was extremely meager, the taxes and services he required of the people extremely few. Thus the myriad peoples were prosperous and happy and did not have the appearance of suffering from hunger and cold" (p. 43).

25. Sawyer, Six Secret Teachings (2007, p. 47).

26. Carreiro (2013).

27. Sawyer, Six Secret Teachings (2007, p. 46).

28. One commentary adds that immobility between employments makes sense on Legalist grounds as well because it would make citizens easier to monitor and control (Sawyer, 2007, p. 402, n. 11).

29. Sawyer, Six Secret Teachings (2007, p. 46).

30. Sawyer, Three Strategies (2007, p. 294).

31. Long (2003).

32. Sawyer, The Methods of the Ssu-ma (2007, p. 126).

33. Sawyer, The Methods of the Ssu-ma (2007, pp. 126-128).

34. Goodrich (1981-1983).

35. Sawyer, Wu Tzu (2007, p. 214); McCaffrey (2014).

36. Sawyer (2007, p. 204).

37. Sawyer (2007, p. 457, n. 29).

38. Sawyer, Wu Tzu (2007, p. 208).

39. Sawyer (2007, p. 461, n. 12).

40. Sawyer, Wei Liao-tzu (2007, pp. 255-256).

41. Sawyer (2007, p. 473, n. 116).

42. This is an example of market entrepreneurship falling prey to unproductive or political entrepreneurship, as discussed in Baumol (1990) and McCaffrey and Salerno (2011).

43. Sawyer, Wei Liao-tzu (2007, p. 243).

44. Sawyer, Wei Liao-tzu (2007, pp. 254-255, 259); Sawyer, (2007, pp. 232-233).

45. Sawyer, Wei Liao-tzu (2007, p. 243).

46. Sawyer, Wei Liao-tzu (2007, p. 273).

47. Sawyer (2007, pp. 233-234).

48. Sawyer, Wei Liao-tzu (2007, p. 246).

49. North (1981, p. 21).

50. Salerno (2008).

51. Tilly (1990).

52. Rothbard (2006, pp. 7-8).

53. Baloglou (2012).

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THE POLITICAL ECONOMY OF SECURITIZATION: THE CASE OF BOKO HARAM, NIGERIA

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Abstract

Since the abduction in 2014 of 276 high school girls in a remote village, Chibok, in Borno state, Nigeria, the activities of the proscribed group Jama'atu Ahlis Sunna Lidda'awati Wal-Jihad, popularly known as Boko Haram, has received elevated domestic and international attention, as has the Nigerian government's strategy to deal with the group. Criticisms of the government's ineffective handling of the situation have been made by a number of foreign governments, and several of them have offered military, intelligence, diplomatic, and law enforcement assistance to Nigeria. From a political economy perspective, this article presents a critical reading and analysis of the local and international response to Boko Haram. It finds that an interest in the "securitization" of development prevails over a genuine peace and security agenda.

Since 2009, Boko Haram has grown to become a deadly terror organization, apparently more than a match for the military power of the Nigerian state. The group now presents a substantial threat to regional security. The Nigerian government and its external partners have responded to the crisis mostly in military terms, as denoted by the proscription of the group as a foreign terrorist organization (FTO) and a declaration of a state of emergency in Boko Haram's northeastern base. Nigeria's security forces have received counterterrorism and counterinsurgency training from the United States and other governments, as well as counterterrorism equipment and funding. Also since 2009, Nigeria's defense budget has increased greatly. Yet all these measures have failed to stop the group from carrying out almost daily attacks within and even outside of Nigeria.

This article investigates the macro- and micro responses to the Boko Haram conflict, looks at the political and economic conditions that have sustained it, and explains the relative lack of success against the group by the emphasis government forces and its allies appear to place on "securitized" development rather than on a more genuine peace and prosperity agenda. The findings indicate that the crisis supports a war economy that is gainful to the group as well as to some corrupt public officials in the government and its armed forces. The conflict is also nurtured by a strong quest for political power between and among Nigeria's leading parties and its northern and southern political elites. Also, external support indirectly and sometimes directly helps to sustain the conflict.

The article proceeds as follows. Starting with an overview of Boko Haram, it then discusses "securitization" and external and internal policy responses to the conflict, respectively. The last section concludes the article.

Boko Haram

Jama'tu Ahlis Sunna Lidda'awati wal-Jihad (People Committed to the Propagation of the Prophet's Teachings and Jihad), popularly known as Boko Haram, started officially in 2002. Its founder and charismatic leader, Mohammed Yusuf, was motivated to return the generally Islamic beliefs and practices of Nigeria's north to an imagined pristine, pure form by following strict codes prescribed by Prophet Mohammed. Yusuf and his followers were involved with the establishment of Sharia penal codes that started in Zamfara state and spread to Nigeria's other 11 northern states in the wake of the civilian rule of President Obasanjo in 2001. The failure to institutionalize that pristine form of belief, and the corruption of and perceived betrayal by northern political and religious elites, led to initial violent and nonviolent clashes between Boko Haram and local authorities, largely through public preaching and brazen criticism of conventional Islamic doctrines and its scholars and through limited armed clashes with police forces.

But since the extrajudicial killing of Yusuf in 2009, and the heavy-handed approach maintained by Nigerian security forces, Boko Haram has evolved into one of the deadliest terror organization in the world, headed by Abubakar Shekau. Its purported ideology is to impose Shariah law on the secular Nigerian state, and this is now mixed with other political and economic agendas. The group's activities are mainly restricted to its operational base in Nigeria's northeastern states, mainly Borno state, the home of its Kanuri-led leadership.[1] Boko Haram, however, has demonstrated a capacity to strike outside its base, as shown for instance by attacks in northwestern and northcentral states such as Kaduna, Plateau, and Kogi, in the capital, Abuja, and more recently even in a suspected attack in

Lagos (a significant state in the southwest). Boko Haram has splinter groups, the most prominent being Jama'atu Ansarul Muslimina fi Biladis Sudan (Vanguard for the Protection of Muslims in Black Africa), popularly called Ansaru. Together with its splinter groups, Boko Haram operates terror cells mainly in Nigeria's north but also in border regions and countries such as Chad, Niger, and Cameroon.

Boko Haram violence has grown from sporadic attacks carried out from motor bikes, to targeted assassinations, kidnapping, bombing of public places using improvised explosive devices (IEDs), to car and suicide bombings. Its attacks on security personnel have become less systematic and civilians are increasingly becoming direct targets. Boko Haram's sourcing of its arsenal has shifted from weapons seized in raids carried out on police stations and military barracks to arms smuggled from crisis-torn Libya, taking advantage of Nigeria's porous borders. Revenue sources include illegal arms deals, ransom for kidnapped foreigners and local elites, rents from local business people and some state governors (to prevent attack on those states), and possibly, donations from other regional terror groups.[2]

This article investigates the macro- and micro responses to the Boko Haram conflict, looks at the political and economic conditions that have sustained it, and explains the relative lack of success against the group by the emphasis government forces and its allies appear to place on "securitized" development rather than on a more genuine peace and prosperity agenda. The findings indicate that the crisis supports a war economy that is gainful to the group as well as to some corrupt public officials in the government and its armed forces. The conflict is also nurtured by a strong quest for political power between and among Nigeria's leading parties and its northern and southern political elites. Also, external support indirectly and sometimes directly helps to sustain the conflict.

Securitized development and macro-securitized responses

The end of the cold war in the early 1990s saw a growing interest in the relationship between development (freedom from want) and security (freedom from fear). Already ingrained in the 1948 United Nation's Declaration of Human Rights (UNDHR), development concept also entered the UN's Millennium Development Goals (MDGs), adopted by member states and other international organizations in 2000. That the MDGs entail a security dimension was not formally recognized by the UN General Assembly until 2008.

The freedom from want and fear concepts stem from U.S. President Franklin D. Roosevelt's Four Freedoms speech of 6 January 1941. The other two freedoms are freedom of speech and expression and freedom of religion.[3] While the latter two were already enshrined in the U.S. Constitution, freedom from want and freedom from fear were new elements, first mentioned by Eleanor Roosevelt in a 1 January 1941 speech, a few day prior to her husband's. The Roosevelts inspired the UN, and the new ideal formed the moral anchor for the development of the UNDHR as reflected in the General Assembly Resolution 217A (1948).

> … whereas disregard and contempt for human rights have resulted in barbarous acts which have outraged the conscience of mankind, and the advent of a world in which human beings shall enjoy freedom of speech and belief and freedom from fear and want have been proclaimed the highest aspiration of the common people.[4]

While freedom from fear signaled a desire to move toward a worldwide reduction of armaments, the notion of freedom from want refers to the provision of economic conditions that guarantee individuals within a state "a decent material standard of living, along with reasonable assurance it will continue (or improve)."[5]

Today, however, the ever-growing threat of transnational and international terror has changed the face of development assistance such that development aid is now seen as a security defense strategy, hence the term "securitized development." Securitized development defines a situation whereby development aid is given not so much to alleviate poverty or the material want of the poor, marginalized, and vulnerable, but rather to guarantee and protect the security interests of donors.[6] The War on Terrorism discourse, following the 11 September 2001 terror attack on the U.S., has played a decisive role in undermining the traditional role of development agencies and nongovernmental organizations. It is now not uncommon to see development intervention overlapping with military intervention, "often tied to 'rich country interest' [ranging] from drugs control to migration and energy security."[7]

United Kingdom

In the United Kingdom, for instance, the International Development Act of 2002—an Act intended to guarantee that development aid is used solely for poverty reduction—is undermined by the government's integration of development, defense, and intelligence resources into a single, coherent policy. While sounding reasonable, this arrangement has ensured that the Department for International Development (DFID) lost its former independence: It is now part of a new National Security Council.[8] U.K. development aid thus is diverted to "fragile" states such as Afghanistan, Yemen, Somalia, and Pakistan and used to counter terrorism. Fragile

states are seen less as places with populations in dire need and more as states that pose potential and substantial security risks or threats.

DFID's activities in Nigeria do not have a direct bearing on the Boko Haram crisis. It was not until July 2013, and at the request of the Nigerian government, that the U.K. proscribed Boko Haram as an FTO. A more direct involvement only occurred after the 14 April 2014 kidnapping of 276 high school girls by Boko Haram, with the U.K., alongside the U.S., China, France, and Israel offering aerial surveillance, drones, intelligence and information sharing, law enforcement, hostage-negotiation experts, development assistance, and special troops assistance. Emphasis is shifted to the security, rather than the development, of Nigeria.

European Union

The EU also plays a major role in establishing peace and security in Africa. For example, it leads the improvement of the Economic Community for West Africa States (ECOWAS), including training of the ECOWAS peacekeeping force, a task shared with the U.S. Articles 8 to 13 of the Cotonou Partnership Agreement articulate the relationship between the EU and Nigeria. The partnership involves concerns with peace and security. The EU recognizes Nigeria as a major contributor to peace and security in the Sahel region and provides support and training for Nigerian peacekeeping troops.

While the EU's development agenda is prominently highlighted, it conceals a more subtle security objective as evidenced by its preconditions of human rights, rule of law, and governance, and its concern with issues of migration and energy. It would seem that the EU's development policies in Africa have become politicized and securitized to produce "unsettling effects on the objectives of EC (European Community) development policies."[9] While the EU has provided development assistance to help Nigeria deal with the security issues in the Niger Delta region and in some northern states, the only hard stance toward the Boko Haram crisis to-date is the proscription of the group as an FTO in June 2014.

United States

The United States' Africa Command (AFRICOM) established by President G.W. Bush under the Department of Defense (DoD), was set up to mitigate security threats posed by fragile African states. AFRICOM, through the African Coastal and Border Security Program and the Trans-Sahara Counter-Terrorism Partnership, provides military training and border and maritime security in Africa. The U.S. Department of State (DoS) established a U.S.-Nigeria Bi-national Commission in 2010, aimed at improving good governance and transparency, promoting regional cooperation and development, energy reform and investment, and food security and agricultural investment. Nigeria benefits from a DoS Antiterrorism Assistance Program that provides funding, equipment, and training to countries fighting terrorism. The Nigerian government also enjoys the benefits of the DoS Counterterrorist Finance Project, which helps to fight terrorist financing and curtails the flow of funds to Boko Haram. In 2011, the DoS labeled three Boko Haram leaders—Abubakar Shekau, Abubakar Adam Kambar, and Khalid al-Barbaai—as Specially Designated Global Terrorists (SDGT), i.e., "foreign persons that support or otherwise associate with ... foreign terrorists."[10] Finally, in November 2013, DoS blacklisted Boko Haram and Ansaru as FTOs. The U.S. currently leads foreign intervention in the effort at rescuing the 276 girls kidnapped by Boko Haram.

However, the Leahy Vetting Process, under the U.S. Foreign Assistance Act of 1961, requires that the DoS and DoD vet foreign partners for human rights compliance to determine eligibility or continuation of assistance and training of foreign security forces. Starting in 2013 when Human Rights Watch published a report on Nigeria (HRW, 2013), the U.S. has threatened to terminate its support to Nigeria, following the indictment of Nigerian security forces for gross human rights violation in the fight against Boko Haram.

Foreign policy implications

The escalation of the Boko Haram conflict as measured by the increasing scale of violence in Nigeria (involving high civilian casualties and the use of sophisticated weaponry and tactics), the growing targeting of foreign nationals and interests, and the expansion of the violence into neighboring countries seem to have triggered an international alert. The EU and the U.S. have called for a constructive joint regional counterterrorism policy between Nigeria and its neighbors to check Boko Haram and halt its disruptive capabilities on the Sahel region. (States in the region such as Nigeria, Chad, and Cameroon are of strategic importance to world energy supplies.)

Some successes have been achieved as counterterrorism forces of neighboring countries such as Cameroon have apprehended several Boko Haram members and foiled their operations. There is also evidence of some intelligence sharing and cooperation between Nigerian troops and their counterparts. However, a significant level of mistrust prevails and seems to frustrate the progress of the joint regional counterterrorism cooperation.

Branding Boko Haram as an FTO can help the fight against the group as it can affect its financing and the movement of its members through sanctions including "denial of visas, blocking

of assets, prosecution of supporters who provide material support or funds, and deportation of members" and inform other countries to proscribe it.[11] In practice, however, this may have little impact as Boko Haram's sources of funding are largely unconventional, with few ties to the standard banking system for instance. Also, visa denials play little role as members restricted themselves to the Sahel region, needing no visa to travel the vast ungoverned borders of the region. Proscription may have a stronger impact at the domestic level, but only if Nigeria's government shows the political will to prosecute.

The direct assistance offered to the Nigerian government since the schoolgirls' abduction has yielded little. Moreover, the assistance may not be free of securitization if we consider the seeming geopolitical rivalry between the U.S. and China for access and control of Africa's abundant energy resources. China's trade volume in Africa is the highest, having reached USD210 billion in 2013, with the U.S.-Africa trade volume down to just USD85 billion in 2013.[12] Hence, the first-ever U.S.-Africa trade summit hosted by President Obama in August 2014 perhaps indicates the U.S.'s effort at strengthening its importance in Africa. However, a recent trade deal between the U.S. and Africa may have more to do with U.S. political and security interests in Africa than with trade *per se*.

Following up on this and on the absence of timely external intervention, particularly the restraint of the DoS in proscribing Boko Haram in 2011, one may conclude that the recent offers of intervention by the U.S., U.K., China, Israel, and France reflect less their interest in helping Nigeria to defeat Boko Haram than their own national and strategic interests (such as Boko Haram's expanding transnational terror ideology and affiliation to other international terror organizations such as the Islamic State and the specific targeting of foreign persons and business interest). Indeed, the Nigerian government and its military have accused the U.S. government of frustrating its counterterrorism effort against Boko Haram. It is, however, unclear if the U.S.'s restraint is based solely on its concern with human rights abuses and perceived corruption in the Nigerian military or more concerned with protecting its own national and strategic interests. Either way, development appears to play a decidedly secondary role.

Political economy and micro-securitized responses

Economic aspects

The people behind Boko Haram wield enormous power, part of which relates to money. Self-evidently, money is one of the forces that sustains the conflict. Since 2009, Nigeria has seen a ten-fold increase in defense budget allocations, from N100 billion (about USD$625 million) in 2010 to and N1 trillion (~USD6.25 billion) in 2014.[13] Ostensibly, the war against Boko Haram is the main motivation for this increase. In addition, on 25 September 2014, the Senate, amid stiff opposition from lawmakers, mainly from the opposition party, approved President Jonathan's request for a USD1 billion loan, to come in the form of supplies of military hardware (such as helicopter, ships, and armaments), logistics and training of armed forces, and other security services.

Apart from the substantial increase in the defense budget, supplementary security budgets, and external loans, the Nigerian government also receives external funding in the form of military aid. Thus, the U.S. supported the Nigerian government with USD2.2 million toward the building of a counterterrorism infantry unit and USD6.2 million for counterterrorism communication and surveillance equipment.[14] It is therefore possible that foreign governments and external organizations are contributing to protract the Boko Haram war, with unhelpful consequences. For example, seen from the viewpoint of government forces, external development and military aid in the form of cash follows a top-down approach such that the funds usually do not reach its intended target. Such monies, like the untaxable revenue accruing from primary commodities, fuels greed and corruption and sustains the violent conflict.[15] Despite ongoing economic reforms in Nigeria, the country is plagued by a massive lack of transparency and accountability. In a public letter, dated 4 December 2013, former central bank Governor, Mallam Sanusi Lamido, revealed that the Nigeria National Petroleum Corporation failed to remit a sum of USD49.8 billion of oil revenue to the central bank (later adjusted to USD10.8 billion after an account reconciliation carried out by the Ministry of Finance). It is therefore not surprising that the military and other law enforcement agencies are underfunded and lacking proper equipment to confront the seemingly superior man- and machine-power of Boko Haram. The unregulated, free flow of cash may have fueled corruption among military commanders who, for selfish gain, divert funds meant for soldiers' salary and for the upgrade of weaponry. This brings in focus the general absence of a transparent system to oversee the purchase of military equipment, explains the low morale among soldiers (there has been more than one mutiny in Maiduguri), and the relative incapacity of the military to face Boko Haram.

Also, the attempt to replicate the Niger Delta amnesty for the case of Boko Haram reproduces the structural violence that generally characterize economic and political policies of the Nigerian government. In his inauguration of the Presidential Committee on Dialogue and Peaceful Resolution of Security Challenges in the North, on 24 April 2013, President Jonathan

bowed to pressure from mostly northern elites to consider granting amnesty to members of Boko Haram. Underlying his decision was an economic logic that overestimated the success of the Niger Delta amnesty and underestimated the much more ideologically-rooted Boko Haram insurgency. Although the Niger Delta militancy is motivated by genuine grievances and aims at economic self-determination and development of the oil-rich region, the rebellion itself is more opportunistic in that the war economy includes a lucrative kidnapping and illegal oil-bunkering business. The Niger Delta amnesty can thus be seen as a formalization of the economic benefit of armed conflict to interested parties and a pay-off to militants: As long as the militants receive their stipends, there is an uninterrupted flow of oil, and oil revenue, as has been the case since 2009.

Far more than is the case for Boko Haram, the Niger Delta insurgency presents high economic incentives as its activities heavily affect Nigeria's oil-based revenue and pose a substantial threat to the international economy (Nigeria being an important supplier of oil and energy). The volume of external aid and assistance flowing toward the Niger Delta thus far exceeds that given toward Boko Haram (in 2011 alone, the EU's Commissioner for Development announced a total amount of EUR478 million for the Nigerian government going toward the consolidation of peace in the Niger Delta and other development projects).

However, "opportunistic rebellions (such as the Niger Delta insurgency) are even less likely to produce economic and social development than ideologically motivated rebellions,"[16] so shifting the Boko Haram conflict toward a Niger Delta-style amnesty is not likely to address the underlying issues. Indeed, with one year to go to the end of the Delta amnesty program (in 2015), and little proof of development in the region, one can begin to see cracks that suggest a continuation of violence in the Niger Delta region.[17] Hence, the statement that "[r]ebel leaders generally do well out of war, but cannot be bought off ex ante by government because they cannot be identified" cannot be more correct when one considers Nigeria's failed attempt to buy off Boko Haram members.[18] For example, in January 2014 it emerged that the Presidential Committee on Peaceful Resolution of Security Challenges in the North had been negotiating with Boko Haram impostors. On 15 January 2014, three men—Kalama Abba, Baba gana Mallam Saje, and Abba Sadiq—were arraigned in a Maiduguri High Court for claiming to be Boko Haram leaders and defrauding a member of the Committee, Barrister Aisha Wakil, of the sum of N70 million (USD431,886), a payment purportedly for convincing Boko Haram members to lay down their arms and embrace dialogue. There is suspicion that federal government officials and impostors were, and are, working together.[19] What we see is deep structural violence: The government strategically ignores root causes, choosing to reward violence and hence create a political economy of conflict that becomes cyclical.

That the Niger Delta insurgency is perceived as obeying a higher political economy or levels of economic incentives than the Boko Haram insurgency is evident in the inequitable 2014 Presidential special intervention fund allocated to both conflicts. While N63.2 billion (USD389.9 million) was allocated to about 30,000 ex-Niger Delta militants, a meager sum of N2 billion (USD12.3 million) was allocated to the whole of the crisis-torn northeastern region. This may in part explain the recent escalation of the Boko Haram crisis and its attempt to attack the country's economic base—the oil-rich Niger Delta region—as well as its spread beyond its northeastern base to the southern states. Essentially, Boko Haram seeks to enhance economic incentives to negotiate about political power.

Political aspects

On 14 May 2013, the federal government, with the approval of the House of Assembly, declared a six-month-long state of emergency in three states (Borno, Adamawa, and Yobe) in the troubled northeast. Despite opposition from mostly northern lawmakers, emergency rule has now been extended twice. This is not the first time emergency rule has been declared in Nigeria, or even by the Jonathan administration. On 31 December 2011, a limited state of emergency was declared in parts of Plateau, Borno, Yobe, and Niger states and included a temporary shutdown of international borders with countries bordering the affected states.

Opposition to a prolongation of emergency rule is based on its perceived ineffectiveness as Boko Haram evidently has become bolder and deadlier and its spate of attacks have resulted in a far greater loss of live and property than before the state of emergency. Governor Nyako of Adamawa state has accused the federal government and the ruling party of intent to commit genocide against the people of the region, citing the bloody Nigerian-Biafra civil war. The governor has been impeached by the Adamawa State House of Assembly and declared wanted for his "treasonable" statement. Similarly, there are ongoing impeachment proceedings brought against the governor of Nassarawa state and governors and deputies in opposition party-controlled states.

The impeachment of Nyako on corruption charges after his open letter is no coincidence, and the proceedings against opposition-controlled states all bear resemblance to the political strategy used by former President Obasanjo. The declaration of emergency rule in Ekiti in 2006 and the prosecution of opposition members using the Economic and

Financial Crimes Commission (EFCC) set up by President Obasanjo offer a handbook on political gaming in Nigeria. It is interesting to note that just as the case with Obasanjo, all these are happening a year before elections (in 2015).

Before the declaration of the state of emergency, there seemed to exist a seamless synergy among members of the Joint Task Force (JTF), comprising the military, police, and navy, and other security agencies such as custom and immigration. Between 2010 and 2012, Boko Haram was spreading its tentacles beyond the northeast and northcentral regions. For example, in 2011 Boko Haram carried out bomb attacks on the police headquarters and on the UN building in Abuja. The success of the JTF was remarkable as they did not only restrict Boko Haram attacks to the northeast, but pushed the group as far back as the outskirts of the northeast states.[20]

The federal government then declared a state of emergency in the northeast with the aim of stamping out any remaining threat. Also in June 2013, the Nigerian National Assembly and Senate approved the federal government proscription of Boko Haram as a terror organization. But the federal government's decision to consolidate its initial victory through the use of the extensive force that a state of emergency affords and the proscription of the group has, paradoxically, helped to sustain Boko Haram. Considering the level of destruction of lives and properties, due to crimes committed by both the insurgents and the Nigerian forces (since the declaration of state of emergency in the northeast from January to March 2014 alone, over 1,500 people were killed[21]), it is valid to question the usefulness of the state of emergency.

Related to the emergency rule is the fear that the military may have been compromised. It is not far-fetched to believe that there is a third column in the security formation. It is obvious that the JTF has lost its seamless coordination of activities and that the security services may have deliberately ignored advance warning of impending attacks by Boko Haram. The lack of coordination among the security forces and their increasing human rights violation explains the reshuffling of service chiefs. It is no secret that President Jonathan's administration has been infiltrated by Boko Haram. The President himself admits it, but what has been referred to as his lack of political will in naming and prosecuting those involved reveals that there are strong "cabals" behind the events. It is likely that these cabals are responsible for sabotaging the government's efforts to fight Boko Haram. It is possible that these same cabals are behind the recent spike in bombings and attacks that have been ascribed to Boko Haram.

Underneath all this lies a power game between northern elite and southern minority interests as the blame game between the ruling party, the People's Democratic Party (PDP), and the opposition party, the All People's Congress (APC), proves. Accusations and counter-accusations between the ruling party and Presidency, on the one hand, and the leaders of the opposition party, on the other, have been flying back and forth.

Although Nigeria is home to a very large number of Muslims—about 53 million, more than in Afghanistan or in Iran—it is yet to have a purely religious political party such as the Muslim Brotherhood in Egypt.[22] The political parties are a mixture of Christians and Muslims and of people of different ethnic groups. Hence, the mission to impose Shariah law on a secular state such as Nigeria can be interpreted as a political calculation to cause a crisis that will favor the reinstallation of northern regional hegemony which was lost in 1999 when power shifted to the South. Likewise, the campaign by the Christian Association of Nigeria (CAN) to portray the Boko Haram crisis as a religious war, as an attack by Muslims on Christians, may also be seen as a political move to attract the sympathy of foreign governments, especially of Western nations, who tend to display zero tolerance toward Islamic fundamentalism.

The internal crises in the PDP, revolving around issues of zoning,[23] power rotation, and President Jonathan's second-term ambition, all are familiar issues that confirm the north/south power struggle. Many northerners, and the PDP, have blamed the escalation of the Boko Haram crisis on President Jonathan's campaign for a second term, a desire they perceive to be in violation of the agreement to only one term and a northern-headed presidency in 2015. Inciting public statements made by prominent northern political and traditional leaders further exacerbate the tension and lend some credibility to the argument.

The aforementioned reshuffling of the service chiefs may not only serve as a response to allegations of corruption, human rights violation, and rivalry within and among the forces, but may also be a political statement by President Jonathan to control key institutions as he maneuvers the country toward the 2015 elections. Interestingly, all of the new service chiefs, with the exception of the Chief of Defense Staff, Air Marshall Alex Badeh, who is from Adamawa state (one of the troubled states), are from the south and mainly from minority ethnic groups. For instance, the Chief of Army Staff, Major General Kenneth Tobiah Miniman, hails from President Jonathan's own Ijaw minority group.

Conclusion

Unlike some established terror organizations such as al-Qaeda and the Taliban, which sport reasonably clear agendas, Boko Haram's goals are diffuse. The shifting pattern in its targets

and its operational dynamics, including its unconfirmed relations with external terror networks and the full range of its financial sources make it a difficult group to engage. What is not in doubt is the group's capacity to cause serious damage to the Nigerian state and to disrupt the whole of the Sahel region. Its importance is underscored by the growing recognition of its influence on, and relations to, other terror networks such as the Islamic State and Hamas in Gaza.[24]

Despite its deadliness, however, the counterterrorism approach to Boko Haram at the macro and micro level appear to be riddled with securitization rather than be concerned with genuine security. There is growing evidence in support of the strong economic and political motivations that underlie and sustain the violence. While, in a bid to stem perceived sabotage and corruption in the military, several court-marshal proceedings have been opened against mutinous and corrupt military personnel and while funds have been sought to improve the morale and fighting capacity of the military, a massive lack of transparency still prevails and little impact on Boko Haram is seen. Nigeria's government has shown little political will to prosecute high-profile individuals who have been fingered as sponsors of the insurgency. More so, external intervention has yielded negligible results, which has made their intention all the more questionable. As the 2015 elections approach, and with a fresh injection of funds into the counterterrorism effort, one waits to see what short and long term effects any of these efforts will have on the conflict.

Notes

1. Kanuri is perhaps the dominant ethno-linguistic group or *lingua franca* of northeastern Nigeria. It belongs to the Saharan linguistic family and is spoken by the Kanuri people (mainly in Borno state and across the Middle Belt states with varying dialects). The Kanuris are originally one with the Kanem people and controlled the ancient Kanem-Borno empire. They are mainly pastoralist.

2. Adibe (2013); Amaliya and Nwankpa (2014).

3. Roosevelt (1941).

4. From the preamble in the United Nation's Declaration of Human Rights (1948).

5. Dumas (2011, p. 13).

6. Van Rooyen and Solomon (2007).

7. Watt (2010).

8. ODI (2011).

9. Hadfield (2007, p. 39).

10. Poling (2013, p. 77).

11. Poling (2013, p. 76).

12. Sun and Rettig (2014).

13. ICG (2014, p. 30).

14. Gartenstein-Ross and Vassefi (2012).

15. Collier (2010).

16. Collier and Hoeffler (2006, pp. 18-19).

17. Nwankpa (2014).

18. Quote: Collier and Hoeffler (2006, p. 15).

19. ICG (2014).

20. Interview with a JTF sector commander.

21. AI (2014).

22. Ousman (2004).

23. "Zoning" refers to the policy of the ruling political party in Nigeria (the People's Democratic Party, PDP) whereby elective political positions such as the office of the presidency, vice president, Senate president are assigned in a rotational structure to specific areas among Nigeria's six geopolitical regions for specific periods of time.

24. Prime Minister Netanyahu compared Hamas to Boko Haram.

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POLITICAL INSTABILITY AND DISCONTINUITY IN NIGERIA: THE PRE-COLONIAL PAST AND PUBLIC GOODS PROVISION UNDER COLONIAL AND POST-COLONIAL POLITICAL ORDERS

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Abstract

This article explores the relative importance of pre-colonial institutional capacity and the effects of periods of peace and stability on long-term development outcomes in Nigeria. We use data on education, health, and public works at a provincial level from a variety of colonial and Nigerian state sources to apply a decade-by-decade analysis of public goods provision in Nigeria from 1900 to 2010. Using a newly constructed measure of pre-colonial institutional capacity our results suggest that colonial-era investments were influenced by pre-colonial conditions and that the *pax colonia* allowed for a strong path dependency until the second world war. Contrary to other studies, which find evidence of pre-colonial centralization affecting current outcomes. In particular, we find that the post-1945 era saw a break in the pattern developed earlier in the century. Rising regionalism from the 1950s led to violent conflict and military dictatorship and caused decades of unstable and unpredictable patterns of investment which ended only with the reestablishment of democracy in the 1990s. Therefore, a key explanatory variable to understanding patterns of public goods provision seems to be the level of political stability which the Nigerian state experienced at different points during the 20th century.

The news that the leader of South Sudan's opposition and rebel movement was seen reading a copy of *Why Nations Fail* in order to "to reflect on whether he is making the right decisions" is evidence of the wide-ranging influence of New Institutional Economics (NIE). This strand of academic thought sees weak institutional arrangements as the ultimate, most significant barrier to economic growth. Proponents have argued that weak states which cannot or will not protect property rights and functioning markets will be unable to provide their citizens with the public goods necessary for long term development. In the case of Africa, one important strand of this literature has suggested that regions which experienced greater levels of precolonial centralization have, since their independence, also seen higher levels of public goods provision through a greater level of state capacity. However, to define state centralization, in the pre- as well as in the post-colonial eras, in the context of Africa is problematic as measures such as population density, which have served as a suitable proxy in Europe and Asia, have been found to be unsatisfactory. To address this problem, economic historians have used a centralization variable taken from either the Murdock Standard Cross Cultural data set or from an updated version maintained by Douglas White at the University of California, Irvine. This article extends this research in two ways: First, it analyzes the decades between the pre-colonial past and the present to learn about the extent to which the present may have been determined by the pre-colonial past. Second, it suggests a new way to measure the degree of state centralization in the era before the arrival of Europeans.[1]

Beginning in the 1990s, a series of articles began to use econometric cross-country regressions in an effort to pinpoint the underlying cause of world economic inequality. A seminal study within the African context is the work of Michalopoulos and Papaioannou who document a strong association between pre-colonial political centralization and contemporary development. Another well cited article is that of Gennaioli and Rainer who argue that pre-colonial centralization predicts better modern-day outcomes, but in this instance focusing on education, health, and infrastructure rather than inequality. These studies have provided important insights into the role of deeply rooted pre-colonial institutions in shaping comparative regional development within African countries. However, other scholars suggest that such an approach is perhaps too deterministic and that an understanding of exactly how the past has influenced present-day outcomes requires investigating the long-term patterns of historical change. In this regard, it is important to appreciate that Murdock's cross-cultural samples and his ethnographic *Atlas* do not properly capture data on

pre-colonial centralization to begin with, as we will argue in the next section.[2]

We test the broad claim that the pre-colonial past still influences the present through a case study of public goods provision in Nigeria from 1900 until the 2000s. As Nigeria emerges as Africa's largest economy, and is predicted to soon become the world's third most populous nation, it is crucial to understand how the nation's history has influenced its development. Nigeria is very well suited to a study of historical complexity. The modern country of Nigeria contained within its pre-colonial borders the Sokoto caliphate, one of the most powerful and centralized indigenous African states of the 19th century, as well as smaller political entities such as the Yoruba successor states and the so-called "acephalous" regions of the Southeast. Different regions were integrated into both the Atlantic and Saharan economies, and inter-regional trade was long established. In addition, the country has had a range of religious traditions, from the relatively long-established tradition of Islam in the north to the missionary-led adoption of Christianity in the south, and to many regions where local religions have survived or been integrated into the imported Abrahamic traditions. During the course of the 20th century, today's Nigeria saw a succession of economic, political, and military shocks which followed the imposition, establishment, and end of colonialism. We use a newly developed measure of pre-colonial centralization to capture the degree of state capacity within each of Nigeria's present-day provincial borders before the arrival of the British. This is then correlated with a decade-by-decade, state-level analysis of government and nongovernment investments in human and physical capital.[3]

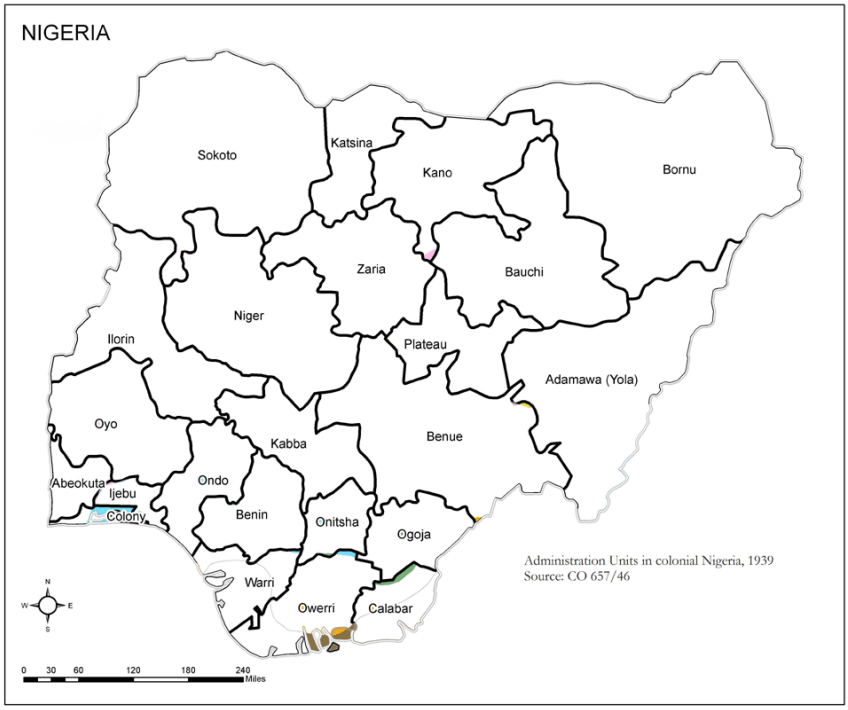

Figure 1: Administration units in colonial Nigeria, 1939.

We argue that the relative peace imposed by the early colonial state allowed pre-colonial institutions to determine the nature of public goods provision. However, in the post-colonial period the country experienced nearly four decades of political and military instability. The rise and fall of successive military regimes and unstable civilian governments effectively broke the patterns of investment established in the first half of the century. Our data suggests that it was not until the establishment of (relatively) stable democratic governments in the 1990s that correspondingly stable patterns of development re-emerged, ending decades of uneven region-driven policies. We interpret our findings as evidence to support the view that history does not necessarily constrain outcomes in the present and that policymakers need to be wary of viewing the past as deterministic. Our work adds support to literature that finds a strong negative connection between unaccountable dictatorial regimes and long-term development.[4]

Methods and data

Pre-colonial centralization

To measure the impact of pre-colonial centralization many scholars, especially in the field of economic history, have relied on the aforementioned cross-cultural sample compiled by Murdock. This vast work, based on anthropological observations, attempted to classify and code various aspects of different cultures around the world. One of these codes—32r/32t—assigned ethnic groups to one of four levels of "Jurisdictional Hierarchy" and has been used as a means of quantifying the extent to which "cultures," based on ethno-linguistic criteria, possessed complex institutional arrangements in the era before the arrival of European rule. But Murdock's *Atlas* does not in fact present a measure of institutional differences in the pre-colonial period and instead uses observations from around 1870 till 1960, ca. 90 years. In the case of Nigeria, the differences in this regard are striking: 71 percent of the observations included by Murdock occurred

after 1920 and 22 percent after 1940. Furthermore, by focusing on individual ethno-linguistic groups, the observations ignore the development of complex, multi-ethnic political entities and empires in 19th-century Africa. Thus it is necessary to find a new method with which to better capture the realities of the continent in the 1870s and 1880s, and specifically the concept of pre-colonial centralization.[5]

Although many of their conclusions are notably different, both Herbst, on one side, and Oasafo-Kwaako and Robinson, on the other, argue that definitions of political centralization developed for Europe are largely unsuitable in the sub-Saharan context. For example, in Europe, high-density populations and relatively limited, valuable land made conquest both possible and profitable. It also meant that states needed to be internally cohesive, with well-defended borders and the resources of the entire nation well-harnessed, in order to develop relations with, and control over, a country's hinterlands. Cities became important centers where capital could be raised for purposes of trade, defense, and aggression. Therefore, a successful European state, as defined by Max Weber and amplified by scholars such as Charles Tilly, was one where a human community was capable of claiming monopoly over the legitimate use of force within a given territory. The instrument of the state relies on its legitimacy, but also on constitutive elements such as a government, a military force, a territory, and the power of an administration to raise taxes from its constituents. Any administration should be able to maintain a satisfactory degree of civil order, be able to secure state's boundaries, issue and control a currency, provide public services, and raise public revenues to sustain the administration.[6]

Jeffrey Herbst, for example, argues that such a definition cannot hold true for pre-colonial, nor even for colonial or post-colonial Africa. A number of decisive factors prevented the establishment of the kind of centralized states characteristic of Europe. The terrain itself prevented the development of efficient infrastructure. Water-based travel was limited, the wheel often impractical, and beasts of burden excluded from much of the continent due to the disease-bearing tsetse fly. Even more crucial was the combination of very low population densities and the availability of huge swaths of unoccupied territory, which together always allowed the possibility of simply moving to escape the control of any predatory state or states. Furthermore, much of African agriculture was rain-fed and required little of the investment that might convince people to turn to a state for capital or protection. This meant, first, that wealth came to be defined by control over people, not land, and, second, that states were always fluid and dynamic entities, based on temporary loyalties, coercion, and the power of a military elite. Tribute, rather than tax would be paid as long as the center was powerful enough to project itself to hinterlands that otherwise could break away with ease. Therefore, successful African "states"—or, more particularly, coalitions of elites within a particular territory—were those that were able to successfully broadcast power from tightly controlled, but territorially limited, power centers. An example is the Asante "state," which was based around matrilineal kinship ties centered on the king, or Asantehene, in its central territories around Kumasi. This state then exercised power in ever decreasing circles of influence away from the capital. Another illustration from pre-colonial Nigeria might be the *ribats*, or new towns, established by the Sokoto caliphate in the 19th century, which allowed the broadcasting of power to newly conquered territories without ever seeking to directly control the surrounding territories.[7]

A famous book, *Why Nations Fail*, argues that pre-colonial institutions are partly responsible for post-colonial economic outcomes in developing nation states. But the institutional literature takes an approach that is perhaps too deterministic. This article re-examines the Nigerian case with alternative historical data and comes to a different conclusion: Inertial forces of the pre-colonial past may not determine the post-colonial present. The present has failings, and successes, all of its own.

What is needed therefore is a way of defining the extent to which elites in various African territories could effectively broadcast power and maintain their influence. One approach, which also carries considerable influence within the field of New Institutional Economics (NIE), is that of Douglass North and his co-authors. Their hypothesis is that the majority of states, or political orders, around the world today and throughout history work by aligning "the interests of powerful individuals to forge a dominant coalition in such a way that limits violence and makes sustained social interaction possible on a larger scale." Classified and labeled as "limited access order (LAO) or natural states," they posses two fundamental characteristics: (1) they limit access to organizational form and (2) they control trade. Recognizing that elites in certain states are more effective at exercising authority and promoting order, North, *et al*. divide LAO states into three groups, fragile, basic, and mature. For each, they then describe the extent to which governing coalitions are stable against external and internal shocks, are able to facilitate more complex economic and political activities, and can constrain and manage violence among themselves. Thus, a *fragile* natural state for instance is characterized by "commitments within the dominant coalition (which) are fluid and unstable, often shifting rapidly, and

Table 1: Example of limited access order (LAO) coding

Category	*Description*	*Score*
Fragile order: High. Category 1	Coalitions can only sustain themselves in the face of external threats; typically break up due to instability	1
Fragile order: Medium. Category 1	Coalitions can sustain themselves in the face of external threats and for the organization of trade; coalitions fragile	2
Basic order. Category 1	Durable and stable organizational structure	3

Table 2: Pre-colonial order scores by source

Province	*(1)*	*(2)*	*(3)*	*(4)*
Kano (Katsina)	40	Hausa	No data	2
Abeokuta	25	Yomba	1950	3
Ondo	20	Ekit-Yoruba	1950	3
Oyo	25	Yoruba	1950	3
Calabar	15	Ido-Edo	1950	1
Owerri	15	Ido-Edo	1950	3

Notes: (1) North, *et al*. taxonomy score; (2) ethnic group (Murdock); (3) date of Murdock observation; (4) levels of Jurisdictional Hierarchy in Murdock, code 32r.

dependant on the individual identity and personality of the coalition members." In contrast, *basic* states "sustain a durable and stable organizational structure for the state ... public institutions ... [and] provide standard solutions to reoccurring problems: succession of a leader, succession of elites, determination of tax and tribute rates, and division of spoils of conquest."[8]

We transcribed North, *et al*.'s descriptions of fragile, basic, and mature natural states into a taxonomy that can be coded (see Appendix, Table A.1). As it turns out, for many regions of Nigeria this threefold division can in fact be made more detailed, and thus we elaborated the taxonomy to include *Fragile Order High*, for the least well-ordered regions, and *Fragile Order Medium*, for those with slightly greater levels of institutional capacity. For each type of LAO "state" we developed eight categories which describe the effectiveness of elites at projecting order. Each numbered category is broadly comparable to the same number in the other types of LAO "states." For example, our first category focuses on the durability of elite coalitions which become progressively more stable as we move from low-order to higher-order LAO states (see Table 1 for an example and Appendix Table A.1 for the full table).

Next, we take the borders of the colonial state as the units of analysis. These were used to calculate regional levels of public goods provision in the 20th century. Until recently, these provincial borders, established by the British, were relatively stable and were used by post-colonial governments for purposes of census-taking, administration, and public goods allocation. For each province we identified ethnic groups via the Harvard Africa Map, and the geographic limits of the pre-colonial LAO "states" through analysis of primary and secondary sources. Using sources we determined just which taxonomic class best fit the ethnic groups or states within the province in the time period just before the advent of colonial rule in the 1870s and 1880s. For example, for the province of Kano (or Katsina) we identified four secondary sources which covered the relevant period. We went through each part of the taxonomy to see which item/s best matched the descriptions in each of the sources in regard to various degrees of state capacity. For instance, for Kano we decided that it best fit Basic Order Category 1 because throughout the century a series of administrative reforms reduced the powers of regional elites and centralized government. This served to promote stability and minimized conflict which meant that the region suffered few serious political or military disruptions. In this instance, the province was awarded a score of 3 points for Basic Order Category 1. In the case of Abeokuta province, also based on four sources, we awarded 2 points as we felt that the sources indicated that the province fit better with the descriptor in the Fragile Order: Medium category. This because elites were able to form coalitions to both defend themselves and to organize offensive warfare while also recognizing the nominal authority of a king. However, unlike in Kano, coalitions were never durable and different towns or areas fiercely and successfully guarded their independence.[9]

This process of identifying differing degrees of pre-colonial order exercised by elites across the entire country was always based on our subjective judgement. In addition, for some provinces primary and secondary data was unavailable. In these instances we made an estimate based on our conclusions from other areas. However, the advantage is that our analysis is based on a widely-cited study of institutional capacity and, more importantly, focuses on state development as it existed before colonialism. The results suggest a rather different pattern than that gleaned from Murdock (see Table 2). For example, according to the ethnographic *Atlas* the province of

Kano (Katsina) had fewer levels of "Jurisdictional Hierarchy" (code 32r) and was therefore less centralized than that of Abeokuta.

However, in the case of Kano (Katsina) province, Murdock's *Atlas* is looking only at the Hausa ethnic group. Although Hausa constituted the majority of the population, in the 19th century, the province was a significant part of the Sokoto caliphate, ruled by a coalition of a dominant Fulani elite along with prominent Hausa families and with a common conception of government based on both Islamic law and West African state precedents. The state was able to impose regular, standardized taxation, its institutions were robust enough to ensure relatively smooth transitions from one ruler to the next and, as mentioned, it was developing an increasingly centralized administration. In addition, as a political entity it was able to engage in complex activities such as to maintain a permanent army and to regulate long-distance trade.

In contrast, the Yoruba city states in Abeokuta did not have the same institutional capacity to project order. They were able to field armies in defense of their territory, maintained a degree of regional unity through promotion of the Ogboni secret society, and project common forms of hierarchal organization. But while the elites were able to create a degree of stability and sense of common identity, any attempts at greater degrees of centralization with one town or group gaining ascendency were largely failures. Even the most significant town, Abeokuta, was not considered at the time to have been run as a coherent town but as a conglomeration of villages over which the ruler had nominal authority.[10]

Public goods provision data

We collected annual data on public goods provision at the provincial level, which in most of British West Africa was the highest administrative unit within a colony (see Figure 1; Table 3).[11] The colonial administration invested in three public goods: education, health, and infrastructure. Every year British officials recorded how many teachers, schools, doctors, and hospitals were needed and how much of the collected local revenues and budget was allocated for public works. This detailed register enables us to retrieve original annual data for the *colonial period* from four types of annual government reports, namely the Administration Reports, Sessional papers, Correspondence letters, and the Bluebooks of Statistics. These four types of reports start at the beginning of the 20th century and continue until the late 1950s.

Regarding education, we collected data on the number of teachers, the number of schools, and enrollment rates per province for each year between 1905 and 1959. We normalized these figures per 10,000 inhabitants and aggregated them into ten-year averages which we then use as a proxy of investments in education. Similarly, we used the number of doctors, medical staff, and health facilities such as hospitals, dispensaries, and hospital beds as a proxy for health investments per 10,000 inhabitants. Finally, we collected the annual figures of road miles, railway miles, and telegraph line miles as well as the number of wells and bridges per province as a proxy of investment in public works.

For the *post-colonial period*, we collected data from the annual federal digest of statistics, various five- and ten-year development plans, several censuses, and the Central Bank of Nigeria. We retrieved information for each year available between 1960 and 2010 and used the ten-year average numbers of education, health, and public works per 10,000 of the population as proxies for post-colonial development. To

Table 3: Descriptive statistics

Variable	*Obs.*	*Std. dev.*	*Min.*	*Max.*
Pre-colonial order index	19	12.763	8.000	46.000
Education				
1910s	19	5.131	0.940	17.120
1920s	19	3.207	1.430	11.290
1950s	19	3.748	0.240	13.080
1960s	19	3.376	0.850	12.920
1980s	19	2.825	2.120	11.580
1990s	19	1.243	3.560	7.570
2000s	19	2.106	1.510	9.970
Health				
1910s	19	4.322	0.330	13.170
1920s	19	4.106	0.290	12.330
1950s	19	3.543	0.700	10.390
1960s	19	2.769	1.380	11.000
1980s	19	1.318	3.330	7.940
1990s	19	0.772	4.270	7.510
2000s	19	1.691	2.440	7.500
Infrastructure				
1910s	19	3.877	0.460	12.320
1920s	19	1.599	1.710	8.880
1950s	19	2.428	1.970	11.680
1960s	19	3.244	1.270	12.670
1980s	19	5.218	0.570	18.880
1990s	19	1.965	2.700	9.800
2000s	19	3.500	0.940	15.900

Note: All numbers are percentage shares of the total Nigerian budget allocated to a specified province. For example, the Max. figure of the Education 1910s variable shows that 17.12 percent of Nigeria's total educational budget was allocated to the province which received the highest share of that budget in the years between 1900-1910.

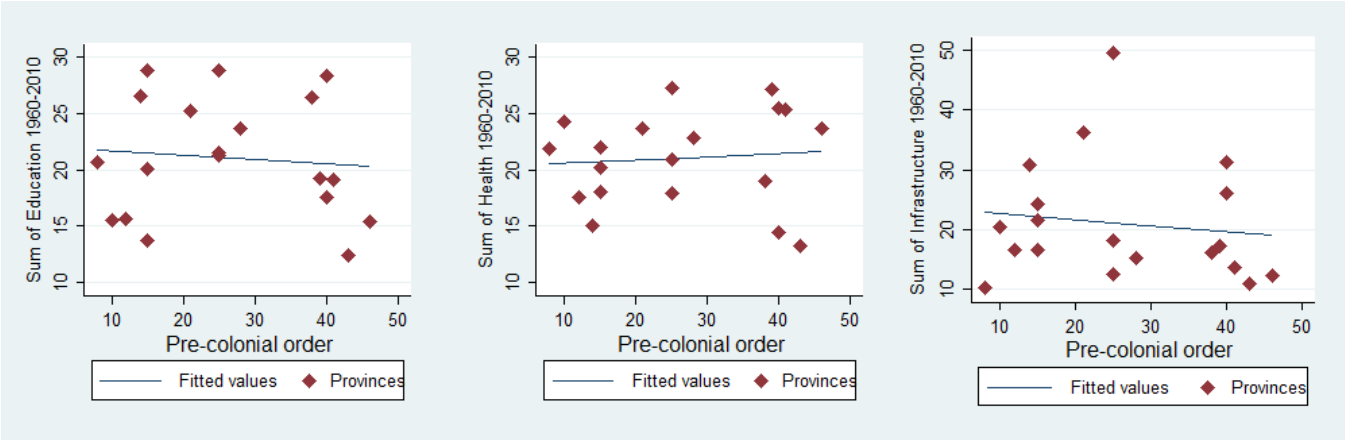

Figure 2: Pre-colonial order and 1960-2008 sum of education, health, and infrastructure.

compare the data across provinces, we created decadal percentage shares: Table 3 shows minimum and maximum shares across the 19 provinces for each decade for each public goods indicator. It is thus possible to see the spread of the share of public goods investments at the subnational level. From a comparative methodology perspective, we believe that this is an effective way of illustrating differences between and among provinces. But another reason why we treated our data in this decade-by-decade manner was that we wanted to highlight changing investment patterns following historical events of outstanding importance—such as multiple regime transitions, the Biafra (civil) war, and the discovery of oil—whose long-term impact would not readily be evident in a year-by-year time series.

In each case, we used outcome variables, not state budget allocations. We did this for two reasons. First, using revenue and expenditure to measure public goods provisions can be misleading as an indicator as throughout the 20th century there often was a mismatch between the distribution of resources and the results on the ground. For a start, in the colonial era much of the investment in human capital was undertaken by nongovernmental actors, such as mission stations, meaning that an analysis of governmental spending alone would not provide an accurate picture of levels of public goods provision. Moreover, in the post-colonial era political bargaining and corruption ensured that large proportions of state budgets were misappropriated or stolen. There are also the difficulties faced in disentangling the reality of government spending from the byzantine complexity of official financial accounts. In contrast, concrete outcomes, such as the number of hospitals, children in school, or kilometers of roads, can be more easily measured and verified and, more importantly, capture the reality of human and physical capital investments. The second reason for choosing our specific variables is that they were used by both colonial and post-colonial governments and therefore allow for consistent comparison over time.[12]

Results and discussion

Aggregated

To investigate whether or not there exist robust past-to-present correlations, we aggregated each outcome variable (education, health, and infrastructure) by adding all each variables' numbers from 1960 to 2008 and created three new variables, *sum of post-colonial education, health, and infrastructure*. This exercise aimed at falsifying hypotheses of path dependency stemming from centralized pre-colonial orders in Nigeria and carrying over to post-colonial public goods provision. To this end, we ran simple OLS regressions for each of the three public goods, and all of the estimated coefficients indeed turned out to be statistically insignificant. As seen in Figure 2, there does not appear to be a (statistically significant) trend, positive or negative, which implies that increasing pre-colonial order levels do not predict present-day outcomes. This finding casts doubt on that portion of the literature which champions the hypothesis of long-term path dependencies.

Pre-colonial order and public goods provision

To estimate the effect of pre-colonial order on public goods for each province, we ran several simple OLS regressions (equivalent to simple scatterplots between the two variables) using the newly constructed province-level measure of pre-colonial order as the dependent variable against each indicator for each decade in the sample. In this way, we aimed to investigate whether a consistent correlation, positive or negative, exists between pre-colonial order and (a) education, (b) health, and (c) infrastructure throughout the century. Table

Table 4: Education, health, and infrastructure correlations with pre-colonial order

Variable	*1910*	*1920*	*1950*	*1960*	*1980*	*1990*	*2000*
Panel A: Education							
Pre-colonial order	–1.194	–1.633	–0.938	0.141	0.533	–4.552	–1.084
	(–2.26)**	(–1.98)**	(–1.38)	(0.15)	(0.49)	(–2.04)**	(–0.75)
R-squared	0.231	0.168	0.076	0.014	0.014	0/196	0.032
Panel B: Health							
Pre-colonial order	–1.779	–2.366	–1.925	1.573	2.313	–5.356	–2.883
	(–3.11)***	(–4.84)***	(–2.66)**	(1.51)	(1.02)	(–1.41)	(–1.77)*
R-squared	0.363	0.579	0.293	0.116	0.057	0.105	0.156
Panel C: Infrastructure							
Pre-colonial order	1.705	2.677	–0.299	0.643	–0.345	–1.017	–0.833
	(2.50)**	(1.98)**	(–0.24)	(0.69)	(–0.59)	(–0.65)	(–0.97)
R-squared	0.268	0.171	0.003	0.019	0.019	0.024	0.052

Note: Slope coefficients are shown in the first row of each correlation and t-statistics are shown in parentheses. Levels of statistical significance at which the null hypothesis is rejected: *** 1 percent; ** 5 percent; * 10 percent.

4 shows statistically significant negative correlations for the two human capital measures—education and health (Panels A and B in Table 4)—with pre-colonial political order until the beginning of the 1950s.

This finding can be explained in that the colonial state was determined to preserve the *pax colonia* which it established after the violent conquest of Nigeria. Following *laissez faire* economics and indirect rule pioneered by the colony's first governor, the colonizers were largely successful in imposing a period of peace and stability. This however required the active cooperation of powerful local elites. The vast majority of European education and health investments were made by nongovernmental missionary organizations, and powerful Muslim emirs of northern Nigeria viewed them as a threat to their authority. Due to their preoccupation with maintaining order, the colonial regime was often actively hostile to mission activity in the areas formally part of the Sokoto caliphate. In contrast, missions had been operating since the 19th century in the more decentralized Southwest. In these areas, existing elites never had the power to block the spread of mission schools or health facilities, which often provided opportunities for social advancement by members of less privileged groups. The net effect was, however, negative such that an increase in pre-colonial order is associated with smaller health and education investments in the first part of the 20th century.[13]

In terms of physical capital, the correlation with pre-colonial order is positive (a higher level of order is statistically associated with higher levels of infrastructure investment) and is relatively robust throughout the colonial era until the independence period. This can be explained in that the principal government investment in Nigeria over this period was the construction of the railway and roads from Lagos to Kano which linked the more ordered territories of the Yoruba and the former Sokoto caliphate. We suggest that indigenous elites supported physical infrastructure investments because this assisted their motive to broadcast power, and the absence of which, as mentioned, could have posed a threat to their authority. It also seems that these patterns, across all three variables, were fairly constant throughout the period of colonial rule as the decade-by-decade correlations remain strong.

The post-colonial break in public goods provision

For the period after the second world war and leading up to independence in 1960, our findings indicate a break in the patterns established during the previous decades (see Figure 3). The key to understanding this break lies in the ever-increasing levels of instability caused by changing British policies toward political reform and public goods provision, which culminated in the Biafra war and an ongoing conflict over oil resources. The second world war had led to a boom in the Nigerian economy as demand for resources and therefore prices rose. The end of the war then brought about a severe economic slump and also the return of combat veterans less willing to accept rule by a clique of white men. Rising agitation led to a number of significant changes and power devolved to three regional blocks—the North, Southwest, and Southeast—in the so-called "tripartite system of government." Within each of these regional blocks "a single ethnic block came to political dominance and other minority groups felt insecure and

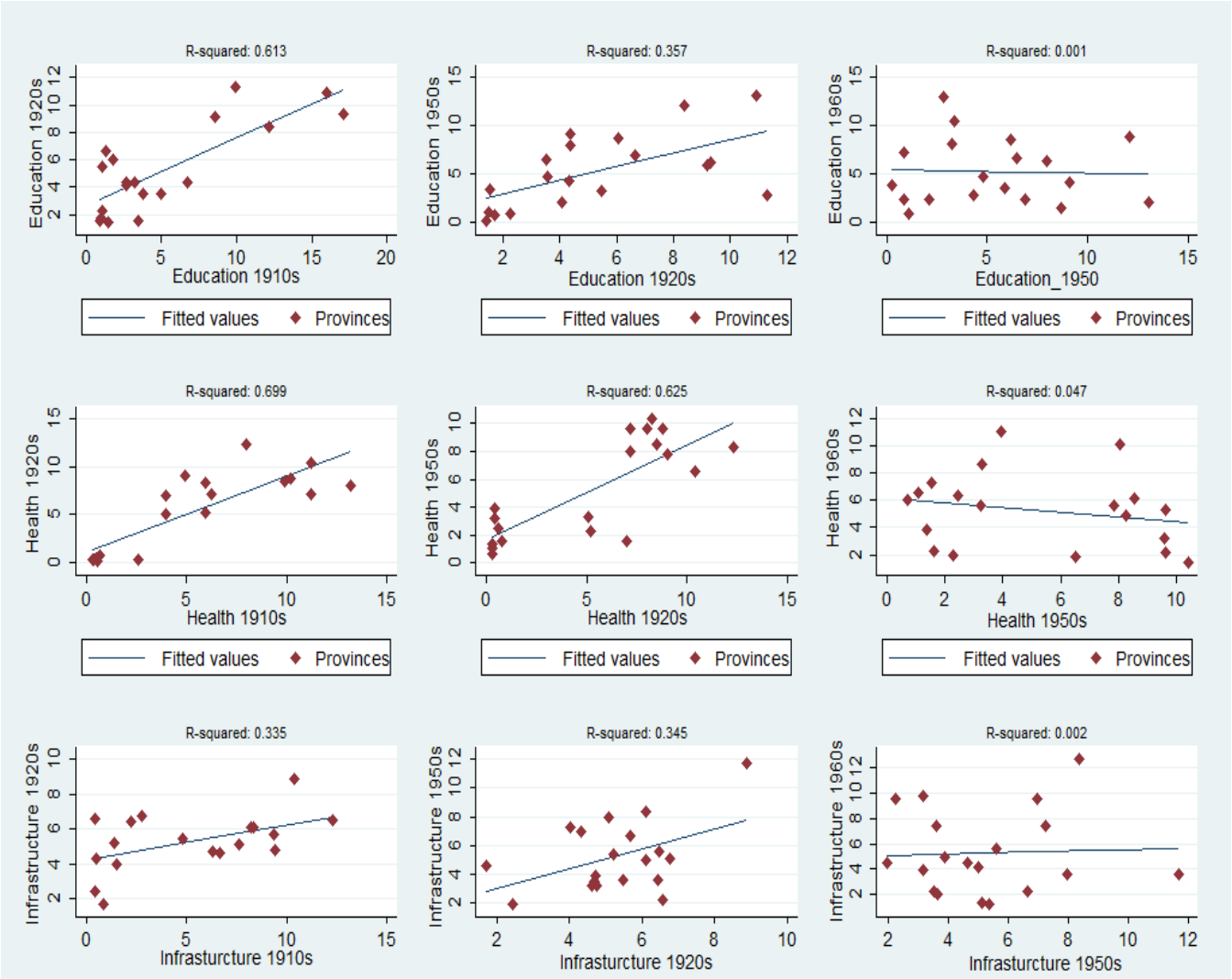

Figure 3: Decade-by-decade correlations, capturing continuity.

disadvantaged." None of the competing groups trusted the others, which led to increasingly bitter struggles to control the center with little incentive to compromise. This escalating tension, fueled by the potential rewards of political victory, seems responsible for the break in the previous pattern of all public goods investments.[14]

The rewards of political power

As from the 1940s, the British began to centralize government power and increase government spending through 10-year development plans and marketing boards, which controlled prices and output of major export commodities. Not only were such initiatives often ineffective, but it meant that capturing control of the center ensured considerable powers of redistribution, which had little to do with ideology but instead were "widely perceived as an area for the advancement of individual and community interests ... the steady expansion of state patronage in which political considerations rather than economic criteria were paramount [and] adversely affected the allocation of resources." Gradually, Nigerians came to play a dominant role in business, which in the early colonial period had largely been in the hands of foreign firms. Their financial support to regional parties was rewarded with handouts made possible by the new political system. This fusion of the worlds of business and politics made the former inefficient and the latter corrupt and saw the rise of a new breed of politician typified by Chief Nanga of Chinua Achebe's satire *A Man of the People* (1966). This ensured that the oil boom of the 1960s did not lead to an improvement in living standards for the majority of Nigerians but fueled political conflict among elites

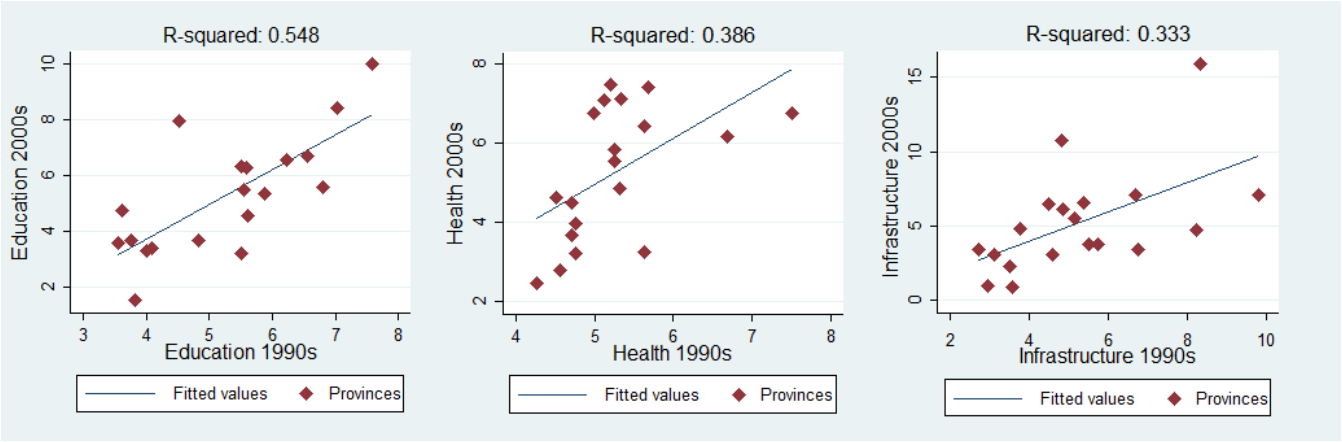

Figure 4: Recapturing continuity and the establishment of democracy.

who wanted access to this source of revenue and funding.[15]

At independence the new politicians who took over from the British thus came to power with the support of their own regions and ethnic groups and with few constraints on their exercise of power and patronage. The military coups of Ironsi and Gowon and the Biafran civil war only served to create a precedence of military rule in which state power was increasingly centralized in the hands of ever-changing elites with few checks on their powers to distribute largess to consolidate their positions and regimes. In terms of investment this was in part fueled by a feeling on the part of northern Nigerians that the South had so far enjoyed far higher levels of development and it was therefore necessary to reallocate funds to "catch up." This resentment was to lead to the massacre of southerners who had emigrated to the North and were seen to be taking jobs and business away from less skilled northern workers. No attempt was made to pursue policies that would encourage ethnic integration or tolerance and that might have led to positive economic outcomes. Instead, politicians could use violence as a justification for unlawful action, which would benefit themselves and their support base.[16]

Coups and civil conflict undermined or swept away the power of old elites and although some, such as the northern emirs, still held considerable power and prestige, they no longer constituted a dominant political class, even within their former territories. Instead, power over the distribution of Nigeria's wealth came to be held by a new breed of military rulers and politicians, characterized by policies of regionalism, military federalism, and nepotism. Unsurprisingly, the factors which had influenced the allocation of government funds in the era of colonialism no longer applied. More importantly, foreign rule no longer imposed political stability, which meant that it was impossible to establish any degree of continuity in investment policy and that at least partially explains why our data do not show any decade-by-decade correlations between the 1950s and 1980s.[17]

Peace and continuity

Not until the reestablishment of civilian government in the 1990s did any kind of meaningful pattern reemerge, with numbers from the 2000s correlating with those of the previous decade for all measures of public goods provision (see Figure 4). Until then, even the huge wealth accrued from oil revenues had little positive impact on development outcomes as the wealth was routinely misappropriated and, in some regions, was a source of conflict. While hardly ideal, only during the last 20 years has civil administration been at least partly constrained and held accountable by the democratic process. More importantly, this is Nigeria's longest period of relative peace and stability since the imposition of the *pax colonia*, thus allowing for greater levels of continuity. But since this reemerging pattern does not seem linked in any way to either the events or the political structures of the pre-colonial or colonial eras, we conclude that it is in fact a new pattern, and that it is in the period from independence to the end of military rule that explanations of present-day outcomes are more likely to be found.[18]

Conclusion

This article examined long-term changes in the patterns of public good provision in Nigeria across the 20th century. Using a newly constructed index of pre-colonial order, along with an extensive regional level data set, we find that socio-political conditions that existed before the arrival of European rule have not had a persistent influence across time and, in this instance, do not provide a satisfactory explanation for modern outcomes.

We argue that in the case of Nigeria patterns of path dependency were highly susceptible to periods of peace and security. During the *pax colonia*, the relative peace imposed by the early colonial state seems to have allowed pre-colonial institutions to determine the nature of public goods provision until the second world war. Conversely, our findings suggest that the insecurity and instability of the second half of the 20th century—the result of a complex and damaging process of decolonization, regionalism, and military federalism—effectively broke the link to the country's past. Our evidence suggests that the combined effects of state failure, the rise of regionalism, and (violent) conflict were responsible for the absence of patterns in our measures of human and physical capital until the restoration of more stable civilian government in the 1990s.

Beyond this specific findings, this article contributes more generally to the literature on the degree to which institutional factors bear on development outcomes in Africa. First, we provide a new approach to the measurement of pre-colonial state capacity. In our view, our measure better captures historical reality than does Murdock's *Atlas*. Second, our decade-by-decade analysis shows the value of examining patterns of long-term historical change so as to the determine exactly how the past may or may not continue to influence the present. In particular, policymakers should be wary of assuming that Africa's history is deterministic, and we expect that additional, data-driven, local case studies will yield illuminating results about the relative role of the pre-colonial, colonial, and post-colonial periods on development today. Third, our findings provide support for greater entrenchment of democracy and long-term political stability if Nigeria's people are to receive equitable shares of the country's investments in public goods.

Notes

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1. *Why Nations Fail* (see Acemoglu and Robinson, 2012). Quote: Fortin (2014) The book was also chosen by USAID's chief economist as part of his organization's monthly book club: http://blog.usaid.gov/2012/10/usaid-book-club-why-nations-fail/ [accessed 31 October 2014]. Significant barriers to growth: Acemoglu, *et al*. (2005); Rodrik, *et al*. (2004); Papaioannou and van Zanden (2015). Long-term development: Acemoglu and Robinson (2012). Greater state capacity: Englebert (2000); Gennaioli and Rainer (2007); Michalopoulos and Papaioannou (2013); Osafo-Kwaako and Robinson (2013). Unsatisfactory: See, e.g., Huillary (2011); Osafo-Kwaako and Robinson (2013). Murdock: Murdock (1969). UC Irvine: http://eclectic.ss.uci.edu/_drwhite/courses/index.html [accessed 9 March 2014].

2. Inequality: The most famous example is Acemoglu, Johnson, and Robinson (2005) which claimed to demonstrate that it was the failure of certain parts of the world to adopt European/North American institutional arrangements that led to current-day world income disparities. In the case of Africa such studies have looked at, among other topics, the impact of geography (Gallup, Sachs, and Mellinger, 1999), ethno-linguistic fragmentation (Easterly and Levine, 1997), and the slave trade (Nunn, 2008). Seminal study: Michalopoulos and Papaioannou (2013). Well-cited article: Gennaioli and Rainer (2007). Other scholars: For instance, Austin (2008); Hopkins (2009). Murdock: Murdock and, later, White, never intended to measure "centralization," and many of their observations were recorded well into the colonial era and not limited to pre-colonial time periods.

3. Third-most populous nation: Economist (2013); Economist (2014). Abrahamic traditions: Falola and Heaton (2008).

4. Negative connection: Papaioannou and van Zanden (2015); Olson (1993).

5. Field of economic history: Englebert (2000); Fenske (2014); Gennaioli and Rainer (2007); Michalopoulos and Papaioannou (2013). Murdock: Murdock (1969; 1981). Percentage of observations: Moreover, in 18 percent of cases no dates were recorded for the observations and in only one instance was an observation taken from before 1900.

6. Notably different: Herbst (2000); Osafo-Kwaako and Robinson (2013). Tilly: Tilly (1990).

7. Herbst: Herbst (2000). Tsetse fly: Alsan (2013). Decreasing circles of influence: Herbst (2000); McKaskie (2003). Sokoto caliphate: Last (1967).

8. Field of NIE: North, *et al*. (2009). Two characteristics and quotes: North, *et al*. (2009, pp. 35, 36, 42, 43).

9. Kano secondary sources: Smith (1997); Hogben and Kirk-Greene (1966); Bayero University (1983); Adamu (1999). Few serious disruptions: Smith (1997, pp. 280, 293, 294). Abeokuta secondary sources: Johnson and Johnson (1921); Peel (2003, p. 37); Llyod (1971, p. 28).

10. Our analysis is based on Johnson and Johnson (1921); Peel (2003); Llyod (1971); Adamu (1999); and Smith (1997).

11. For the full data set please contact the authors.

12. Nongovernmental actors: Frankema (2010). Misappropriated or stolen: Osaghae (1998); Marwah (2014).

13. Period of peace and stability: Lugard (1922); Reid (2012). Sokoto caliphate: Lugard (1919); Frankema (2012). Since the 19th century: Latham (1973).

14. Clique of white men: Falola and Heaton (2008). Little incentive to compromise: Forrest (1993); Diamond (1988). For example, the larger population of the northern regions ensured that its party was able to allocate the bulk of the 1962-1968 development plan's expenditure to the North. Also see Falola and Heaton (2008, p. 103).

15. Quote: Forrest (1993, p. 40). Access to revenue and funding: Okigbo, *et al*. (1989); Ovadia (2013); Collier (1981); Forrest (1994).

16. Power and patronage: Diamond, *et al*. (2013); Meredith (2011). Catch-up: Diamond (1988, p. 293). Northern workers: Diamond (1988, p. 49); Forrest (1993, p.31). Positive economic outcomes: Jha (2007).

17. Policies of regionalism, military federalism, and nepotism: Adebanwi and Obadare (2010); Osaghae (1998).

18. Source of conflict: Watts (1987, pp. 14-18); Nwajiaku-Dahou (2012). Democratic process: Adebanwi and Obadare (2010); Diamond, Adebanwi and Obadare (2013).

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Appendix

Table A.1: A taxonomy of pre-colonial order (category, description, and score)

Fragile Order High 1: Coalitions can only sustain themselves in the face of external threats, typically break up due to instability 1

Fragile Order High 2: Commitments within the dominant coalition are fluid and unstable, often shifting rapidly and dependent on the individual identity and personality of the coalition members 1

Fragile Order High 3: Shocks can easily lead to violence and the creation of a new coalition. Alternatively, shocks can lead to rearrangements with the coalition 1

Fragile Order High 4: Characterized by simple institutional structures / private elite organizations (e.g., secret societies) rarely beyond village level 1

Fragile Order High 5: Elites only commit to observe laws in very limited circumstances (e.g., external threats) 1

Fragile Order High 6: Patron-client networks dominate the organizations within fragile natural states but gains for both sides are very limited 1

Fragile Order High 7: Elites capable of organizing violence for limited periods of time (e.g., external threats) 1

Fragile Order High 8: Simple laws that govern the relationships among individuals based on social identity and stipulate a set of rules that patrons can use to make decision 1

Fragile Order Medium 1: Coalitions can sustain themselves in the face of external threats and for the organization of trade, coalitions fragile 2

Fragile Order Medium 2: Commitments within the dominant coalition show degrees of stability and are not always dependent on the individual identity and personality of the coalition members 2

Fragile Order Medium 3: Shocks can sometimes lead to violence and the creation of a new coalition. Alternatively, shocks sometimes lead to rearrangements within the coalition 2

Fragile Order Medium 4: Characterized by simple institutional structures / private elite organizations that can extend to province level 2

Fragile Order Medium 5: Elites only commit to observe laws to facilitate trade and in the face of external threats but instability prevents societies from forming durable forms of law 2

Fragile Order Medium 6: Patron-client networks dominate the organizations within fragile natural states, potential to accumulate power on both sides 2

Fragile Order Medium 7: Elites capable of organizing violence against internal threats and to maintain trade (monopolies) 2

Fragile Order Medium 8: Simple laws that govern the relationships among individuals based on social identity and stipulate a set of rules that patrons can use to make decisions 2

Basic Order 1: Durable and stable organizational structure 3

Basic Order 2: Standard solution to succession of ruler 3

Basic Order 3: Standard solution to succession of elites 3

Basic Order 4: Standardized tax / tribute rates 3

Basic Order 5: Standardized division of spoils of conquest 3

Basic Order 6: Common beliefs about the behavior among

elites 3
Basic Order 7: Only organizations with direct connections to the states are durable 3
Basic Order 8: Elite privileges closely aligned with the state 3
Basic Order 9: State used as the vehicle for complicated organizational activities—warfare, foreign trade, religion 3

THE EFFECT OF FARMER-PASTORALIST VIOLENCE ON INCOME: NEW SURVEY EVIDENCE FROM NIGERIA'S MIDDLE BELT STATES

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Abstract

This study estimates the relationship between violent conflict and household income in four states of Nigeria's Middle Belt region (Benue, Kaduna, Nasarawa, and Plateau) where farmers and pastoralists routinely clash over access to farmland, grazing areas, stock routes, and water points for animals and households. Although relatively low in intensity, this form of violence is widespread, persistent, and arguably increasing in its incidence. We obtained data on income and household-level violence exposure from an original household survey administered in September 2014. Employing a negative binomial instrumental variables model, we find an inverse relation between violence and household incomes. Incomes could be increased by between 64 to 210 percent of current levels if violence related to farmer-pastoralist conflict in the four study states were reduced to near-zero. Cumulatively, we find that forgone income represents 10.2 percent of the combined official state domestic product in the study area. This is high when compared to the costs of conflict measured in other studies, even as our study takes account only of microeconomic costs. After incorporating an estimate of the size of the informal economy, the microeconomic cost of farmer-pastoralist conflict to the total economy is approximately 2.9 percent.

This study seeks to understand the relationship between the violence that results from farmer-pastoralist conflict and household incomes in four states of the Middle Belt region of Nigeria, namely, Benue, Kaduna, Nasarawa, and Plateau. We created and administered an original, one-shot household survey designed to answer this research question: What is the effect of farmer-pastoralist violence on household income, both in general and by livelihood strategy?[1]

The analysis estimates *income foregone* as a result of violent farmer-pastoralist conflict. Our approach differs from typical accounting-cost attempts to sum the cost of conflict or benefits of peace. In contrast, we estimate household income that could be generated were violence reduced, as income loss is one of the many costs imposed on an economy as a result of violent conflict. We isolate the costs borne by households in terms of their ability to consume, save, and accumulate wealth as a result of lost income. Our work also generates microlevel data for use in a subsequent estimation of the macroeconomic cost of violent farmer-pastoralist conflict in a related study, also published in this issue.[2]

Background

Farmer-pastoralist conflict in the Middle Belt

Nigeria's ethnically and religiously diverse Middle Belt has experienced recurrent eruptions of violence over the past several decades. Disputes between pastoralists and farmers arise from disagreements over the use of land around farmland, grazing areas, stock routes, and access to water points for both animals and households. A range of interrelated factors underlie these disputes, including increased competition for land (arguably driven by desertification, climate change, and population growth), lack of clarity around the demarcation of pasture and stock routes, and the breakdown of traditional relationships and formal agreements between farmers and

pastoralists. These conflicts undermine market development and economic growth by destroying productive assets, reducing production, preventing trade, deterring investment by private sector actors, and eroding trust and social cohesion. Because livelihood strategies in Nigeria are closely tied to identity and because access to services and opportunities can vary across identity groups, many farmer-pastoralist conflicts take on ethnic and religious hues and are exacerbated along identity lines. Most farmers, for instance, are Christian, while most pastoralists are Muslim (see Table 1 below).[3]

Prior literature

A number of studies have sought to measure the effects of violent conflict on income, often through a proxy measure of consumption. For instance, one study traces the impact of conflict on consumption at the village level in Burundi, finding that areas that experienced 25 war-related deaths or injuries subsequently saw a reduction of consumption growth of 13 percent compared to those which did not. Another study finds lower post-conflict household consumption in households that experienced high-intensity conflict within Rwanda in 1994. The effects of conflict on income may be channeled through different mechanisms, among which is displacement. Thus, one study analyzes data from displaced households in Colombia and finds that displacement limits the ability of households to generate new income.[4]

The ability of households to withstand the effects of violence on income and to absorb income shocks differs across conflict contexts and households. It may depend in part on wider economic conditions, market functionality, and the flexibility of households with regards to livelihood practices. As Patricia Justino notes:

> A negative shock will result in losses in household utility and welfare if the household is not able to switch activities or no alternative activities exist. If the household is able to switch activities in order to take advantage of them […] then losses may be small or the effect may even be positive.[5]

The structure, nature, and functioning of the markets for goods and services supplied and demanded by an individual household suggest that even if an aggregate reduction in household incomes is observed across conflict contexts, some households will be more resilient and may even benefit from restructured markets. Aggregate figures may mask these countervailing tendencies, pointing to the need to disaggregate patterns by household characteristics and conditions as much as possible.

Nigeria's ethnically and religiously diverse Middle Belt has experienced recurrent eruptions of violence over the past several decades. Disputes between pastoralists and farmers arise from disagreements over the use of land around farmland, grazing areas, stock routes, and access to water points for both animals and households. This study estimates the effect of violence on forgone income.

Some studies have suggested that higher income levels correspond to a higher likelihood of being targeted in certain conflict contexts. For example, one paper analyzes the microeconomics of households affected by urban rioting in India and concludes that higher income per capita increases the likelihood of victimization through an opportunity cost mechanism. In common with the findings of other studies, the "target value" of a wealthy or high-income area may render it more vulnerable to violence, rather than less. The circular causation between violence and income indicates the need for an instrumental variable model to account for endogeneity. Finally, there is ample evidence at the microlevel that the experience of violent conflict can vary greatly between and among neighborhoods, households, and even family members, meaning that studies seeking to find relationships between violence and economic outcomes at the household level are most reliable when based on survey responses rather than imputing experience of violence based on, say, proximity to violent events.[6]

This study, then, adds to the sub-field of the cost of conflict literature dealing with income effects of violence. Its principal contribution is to evaluate the effects of violence in a non-civil war situation. However, it has other unique features as well. Existing research underscores the importance of empirical methods that account both for endogeneity in the relationship between income and violent conflict and derive measures of impact from methods sensitive to the variation in the effect of conflict within and across individuals, households, and communities. This study develops a model in line with these requirements in several ways. For one, it obtains disaggregated, household-level data, which is relatively uncommon—as mentioned, conflict researchers often presume that households experience more or less violence based on geographic or temporal proximity to violent events. The study also makes a unique contribution in applying these methods to a relatively understudied form and location of violence: Largely to the exclusion of the more quotidian farmer-pastoralist conflicts that characterize to a large extent violence dynamics in the Middle Belt region, and indeed large swathes of the African Sahel, media reports and academic studies of Nigerian violence have focused on petroleum extraction-related violence in the

Table 1: Cross-tabulation of survey respondents by livelihood and religion

Livelihood	*Muslim*	*Christian*	*Other*	*Total*
Farming	262	643	9	914
Pastoralism	393	56	1	450
Mixed	25	2	0	27
Other	65	145	1	211
Total	745	846	11	1,602

Note: 1,602 observations with valid responses for questions regarding livelihood *and* religion.

Niger delta region and, in recent years, violent extremism in the country's northeast. In contrast, the economic impact of the ubiquitous Middle Belt conflicts have only been indicated but not rigorously estimated.[7]

Methods

We use an original one-shot household-level cluster-sample survey (n = 1,607) administered in September of 2014 in rural areas of four Middle Belt states of Nigeria: Benue, Kaduna, Nasarawa, and Plateau. Previous research has found purposively designed surveys to generate better information on the broad range of effects of violent conflict on household income. In Nigeria, as in other contexts, existing recent surveys either do not collect data on income, do not collect data on violence experienced, or both (as in the case of the Demographic and Health Survey, DHS). As standard surveys tend to have some selection bias built into the sampling frame, we took care to aim for roughly equal representation between farmer and pastoralist households. For instance, it is likely that pastoralist communities are underrepresented in the DHS generally, due to the sampling frame being based on the Nigerian census. Sedentary settlements are privileged over temporary, nomadic ones, for obvious reasons. Moreover, there is some anecdotal evidence from Mercy Corps Nigeria staff that pastoralists who experience violence directed against their communities tend to move—whether deeper into the bush or across state lines. During the course of the administration of our survey, many pastoralist communities originally from Benue state had migrated recently to Nasarawa, where they felt more secure.[8]

Our survey was based on a 2-stage cluster sampling frame. The first stage selected the Local Government Areas (LGAs) to be sampled and determined how many clusters were in each sampled LGA. The second stage was done in the field, and required survey administrators to identify households in each community. Between these two stages, administrators identified specific communities to survey in each LGA by using randomly selected radii from the LGA centroid to capture a 20-degree section of each sampled LGA, assigning numbers to each community in the section, and then randomly selecting a number to identify a survey location. The survey design and sampling frame may be found in the Appendix. It is designed to be representative at the household level for rural areas in the study states. However, one weakness resides in the selection of villages within selected LGAs: While LGAs are selected on a population proportionate basis, villages have equal chances of being selected, privileging smaller villages disproportionately. Table 1 breaks out survey respondents by livelihood and religion.

Methodologically, we take a three-step approach. First, we run a 2-stage instrumental variable model to estimate the effect of violence on income. Second, we use a population attributable fraction (PAF) calculation to estimate the effect of a hypothetical reduction in violence to near-zero levels on total rural income. Third, we run adjusted predictions for each state of reducing violence to near-zero levels. This latter tactic will not only serve as a check on the PAF, but also break out results at a more local level.

Empirical strategy

At its base, this study seeks to assess the impact of farmer-pastoralist violence on income. But the relationship between the two variables is most often endogenous: While violence may depress income, high incomes may also attract violent attacks in the first place. Indeed, initial analyses from our survey data indicated that income and violence were significantly and positively associated with one another. We therefore use an instrumental variable (IV) approach. We chose to test as an IV candidate a binary variable indicating whether the INGO Mercy Corps had a programmatic presence in the surveyed community, since Mercy Corps' programs in the region are geared toward peacebuilding and violence reduction. Mercy Corps peacebuilding programs are often built around shared livelihoods projects, such as apiaries, raising the possibility that this choice of IV was poor. However, the variable proved both exogenous (i.e., not associated with the outcome of income) and relevant (i.e., associated with the main predictor of violence). However, it explains just 4.21 percent of the variation in violence, and its effect size is just around 38 percent of the interquartile range of the violence variable. These facts may signal that, while appropriate as an IV, it may not be strong enough to transmit a signal through regression

Table 2: Summary statistics for two outcome variables (in Naira)

Statistic	*Last month's income*	*Yearly income*
Observations	1,570	1,568
Mean	111,994	1,755,363
Variance ($\times 10^9$)	3,600	1,580,000
Skewness	39	39
Minimum	150	—
P25	20,000	200,000
P50	40,000	360,000
P75	70,000	720,000
Maximum	75,000,000	1,560,000,000

residuals in the presence of many control variables.[9]

Our second step is made of (a) a 1st-stage ordinary least squares (OLS) model predicting the violence variable and instrumented by Mercy Corps' program intervention, and (b) a 2nd-stage negative binomial estimator estimating monthly income as a function of violence and residuals from the 1st-stage model. Written as simultaneous equations, the IV model takes the form:

$$V_i = \alpha_0 + \alpha_1 MC + \gamma_i X_{in} + ... + \gamma_{in} X_{in} + \varepsilon_1 \quad \text{(1a)}$$

$$E(INC_i) = \mu_i = \exp(\beta_0 + \beta_1 V_i + \beta_2 \text{Res}_{V_i} + \delta_1 X_{i1} + ... \delta_{in} X_{in} + \varepsilon_2) \quad \text{(1b)}$$

The first equation models felt violence for household *i* (V_i) as a function of *MC*, the presence of Mercy Corps, and a given set of controls X_{i1} to X_{in}. The second, negative binomial, equation models last month's income of household *i* (INC_i) as a function of felt violence V_i. The latter is appropriate given that the outcome variable is extremely right-skewed and its variance is far greater than its mean (see Table 2).

Variables: Outcome, predictor, controls

The outcome variable is household income. We examine income because it is a useful indicator for microeconomic development: Income is the basis of Gross National Income (GNI), raising incomes is a goal of economic development, its absence is a globally accepted indicator of poverty, and, despite difficulties in data collection, income is relatively straightforward to measure. In addition, it has been shown that low incomes reduce the opportunity cost of engaging in violence, implying that raising incomes is a critical peacebuilding activity. We considered examining expenditure, which would arguably have fed more naturally into this study's macroeconomic counterpart. But expenditure might rise in crises, when households may need to dip into savings or even liquidate assets. Such expenditure may boost GDP in the short term, but it would be an unsustainable coping mechanism in the face of financial stress. Returning to income, there are two possible survey questions from which to derive the measure of household income, one asking for 'income reported in the last month,' the other for 'income in the last year' (see Table 2). We chose to work with the former as the belief that it is less prone to generalizations and therefore possibly more sensitive to the effects of recent violence.[10]

The average monthly income per household in our sample was 111,994 Naira, or roughly USD680, while the mean yearly reported income was 1,755,363 Naira, or about 146,000 Naira per month. The World Bank reports that the 2013 Gross National Income (GNI) per capita in Nigeria is 446,252 Naira per year, or around 37,200 Naira monthly, implying that on average, households have the approximate equivalent of three income-earning members.[11]

Regarding the predictor variable, we hoped to use a single variable to represent violence at the household level. But the common proxy of household fatalities seemed too insensitive, conceptually and statistically, not capturing nuances of experienced violence. Violence that causes injuries without fatalities, as well as threats of violence that provoke behavioral changes or restrict geographic access, could very conceivably affect household income. Therefore, we constructed a single predictor variable using the first eigenvector of a principal components analysis (PCA) of binary variables (household deaths, household injuries in the past year, and access impairment to various amenities due to threat of violence), categorical variables (degree to which access was impaired for certain amenities), and the sum of integer count variables (numbers of dead and injured due to farmer-pastoralist conflict). Data for all of these variables were collected individually in the administered survey. The primary component encapsulates 52.6 percent of the total variation in the violence variables (Table 3).

Names, types, and descriptions of household-level control variables employed are listed in an endnote.[12] We also control for state and cluster of each household.[13]

Population attributable fraction (PAF)

Following the first step model estimation, to estimate the total household income that would be gained if farmer-pastoralist violence levels were brought down to zero we then employ the epidemiological concept of a population attributable fraction

Table 3: Eigenvector of the violence PCA and their proportion of violence explained

(1)	*(2)*	*(3)*	*(4)*	*(5)*
1	3.15371	1.96692	0.5256	0.5256
2	1.18679	0.55483	0.1978	0.7234
3	0.63196	0.19141	0.1053	0.8287
4	0.44055	0.06488	0.0734	0.9022
5	0.37567	0.16436	0.0626	0.9648
6	0.21131	—	0.0352	1.0000

Note: (1) Component; (2) eigenvalue; (3) difference; (4) proportion; (5) cumulative proportion.

(PAF), or etiologic fraction. PAF is usually used to determine the proportion of disease incidence that is attributable to exposure to the risk factor. Here we want to estimate the income reduction that is attributable to exposure to violence.[14]

The PAF for adjusted predictions is often defined as

$$(2) \qquad PAF = \frac{\Pr(E|D) \times (RR_{adjusted} - 1)}{RR_{adjusted}},$$

where $Pr(E|D)$ represents the prevalence of exposure given the disease (in our case, the decile exposure to violence for each household), and $RR_{adjusted}$ represents the adjusted relative risk of disease (here, the adjusted prediction of income as a function of violence). To illustrate the concept, take the example of smoking (exposure) and lung cancer (disease). In this scenario, $Pr(E|D)$ represents the probability of being a smoker, given that one has lung cancer. In effect, this term identifies the total population, in proportional terms, that could be affected if smoking were eliminated. $RR_{adjusted}$ in this scenario represents the ratio of the probability of having cancer given smoking to the probability of having cancer given nonsmoking, controlling for age, genetic predisposition, etc. It is, in other words, the percentage increase in risk of cancer associated with smoking. Conversely, $(RR_{adjusted} - 1) / RR_{adjusted}$ then is the percentage reduction in adjusted risk of lung cancer given the elimination of smoking. Putting the two terms together yields the proportion of lung cancers among the smoking population that would be prevented with the elimination of smoking. The formulation, however, assumes that no lung cancers among the nonsmoking population could be prevented (e.g., through the removal of second-hand smoke), using the unexposed population as a baseline.[15]

In our application of the PAF, we likewise assume that the decile of households experiencing the least amount of farmer-pastoralist violence is our baseline or standard of comparison. Any decline in adjusted income in other deciles is then attributed to farmer-pastoralist violence. Equation (2) tends to overestimate the PAF as it assumes perfect additivity of the effects of variables when included in a single model, that is, $E_A + E_B = E_{(A+B)}$. To mitigate that risk, we implemented a statistical formulation allowing for $E_A + E_B > E_{(A+B)}$. Returning to the smoking example, we might find that the removal of smoking reduces the total number of lung cancers by, say, 60 percent, but that elimination of smog would be predicted to reduce lung cancers by 30 percent. The PUNAF module does not assume that all lung cancers prevented by the elimination of smoking are mutually exclusive of those prevented by the elimination of smog—many people are exposed to both, and the elimination of one would suffice to prevent their would-be lung cancer. Thus, the total percentage reduction of lung cancers by the elimination of both smog and smoking is likely less than $(1 – (1 – 0.6) \times (1 – 0.3)) \times 100 = 72$ percent.[16]

In this case, the PAF function will estimate household income by summing the adjusted predictions of income across all decile-violence groups of households. This is akin to taking the integral of the (presumably) downward-sloping adjusted predictions curve of income as a function of decile-violence exposure. The PAF function then estimates the proportion of total income in the study area that is *unattributable* to the predictor variable. Therefore, the adjusted prediction for the tenth decile-distance group of households is assumed, *ceteris paribus*, to be the baseline level of income that would exist in a hypothetical alternative scenario in which all households in the study area are lowered to a level of violence exposure equivalent to that felt by the least affected 10 percent of households. Any dip below that baseline level of income is then considered to be *attributable* to the presence of violence related to the farmer-pastoralist conflict. In effect, the PAF function ascribes the adjusted baseline level of income to each of the household decile groups and then subtracts out the sum of the attributed values. The remainder is treated as the numerator in equation (2) and normalized by the sum of adjusted predictions across decile-violence groups to obtain a proportion. This proportion would represent the presumed fraction of total hypothetical income (in a peaceful scenario) that violence has destroyed.

Results

Single-stage negative binomial models predicting income as a function of violence yield either weak, statistically insignificant coefficients or strong positive coefficients, depending on the control scheme (Table 4). This was foreseen in the research design phase, as discussed above. In the 2-stage models,

Table 4: Single-stage negative binomial models predicting monthly income as a function of violence

Variables	*(1) hh046*	*(2) hh046*	*(3) hh046*	*(4) hh046*	*(5) hh046*	*(6) hh046*
Violence PCA component 1	–0.117	**0.0704*** **	–0.101	**0.0695*** **	0.0130	0.0167
	(–0.108)	(0.0242)	(–0.0650)	(0.0242)	(0.0219)	(0.0228)
Controls	No	Yes	No	Yes	No	Yes
State categorical control	No	No	Yes	Yes	No	No
Cluster categorical control	No	No	No	No	Yes	Yes
Constant	**11.67*** **	**9.139*** **	**12.35*** **	**8.577*** **	**10.46*** **	**9.239*** **
	(0.337)	(1.500)	(0.586)	**–0.252*** **	(0.182)	(1.170)
Ln alpha	**0.624** **	**–0.236*** **	**0.487*** **	(–0.0569)	0.0581	**–0.342*** **
	(0.246)	(–0.0532)	(0.149)	(1.193)	(0.0467)	(0.0444)
Observations	1,448	1,135	1,448	1,135	1,448	1,135
Number of strata	39	39	39	39	39	39
F-value	1.179	4.817	1.903	5.478	6.267	4.761
p-value	0.278	0	0.108	0	0	0

Note: Standard errors in parenthesis; *** p<0.01; ** p<0.05; * p<0.10.

Table 5: Endogeneity-controlling 2-stage (OLS/negative binomial) models predicting monthly income as a function of violence

Variables	*(1) hh046*	*(2) hh046*	*(3) hh046*	*(4) hh046*	*(5) hh046*	*(6) hh046*
Violence PCA component 1	**–0.932** **	**–0.626** **	**–0.366*** **	**–0.308***	0.199	–0.169
	(–0.445)	(–0.249)	(–0.115)	(–0.170)	(0.196)	(0.340)
Residuals	**0.853** **	**0.696*** **	**0.274** **	**0.378** **	0.217	0.185
	(0.377)	(0.250)	(0.118)	(0.171)	(0.185)	(0.341)
Controls	No	Yes	No	Yes	No	Yes
State "fixed effects"	No	No	Yes	Yes	No	No
Cluster "fixed effects"	No	No	No	No	Yes	Yes
Constant	**11.62*** **	**9.457*** **	**12.40*** **	**8.859*** **	**10.32*** **	**9.096*** **
	(0.302)	(1.497)	(0.583)	(1.191)	(0.217)	(1.255)
Ln alpha	**0.594** **	**–0.236*** **	**0.483*** **	**–0.252*** **	0.0584	**–0.342*** **
	(0.232)	(–0.0532)	(0.149)	(–0.0569)	(0.0466)	(0.0444)
Observations	1,444	1,135	1,444	1,135	1,444	1,135
Number of strata	39	39	39	39	39	39
F-value	3.024	4.817	3.223	5.478	5.829	4.761
p-value	0.0489	0	0.00673	0	0	0

Note: Standard errors in parenthesis; *** p<0.01; ** p<0.05; * p<0.10.

however, the coefficients for the first component of the violence PCA are universally negative and statistically significant at the p<0.10 level for Models 1 to 4 (Table 5). Household controls and state- and cluster-level "fixed effects" depress the absolute values of the coefficients, with the smallest effect size exhibited in Model 6, in which both household controls and cluster-level "fixed effects" are included. In Models 1 to 4, the residuals term for the first-stage model predicting violence (proxied using our PCA first component of reported experience of violence) as a function of Mercy Corps' programmatic intervention is statistically significant at the p<0.05 level, indicating the appropriateness of an IV approach. Models 5 and 6 do not exhibit statistical significance, possibly due to the previously mentioned reason that the IV may not exert a strong enough effect to be "heard" through the numerous controls in the 1st stage. In other words, increased specificity in control variables may "mute" the effect of the IV.

Consequently, all of the relevant models yield population attributable fractions (PAFs) that are negative. Negative PAFs indicate that if violence is hypothetically reduced, the total income of respondents would be greater. PAFs are calculated

Table 6: Income change coefficients for violence reduction (in Naira)

Model	*Estimate*	*95% LB*	*95% UB*
1	354.37	6,777,650.10	-0.98
2	45.35	13,412.44	-0.84
3	2.01	6.88	0.15
4	2.10	17.81	-0.49
5	0.64	4.03	-0.47
6	0.64	15.21	-0.83

Table 7: Adjusted predictions of income changes due to hypothetical violence reduction by state (in Naira)

	Predictions on Model 3	
State	*Predicted average income change (Naira)*	*Predicted average income change (%)*
Benue	406,058	154
Kaduna	66,171	89
Nasarawa	192,857	190
Plateau	151,905	177
Total	204,796	137
	Predictions on Model 4	
Benue	88,710	119
Kaduna	84,779	71
Nasarawa	110,690	145
Plateau	193,304	136
Total	106,601	107

Table 8: Adjusted predictions of income changes due to hypothetical violence reduction by livelihood (in Naira; based on Model 4)

Livelihood	*Predicted average income change (Naira)*	*Predicted average income change (%)*
Farming	108,901	108
Pastoral	46,754	101
Mixed	160,649	116
Trading/other	82,693	96
Total	120,223	109

for each Table 5 Model, which, when multiplied by –1, then yield income change coefficients for hypothetically reduced farmer-pastoralist violence over all four states to the minimum value reported (Table 6). These coefficients can be multiplied further by the average rural income to yield the predicted total additional income earned due to the absence of violence. For instance, Model 3, in which we have employed categorical controls at the state level, predicts that the absence of violence would yield a 201 percent increase in rural incomes. Model 6, which includes specific control variables at the household level and categorical controls at the cluster level, yields the smallest coefficient, indicating that reducing violence to minimal values across all four states would yield a 64 percent increase in total rural income.

Models 3 (using state-level "fixed effects") and 4 (which uses specific household controls as well as categorical controls at the state level), can yield adjusted predictions of income changes due to violence reduction by state, as shown in Table 7. These average hypothetical percentage income increases are inferior to, but of the same order of magnitude as, the income change coefficients for Models 3 and 4 in Table 5. The increases in income presented in Table 7 are over and above current incomes: For example, the estimated income increase of 119 percent in Benue, based on Model 4, represents 2.19 times the state's current income.

Adjusted predictions may also be broken out by livelihood category. This categorization yields the figures in Table 8. The total figures differ slightly from those in Table 7 because control variables describing income from various livelihood strategies (i.e., hh042, hh043, and hh044) had to be dropped to allow specification of the livelihood strategy itself (i.e., hh045).

Conclusion

We have demonstrated that farmer-pastoralist conflict in rural areas of Nigeria's Middle Belt states may adversely affect household incomes, and quite dramatically so. At least three methodological caveats should be noted, however. The first concerns the IV. If it is correct that the IV employed was not strong enough to keep the 1st-stage residuals term statistically significant, we could reason that the effect sizes seen in Table 5, Models 5 and 6 might not be unreasonable. Indeed, they follow the trend of decreasing effect sizes as more control variables and "fixed effects" are added, even if their standard errors do not contract enough to keep them significant.

There is reason, however, to believe that "fixed effects" at the state level are superior to those at the cluster level. It is well appreciated in the economic geography literature that violent events have spatial spill-over effects: If one family is attacked, word spreads and friends and neighbors alter their behavior in response. This clustered response can cause spatial auto-correlation in the outcome variable, meaning that incomes in an entire cluster could be depressed due to generalized behavior modifications (e.g., households deciding not to let their cattle graze freely, or not to cultivate more distant fields,

Table 9: Estimated total rural income costs of conflict (in '000s) by state due to hypothetical violence reduction

			Est. cost to rural income ('000s)			*Losses as % of*	
State	*No. of rural households*	*Currency*	*Model 3*	*Model 4*	*State GDP 2014**	*State GDP***	*Formal & informal economy***
Benue	340,632	Naira	1,659,797,389	362,609,947	3,612,921,757	9.1	2.6
		USD	10,108,166	2,208,295	22,002,693		
Kaduna	394,765	Naira	313,464,164	401,614,900	5,439,384,242	6.9	2.0
		USD	1,908,997	2,445,835	33,125,850		
Nasarawa	115,659	Naira	267,667,675	153,627,754	1,590,654,072	8.8	2.5
		USD	1,630,096	935,593	9,687,083		
Plateau	255,555	Naira	465,840,239	592,796,202	2,712,849,466	17.9	5.2
		USD	2,836,967	3,610,129	16,521,253		
Total	1,106,611	Naira	2,706,769,467	1,510,648,803	13,355,809,536	10.2	2.9
		USD	16,484,226	9,199,851	81,336,880		

Notes: * Based on 2007 estimates from the Canback Global Income Distribution Database (C-GIDD), updated for GDP growth and inflation to 2014. ** Based on Model 4 estimates.

for fear of attack). The household violence variable will not capture the full range of security perceptions. In this case, cluster-level fixed effects, or introduction of a categorical cluster control variable, will attribute any resulting generally low incomes to unobserved cluster characteristics that remain immutable.[17]

The second caveat concerns the limitations of all one-shot surveys, this one included. The lack of panel data implies that the income effects estimated in the above models demonstrate correlation but not Granger causation. Moreover, this particular survey was not nearly as large as, say, the Demographic and Health Survey for the country.

Third, our 2nd-stage sampling method may lead to positively or negatively biased results. Smaller villages are likely to be disproportionately represented. If smaller villages are also more likely to suffer farmer-pastoralist violence, we would have overestimated the general effect. If they are less likely to suffer such violence, we would have underestimated the effect.

Given a few contextual facts regarding population and its split along rural/urban lines, we are able to extrapolate from the adjusted predictions at the household level to the total microeconomic costs of farmer-pastoralist conflicts in the study states. According to the 2013 National Demographic and Health Survey (DHS) of the National Population Commission, the population of Nigeria is 57.9 percent rural and 42.1 percent urban, or 93,589,088 people in rural areas according to the World Bank. An earlier National Population Commission survey reports similar national statistics (62.8 percent rural and 37.2 percent urban), but also reveals that the four study states have largely rural populations: 81.4 percent rural in Benue, 65.5 percent in Kaduna, 81.3 percent in Nasarawa, and 65.28 percent in Plateau.[18]

According to the 2006 census, Benue state has 4,253,641 people, Kaduna 6,066,562, Nasarawa 2,040,097, and Plateau 3,178,712. Our survey-adjusted means for household size for those states are 10.16, 10.07, 14.34, and 8.12, respectively. Multiplying the state populations by the respective state rural population percentages gives the rural population. We then divide that by the average rural household size by state to obtain total rural households in each of the study states. If we conservatively assume that farmer-pastoralist conflict only has a direct effect on the incomes of rural households, then we can estimate the total income effect of a hypothetical reduction in farmer-pastoralist violence based on the projections in Table 7. Table 9 gives these estimations by state and in total.

The aggregate microeconomic costs of violence according to this estimation method totals around USD9.2 billion annually. This sum represents roughly 10.2 percent of the combined official state domestic products in the study area. This result is high when compared to the costs of conflict measured in other studies, even as our study takes into account only the microeconomic costs (i.e., excluding macroeconomic ripple effects). The total costs of outright civil war to the Sri

Lankan economy, for instance, has been estimated at around 11 to 16 percent of that country's GDP over the period 1983-1996.[19]

However, a few considerations make our estimates at least plausible. For one, we have estimated the virtual elimination of a widespread form of violence, rather than just modeling the effect of a civil war on an economy. Second, the percentages we have estimated are based on numerators and denominators that are separately obtained: Other cost of conflict studies use official GDP only and therefore are internally consistent. In our case, the numerator (income losses) is estimated from survey data, while the denominator is the estimated official GDP. The latter may vastly underestimate the size of the real economy. One study estimates that Nigeria's informal economy represents 71.2 percent of total output in 2010. This implies that the formal sector is only 28.8 percent of the total. Depending on which variable is chosen from the survey (monthly or yearly estimated income), Nigeria's per capita GNI as a percentage of mean reported income is between 25.7 and 33.2 percent. If we then adjust the percentages reported in Table 9 to account for the informal economy, then the microeconomic cost of farmer-pastoralist conflict to the total economy hovers at around 2.9 percent (10.2 percent × 0.2882).[20]

In sum, we have demonstrated that the microeconomic effects of farmer-pastoralist violence, in terms of household income lost, are mostly likely not trivial. Farmer-pastoralist conflicts stretch across the continent, intersecting with both urban violence between religious groups (such as riots in the city of Jos on repeated occasions) and violent extremism (such as in the case of Boko Haram in northeastern Nigeria, or the Lord's Resistance Army, formerly of northern Uganda). Furthermore, climate change may make this type of livelihood conflict more common.[21] Policymakers in Nigeria and across the Sahel may wish to pay greater attention to resolving such disputes in the knowledge of the tolls they take on their constituents' wellbeing.

Notes

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1. The Middle Belt is an informal term that encompasses states along Nigeria's North-South divide, and overlaps with the North-Central geopolitical zone.

2. Related study: See McDougal, *et al*. (2015).

3. Competition for land: Benjaminsen, Alinon, Buhaug, and Buseth (2012); Hendrix and Glaser (2007); Odoh and Chigozie (2012); Sayne (2011). Breakdown of traditional relationships: Blench (2010). Exacerbated along lines of identity: Mohammed (undated); Sulaiman, Ja`afar-Furo, Nasiru, Haruna, and Ochi (2011).

4. Burundi: Verwimp and Bundervoet (2008). Rwanda: Serneel and Verpoorten (2012). Colombia: Ibánez and Moya (2006).

5. Justino (2011, p. 14).

6. Urban riots in India: Gupte, Justino, and Tranchant (2014). In common with other studies: Hegre, Østby, and Raleigh (2009, p. 600). Ample microlevel evidence: Justino, Brück, and Verwimp (2013).

7. Researchers often presume: For instance, Hegre, *et al*. (2009); McDougal (2011). Middle Belt region: Cf. Higazi (2013); Mohammed (undated); Sulaiman, *et al*. (2011). Sahel: Jones-Casey and Knox (2011). Niger delta: Hazen and Horner (2007); Hunt (2006); Obi (2010); Watts (2007). Extremism in the northeast: Aghedo and Osumah (2012); Onuoha (2010). Ubiquitous conflicts: Mohammed (undated).

8. Previous research: Brück, Justino, Verwimp, and Avdeenko (2010).

9. Endogenous relation: See, e.g., André and Plateau (1998).

10. Quote: World Bank (2011, p. 78). Macroeconomic counterpart: McDougal, *et al*. (2015).

11. World Bank (2014).

12. Name, type, and description of control variables used at the household level:

hh019	Integer	Household size
hh020	Integer	Number of adults
hh021	Integer	Number of adult men
hh022	Integer	Number of adult women
hh023	Integer	Number of adults w/ primary education
hh024	Integer	Number of adults w/ secondary education
hh025	Integer	Number of children
hh026	Integer	Number of boys
hh027	Integer	Number of girls
hh029	Integer	Number of household girls in school
hh030	Integer	Number of household boys in school
hh031	Categorical	Ethnicity
hh033	Categorical	Religion

hh035	Integer	Number of months in this community
hh036	Binary	Ever migrated?
hh042	Ordinal (1-5)	Amount of income from farming
hh043	Ordinal (1-5)	Amount of income from pastoralism
hh044	Ordinal (1-5)	Amount of income from trading
hh045a	Categorical	Livelihood strategy (farming, mixed, pastoralism, trading/other)

13. The Stata command *menbreg* is not compatible with survey adjustments, so we are unable to use true fixed effects at the state or cluster levels. Therefore, we run the *nbreg* command with the categorical control variables of state and cluster, which, aside from the unfortunate effect of decreasing the degrees of freedom more than does the standard fixed effects approach, accomplishes a similar goal.

14. Usual use of PAF: Greenland and Drescher (1993); Last (2001, p. 137).

15. Adjusted relative risk: See, e.g., Doidge, Segal, and Gospodarevskaya (2012).

16. Additivity: Walter (1976; 1983). Statistical formulation: Greenland and Drescher (1993) as implemented in Stata's PUNAF module (Newson, 2012).

17. Spatial spill-over effects: Maystadt, De Luca, Sekeris, and Ulimwengu (2014); Tollefsen (2012).

18. DHS: Nigeria National Population Commission (2013, p. 9). World Bank: World Bank (2014). State populations: Nigeria National Population Commission (2006).

19. Sri Lanka: Lindgren (2005, p. 12).

20. Size of informal economy: Ogbuabor and Malaolu (2013).

21. Climate change: Benjaminsen, *et al*. (2012); Hendrix and Glaser (2007); Odoh and Chigozie (2012); Sayne (2011).

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Appendix

This appendix presents the calculation of the sample size, first stage methodology, and second stage methodology.

Sample size calculation

Table A.1: Sample size requirements for different values of sd_i

Presumed sd_i	*n*
0.25	854
0.30	1,229
0.35	1,673

The standard sample size (n) calculation for determining a difference in the mean values of an indicator between two groups (1, 2) is given as:

$$n = \frac{1}{r} D \frac{\left[(Z_1 + Z_2)^2 (sd_1 + sd_2)^2\right]}{(X_1 + X_2)^2}, \quad \text{(A.1)}$$

where r is the response rate, D is the design effect, Z_i is the indicator's Z-score for group i, sd_i is the indicator's standard deviation for group i, and X_i is the value of the mean value of the indicator for group i. For the purposes of the present calculation, we assumed r=0.9, D=2, Z_1=Z_2=1.96, and X_1–X_2=0.1. We calculate sample size for three different standard deviations: sd_1=sd_2=(0.25, 0.30, 0.35). The sample size results are given in Table A.1. Conservatively, an n of 1,500 should suffice. These calculations are in line with the CONCUR baseline report, which was based on a survey originally designed to have 1,350 respondents (at the individual level).

First stage

Without the benefit of the Enumeration Areas (EAs) used by the Nigerian DHS, we use LGAs as Primary Sampling Units. LGAs with population densities greater than 700 persons per km^2 were considered urban, and otherwise the LGA was considered rural. This cut point was determined by examining the histogram of LGA population densities (available from the authors), which reveals that the bulk of LGAs in the study states have population densities less than 700 persons per km^2, with a limited number of urban centers rising to around 6,500 persons per km^2. We also spot-checked LGAs with populations

just above and just below the cut point using Google Earth. Indeed, it did seem to be that LGAs below the cut point (e.g., Kaura, Kaduna; Kudan, Kaduna) do not have large urban centers, while those above the cut point (e.g., Makurdi, Benue) usually hosted a large, urban center.

A table giving the specific breakout of the sampling frame's first stage is available from the authors. We chose to use 40 clusters and 40 households per cluster, as we were aiming for n>1,500 [1,500HH/(40HH/cluster) =37.5 clusters]. The sampling interval accordingly is given as SI = N/clusters = 13.54m/40 = 338,505. Using a random number generator, we determined the random start at 230,098. A column in the table, Attributed Clusters, gives the total number of clusters that should be selected in each LGA.

Mercy Corps administered the survey in nine program communities, as described in our CONCUR Baseline Report. In every case, these purposively sampled observations came from a randomly identified LGA (via Stage 1) and are noted with a dummy variable. In one case, a Mercy Corps program site was selected randomly in both Stage 1 and Stage 2 of the sampling process.

Second stage

Mercy Corps has large-format (small-scale), GIS-generated maps of each state with LGAs and community locations identified, which were used to draw approximate centroids on each LGA, spin a bottle to set a random direction, count the number of communities in a 20-degree arc radiating from the center to the farthest point in the LGA, and finally use a random number generator to choose a community corresponding to a number between 1 and the total count of communities in that swathe.

Once particular communities were selected, a similar "spin the bottle" method was used to identify households with the community. A spin of the bottle from the community's center point indicates a random direction. Following this radius toward the edge of the community yields a certain number of households, from which a random number generator selects a starting point. Arbitrary rules for sequence can then dictate the next households to be selected. A common method is just to find the nearest, non-sampled house. However, that method tends to draw the researcher closer to the center of town (because houses are more closely spaced toward the center than away from it), and it violates the ideal tenet in sampling to make the selection of any given observation independent of all others. Because the survey will be operating at only the household (and not the individual) level, a Kish Grid or other method of selecting a respondent is not necessary.

MACROECONOMIC BENEFITS OF FARMER-PASTORALIST PEACE IN NIGERIA'S MIDDLE BELT STATES: AN INPUT-OUTPUT ANALYSIS APPROACH

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Abstract

This article reports on the potential macroeconomic benefits of peace stemming from a reduction in farmer-pastoralist violence in four Middle Belt states of Nigeria (Benue, Kaduna, Nasarawa, and Plateau). Farmers and pastoralists routinely clash over access to farmland, grazing areas, stock routes, and water points for both animals and households. Farmer-pastoralist violence in these states is a relatively low-intensity form of conflict, but it is regionally widespread and chronic, and its incidence is arguably increasing. Using estimates of potential income benefits of peace at the household-level derived from a related study, we herein derive macroeconomic benefits via an input-output model of the Nigerian economy. We estimate these benefits to amount to around 2.8 percent of the nominal Nigerian GDP (or around 0.8 percent of the total Nigerian GDP, inclusive of the informal sector), representing a major macroeconomic opportunity. We break out these benefits by sector, showing that the sectors that stand to gain most from peace are the crop production, food and beverage, livestock, and chemical and petroleum industries.

This article reports on a study of potential macroeconomic benefits of peace subsequent to a hypothetical reduction in farmer-pastoralist violence in four Middle Belt states of Nigeria (Benue, Kaduna, Nasarawe, and Plateau). Estimates of potential income benefits of peace at the household-level, derived in a related study, are used here to compute the macroeconomic benefits—both in the aggregate as well as disaggregated by industrial sector—via an input-output model of the Nigerian economy. While somewhat experimental, this spreadsheet-based approach has the advantage of producing industry-by-industry estimates in a fairly parsimonious way.[1]

Other violent conflicts in Nigeria routinely capture media headlines and the attention of peace researchers, usually in regard to petroleum extraction-related conflict in the Niger delta region or in regard to violent extremism in the country's northeast. In contrast, we focus on Middle Belt states and demonstrate that addressing farmer-pastoralist violence, a low-intensity but pervasive form of conflict there as well as across the Sahel, is a major opportunity for macroeconomic improvement for Africa's largest economy. We break out the benefits by sector in an exercise that may help policymakers identify potential private sector partners in peacemaking. We find that the top sectoral beneficiaries are the food and beverage, agriculture, and the chemical and petroleum industries.[2]

Background

Nigeria's ethnically and religiously diverse Middle Belt has experienced recurrent eruptions of violence over the past several decades. Disputes between farmers and pastoralists arise from disagreements over access to farmland, grazing areas, stock routes, and water points for both animals and households. A range of factors underlie these disputes, including increased competition for land (potentially driven by desertification, climate change, and population growth), lack of clarity around the demarcation of pasture and stock routes, and the breakdown of traditional relationships and formal agreements between farmers and pastoralists. These conflicts undermine market development and economic growth by destroying productive assets, reducing production, preventing trade, deterring investment by private sector actors, and eroding social cohesion. Because livelihood strategies in Nigeria are closely tied to identity and because access to services and opportunities can vary across identity groups,

many farmer-pastoralist conflicts take on ethnic and religious hues and are exacerbated along lines of identity.[3]

This study demonstrates that addressing farmer-pastoralist violence, a low-intensity but pervasive form of conflict in the Middle Belt of Nigeria, constitutes a major opportunity for macroeconomic improvement for Africa's largest economy. Taking account of the size of the informal economy, we estimate that Nigeria's total GDP could be larger by 0.8 percentage points which, in economics, is a large-scale effect. We break out the potential benefits of peace by sector in an exercise that may help policymakers identify where they might look for peacebuilding partners in the private sector. In particular, we identify the top sectoral beneficiaries as the crop production, food and beverage, livestock, and chemical and petroleum industries.

Prior literature

Effects on the economy as a whole

There have been numerous attempts to quantify and measure the economic costs of conflict at country and at cross-national levels. Of course, any estimate of the costs of conflict depends on the definition and scope of conflict itself. Some literature has sought to assess the economic burden of violence by aggregating the estimated costs of all violence globally, including collective violence such as civil wars, and criminal and interpersonal violence. One McKinsey Global Institute paper, for example, ranks the cost of armed violence, terrorism, and war as tied (with smoking) for the greatest social burden generated by human beings, representing 2.8 percent of global GDP. It is unclear, however, how this statistic is arrived at, and a number of indications suggest that it may dramatically underestimate the total cost of violence. For instance, the 2013 Global Peace Index reports that global spending on violence containment was approximately USD9.5 trillion, or roughly 13.1 percent of global GDP. Of these costs, roughly 40 percent were associated with a broad measure of military-related expenditure; a further 13 percent were associated with internal security; and just under 2 percent were associated with GDP losses from conflict. As for Nigeria, IEP estimated that the country spent approximately 6 percent of its GDP in 2012 on violence containment. Some authors, moreover, have disputed the usefulness of GDP as an indicator of the cost of conflict, in that it includes responses to insecurity (which may have some positive effects on GDP growth), while excluding the informal economy.[4]

Many studies distinguish between collective violent conflict and criminal and interpersonal violence. Of the former, a number focus on a relatively narrow definition of violent conflict—often, just on civil war—and do not address the costs of lower-intensity conflict, such as pastoralist-farmer conflict or other inter-communal conflicts. In the context of civil war, Paul Collier famously estimated the impact of civil war on the annual GDP growth rate at minus 2.2 percent. A survey of the economic performance of 24 low-income countries that experienced civil conflicts since 1970 contends that structural shifts in political, economic, and aid relations in the post-cold war period correspond to a reduction of real GDP per capita of 12.5 percent annually, with real GDP growth reduced by 12.3 percent below normal over the course of the entire conflict. The International Action Network on Small Arms (IANSA) estimated that armed conflict costs Africa around USD18 billion annually; with approximately USD300 billion lost by 23 countries (including Nigeria) since 1990, representing an average annual loss of 15 percent of GDP.[5]

Case study research has found similar, although hugely varying, costs of civil wars, ranging from GDP reduced by 8.3 percent in Nepal to 20 to 23 percent for Rwanda to133 percent for Sudan. Effects of war may differ based on the scale and morphology of violence as well as its geographic relationship to economically important activity. Sri Lanka may have continued to experience reasonable economic growth during its conflict due to the geographic concentration of unrest in the north, which left much of the rest of the country economically unaffected. It may also depend on whether boosting defense and security budgets precipitates a drop in education, health, and development spending.[6]

As noted, much of the existing literature focuses on a relatively narrow category of violent conflict: that of civil war. Moreover, this research generally suffers from a low degree of "data differentiation," particularly in regard to disaggregation among conflict types. In response to this, a smaller literature has focused on the costs associated with lower-intensity violence, in contrast to civil wars. In these lower-level internal conflicts, costs may be less directly associated with the same scale of property destruction, death and injury, and may have different geographic dynamics in that they are typically dispersed across a larger geographic area.[7]

One relevant study of the effects of violence in the Middle Belt states notes the particular paucity of sub-national data on economic activity in Nigeria. Instead, as a proxy for economic activity, the author proposes using satellite technology to detect the amount of light observed at night by satellite, a method with a precedent in the study of Somalia's pirate economy. He focuses on the effect of the Jos crisis (which began in 2001) on growth in Plateau state, concluding that since 2001, growth in that state has been slower than in other states in the Middle Belt region.[8]

In addition to the economic consequences of conflict during

the course of conflict are those in the years following conflict. Paul Collier estimates that these are in part determined by the duration of war, with short wars exhibiting continued postwar economic decline—what he terms a "war overhead"—while long wars experience a phase of rapid economic growth in the subsequent period of peace.[9]

The means by which violence is perpetrated is the focus of some studies on the costs of conflict, with the import, availability, and use of small arms constituting a central focus in much of the research. A focus on the weaponry of violence illustrates differences in the nature of victimhood, with studies from Nigeria suggesting that male-to-female ratios for injuries sustained from gun violence ranged from 6:1 in case studies in northern Nigeria to 12.4:1 among the civilian population in central Nigeria. This suggests that there may be different economic costs of gun violence if victims are disproportionately engaged in gender-dominated economic activities. Technology may also have implications for the subsequent costs of treatment and rehabilitation from violent conflict, with studies from the United States suggesting that the average gunshot injury costs 50 times more than the average stabbing injury.[10]

Effects on sectors of the economy

A study on Nepal focuses on the overall GDP growth impact of its conflict and, as such, is not sector-specific. However, the authors' hypothesized mechanism works through the trade-off between military and development expenditure, finding that conflict exerts its effects via differentials in sector-specific multipliers. The development sector in particular stands to gain from a reduction in expenditure on security, dependent on greater peace nationally. In contrast, a study on Mozambique analyses the impact of its civil war on various sectors of the economy more directly. For example, its author estimates that by the cessation of hostilities in 1992, the recorded cattle stock was reduced to less than a fifth of its recorded 1980 level. Similarly, a study of the economic effect of the 1994 genocide in Rwanda estimates that between 50 to 80 percent of the country's cattle stock was lost in that year and, by 2002, had returned to under three-quarters of pre-crisis levels. These losses occurred through a combination of direct measures (such as the killing of cattle to spread fear, to exert economic pressure on communities, and to feed troops) and indirect measures (such as the shortage of feed and veterinary care, consumption needs of the population, and disruption to cattle markets). In some contexts, agricultural losses may also arise from security operations that compel households to abandon their livestock or land, with even temporary departures resulting in potential deterioration of assets. For Nigeria, evidence on the effects of violence by sector is scarce. One author notes the particular impact of violent conflict in the Jos plateau—Plateau state—on livestock prices, given the centrality of herding to the economy, and spill-over effects from this instability on the cost of beef and milk in Jos and the surrounding area.[11]

Taken together, the literature highlights considerable gaps in measuring the effect of lower-intensity, but pervasive and chronic, conflicts beyond civil wars alone; this is in addition to the need to develop and refine sensitive methods which can estimate sector-specific costs of conflict. This article sets out to make a contribution addressing both of these gaps.

Methods

Input-output (I-O) analysis is a common economic analysis technique originally developed by Wassily Leontief to estimate the effects on the economy of a certain change in supply or demand within a particular industry. I-O tables contain static summary information of the industrial structure of an economy for a given period. There is a long tradition, dating back to Leontief himself, of using I-O analyses to examine the effects of military expenditure on the economy. Regional and sectoral economic studies have also made extensive use of I-O analysis.[12]

Employing I-O analysis in estimating the benefits of peace in the farmer-pastoralist conflict to the Nigerian economy is, in its simplest form, relatively straightforward. The benefits may be broken out into three categories: (a) direct, (b) indirect, and (c) induced. The direct impact includes the jobs, wages, and output of the increased economic activity. The indirect impact includes the jobs, wages, and output deriving from the production of intermediate goods serving as inputs to the sector in question. The induced benefits from the change in demand or supply are the ripple effects caused by the first two. I-O analysis deems the benefits of increases in the supply of a good to be a function of "forward linkages," while the benefits of increases in the demand of a good are a function of "backward linkages."

We constructed an I-O table by collapsing the 2010 Nigerian Supply-Use Table (SUT) into 46 basic industry types. (This is the same SUT used to rebase Nigerian GDP in 2013.) The inputs (rows) also include free-on-board (FOB) and cost, insurance, and freight (CIF) adjustments; direct purchases abroad by residents; domestic purchases by nonresidents; wages; production taxes; consumption of fixed capital; and net operating surplus. The outputs (columns) also include household consumption; nonprofit consumption; governmental consumption; gross fixed capital formation; inventory changes; and exports. For the purposes of the matrix operations

described below, we estimate "closed" I-O analyses, meaning that the matrix is defined not only by the 46 industries, but also by household income (wages, as an additional row), and household consumption (as an additional column). Our I-O matrices therefore have the square dimensions of 47×47.[13]

Empirical strategy

I-O tables take the form of matrices where the columns are defined by the industries that are buying inputs, and the rows by the same industries selling outputs. An I-O matrix $\boldsymbol{M} \ni m_{i,j}$ contains values of goods and services $m_{i,j}$ sold by industry i to industry j. Given this structure, matrices $\boldsymbol{A}$ and $\boldsymbol{B}$ may be created, defined as:

$$(1) \qquad \begin{aligned} A \ni a_{i,j} &= m_{i,j} / \sum_i m_{i,j} \\ B \ni b_{i,j} &= m_{i,j} / \sum_j m_{i,j} \end{aligned} .$$

$\boldsymbol{A}$ then represents the matrix of backward linkages. One way of thinking about this is to say that for every $1 rise in demand in industry j, that industry will have to purchase $a_{i,j}$ dollars of inputs from industry i. Conversely, $\boldsymbol{B}$ represents the matrix of forward linkages. For every $1 increase in the supply from industry i, that industry may contribute $b_{i,j}$ dollars of inputs to the production of industry j. Direct backward and forward linkages are then given, respectively, as the column sum of the $\boldsymbol{A}$ matrix and the row sum of the $\boldsymbol{B}$ matrix. The total backward linkages (direct, indirect, and induced effects) may be calculated as the column sum of $\boldsymbol{T} \equiv (\boldsymbol{I} - \boldsymbol{A})^{-1}$, and the total forward linkages as the row sum thereof.[14]

For the purposes of this study, the potential benefits of peace at the household level are assumed to be the income losses due to farmer-pastoralist conflict as calculated in a microeconomic companion study from original data obtained by a cluster sample survey of rural households in the study states. These estimated benefits of farmer-pastoralist peace are fed into the I-O matrices described above. The economic boost in production, *PB*, driven by anticipated increased consumer spending (*cons*), may be obtained by summing (1) the products of the population-wide income gains, G_{cons}, also from the companion study, (2) a term representing the proportion of the gains spent (*1–s*, where *s* is the savings rate), and (3) $t_{i,j=cons}$ (where $t_{i,j} \in \boldsymbol{T}$ over all affected input sectors i). These will be our effects due to "backward" linkages. The economic boost in consumption, *CB*, driven by anticipated increased agricultural (crop plus livestock) production, may be obtained by summing the product of population-wide production gains, G_{prod}, as determined below, by $t_{i=ag,j}$, across all output sectors j. These will be our effects due to "forward" linkages.

In sum:

$$(2) \qquad \begin{aligned} PB &= \sum_j (G_{cons} (1 - s) t_{i,\, j=cons}) \\ CB &= \sum_i (G_{prod}\ t_{i=\, prod,\, j}) \end{aligned} .$$

These two parts can then be added together to derive the *total* economic benefit of peace to the Nigerian economy: *TB* = *PB* + *CB*. In our case, the survey-adjusted mean savings rate of 15.48 percent for the study states was used.[15]

To determine the *sectoral* benefits of peace, we use the same techniques. Again, we multiply population-wide income gains as determined in the companion study by the proportion of income spent, and again by $a_{i,cons}$ to obtain the direct backward linkage associated with each sector i in the Nigerian economy. Similarly, we multiply population-wide agricultural and livestock production gains by $b_{f,j}/b_{p,j}$, where f is farming (or agriculture) and p is pastoralism (or livestock), to obtain the direct forward linkage associated with each sector j in the Nigerian economy. Sector-specific total (direct, indirect, and induced) backward and forward linkages for consumption and production rises can be estimated by multiplying total consumption and production by $t_{i,j} \in \boldsymbol{T}$.

We use the results of the companion study, as its survey instrument was specifically designed to estimate (a) income and (b) determine what proportion of that income is derived from crop and/or livestock production. In that paper, we estimate the size of the economic gains to peace that would translate into higher demand and revenues for private sector industries. These results can be used to calculate, respectively, the total backward linkages associated with increased consumer spending and the total forward linkages associated with increased rural productivity in a peaceful scenario.

Generating inputs

The specific estimates of total averted income losses by state in the hypothetical scenario that violence was reduced to near-zero levels are produced in the companion study. In that study, we also considered examining household expenditure instead of income, as expenditure could be argued to be the real motivating force behind any macroeconomic expansion as predicted in the present study. However, expenditure might rise in crises, when households may need to dip into savings or liquidate assets to offset potentially negative effects of conflict on their livelihoods. Such expenditure might then boost GDP in the short term, even as it represents a short-term coping mechanism in the face of financial stress. We thus use the abovementioned study's Model 4, as it is a controlled model

Table 1: Total income losses in the study states by sector and approximate percentage of contribution to the household income

		Farming	*Pastoralism*	*Trading/other*	*Total*
Category	*Approximate percentage of household income*	*n=1,490*	*n=1,443*	*n=1,409*	
Panel A: Survey-adjusted proportions (95% confidence intervals in parentheses)					
1	10	0.075 (0.063; 0.088)	0.623 (0.597; 0.649)	0.697 (0.67, 0.724)	0.140
2	30	0.121 (0.103; 0.141)	0.159 (0.140; 0.180)	0.246 (0.223, 0.272)	0.158
3	50	0.064 (0.052; 0.079)	0.041 (0.031; 0.053)	0.046 (0.032, 0.066)	0.075
4	70	0.412 (0.385; 0.0439)	0.116 (0.098; 0.136)	0.008 (0.004, 0.013)	0.374
5	90	0.328 (0.304; 0.354)	0.062 (0.051; 0.074)	0.003 (0.001, 0.007)	0.354
Total		0.660	0.267	0.174	1.101
Panel B: Predicted proportions (adjustment coefficient = 0.84)					
1	10	0.068	0.607	0.562	0.124
2	30	0.110	0.155	0.199	0.139
3	50	0.059	0.039	0.037	0.067
4	70	0.374	0.112	0.006	0.345
5	90	0.298	0.060	0.002	0.325
Total		0.600	0.260	0.141	1.000

and yields the most conservative estimates produced. These hypothetical income gains then serve as inputs to the I-O model to calculate direct, indirect, and induced backward linkages, because these *backward linkages* will be modeled as a function of household consumption.

However, the inputs to calculate *forward linkages* must be broken out by sector. In this case, the income gains must be separated by farming, pastoralism, and trade/other so that the appropriate industry multipliers may be calculated. In order to do this, we first take the survey-adjusted proportions of the ordinal categorical variables indicating the proportion of household income derived from each of the above-mentioned sectors. We assume, initially, that the values of a 1 to 5 Likert scale (1=little to none; 2=a minority; 3=about half; 4=most; 5=about all) correspond to percentages (1=10%; 2=30%; 3=50%; 4=70%; 5=90%). The survey-adjusted proportions of each sector may be multiplied by the corresponding percentage of household income that the ordinal value represents, and then summed to obtain the total proportion of income derived in that sector. Table 1, Panel A displays the results.[16]

Note that the totals on the bottom line of Panel A do not sum to 1. Presumably due to the fact that the Likert scale does not force cumulative responses to sum to any particular number, one can retroactively multiply each proportion by some coefficient to satisfy that condition. At this point, Panel A is purely descriptive: Just because income is broken out in this fashion does not mean that economic losses due to violence are distributed in the same proportions. In fact, the companion study determined that pastoralist incomes would grow by 136 percent in the case of near-zero violence, with farmer and trader incomes growing by smaller percentages (respectively, by 127 percent and 112 percent). Therefore, we first multiply all proportions in Panel A by the growth factors for the corresponding sectors (dropping the 95% confidence intervals in the process) and then adjust the proportions in each cell by a coefficient that brings the sum of totals to 1. The result is displayed in Table 1, Panel B.

Table 1, Panel A represents proportional income losses for the entire study region. But in fact we estimated total income losses in Naira by repeating this process for each study state in

Table 2: Estimated income losses in all study states due to farmer-pastoralist violence (amounts in 1,000s of Naira)

	Projected income change in sectors				
State	*Farming*	*Pastoralism*	*Trading/other*	*Total*	*Percentage*
Benue	237,827,874	70,253,030	54,529,043	362,609,947	24%
Kaduna	231,752,901	119,446,304	50,415,695	401,614,900	27%
Nasarawa	77,308,368	52,274,046	24,045,341	153,627,754	10%
Plateau	359,776,445	146,966,324	86,053,433	592,796,202	39%
Total	906,665,588	388,939,704	215,043,511	1,510,648,803	
Percentage	60%	26%	14%	100%	100%

Source: McDougal, *et al*. (2015, Tables 7, 10, 13, 16).

Table 3: Total estimated macroeconomic benefits of farmer-pastoralist peace to Nigeria's economy (amounts in 1,000s of Naira)

		Macroeconomic losses				
Linkages	Types	Amount in 1,000s Naira	Amount in 1,000s USD	National GDP (2013)	Gains as %-age of official GDP	Gains as %-age of total economy*
Backward linkages	Direct	70,162,404	427,289	81,009,964,600	0.09%	0.02%
	Total	353,966,044	2,155,653	81,009,964,600	0.44%	0.13%
Forward linkages	Direct	286,814,612	1,746,701	81,009,964,600	0.35%	0.10%
	Total	1,902,917,447	11,588,767	81,009,964,600	2.35%	0.68%
All linkages	Direct	356,977,016	2,173,990	81,009,964,600	0.44%	0.13%
	Total	2,256,883,491	13,744,420	81,009,964,600	2.79%	0.80%

Note: * Assumes Ogbuador and Malaolu (2013) estimate of the informal economy as 71.18% of the total.

order to get column sums of income gain proportions for each sector. These income gain proportions may then be multiplied by the total income gain predicted for each state to obtain sectoral break outs. These detailed state-by-state tables are available upon request. The results are summarized in Table 2. The "total" row gives the I-O inputs for the forward linkage analysis by sector.[17]

Although we estimate that 60 percent of the total income losses accrue to the farming sector, this does not mean individual farming households would stand to gain twice as much as pastoralist households in a scenario of peace. Rather, it is likely that the population of farming households is greater than that of pastoralist households, and that a large proportion of cattle rearers also derive at least some income from crop farming (the reverse is not necessarily true), resulting in the farming sector incurring a greater share of total losses.[18]

Results

Total macroeconomic costs of farmer-pastoralist violence

The input-output analysis yields both direct and total (direct, indirect, and induced) macroeconomic gains to the Nigerian economy due to hypothetical farmer-pastoralist peace in the study states. Table 3 displays the calculated results, with the maximum attributable benefit totaling over USD13.7 billion annually. These gains represent a sizeable share of Nigerian GDP—up to 2.79 percent, if one uses officially reported GDP. At 0.8 percent, this toll is much smaller, percentage-wise, if one calculates an imputed "total economic product" of Nigeria, that is, inclusive of the informal economy, as 3.5 times the size of official GDP. Nonetheless, a 0.8 percent gain is substantial in macroeconomic terms.[19]

Sectoral benefits of peace

The industries with the most to gain from farmer-pastoralist peace as measured by direct (and total) gains from

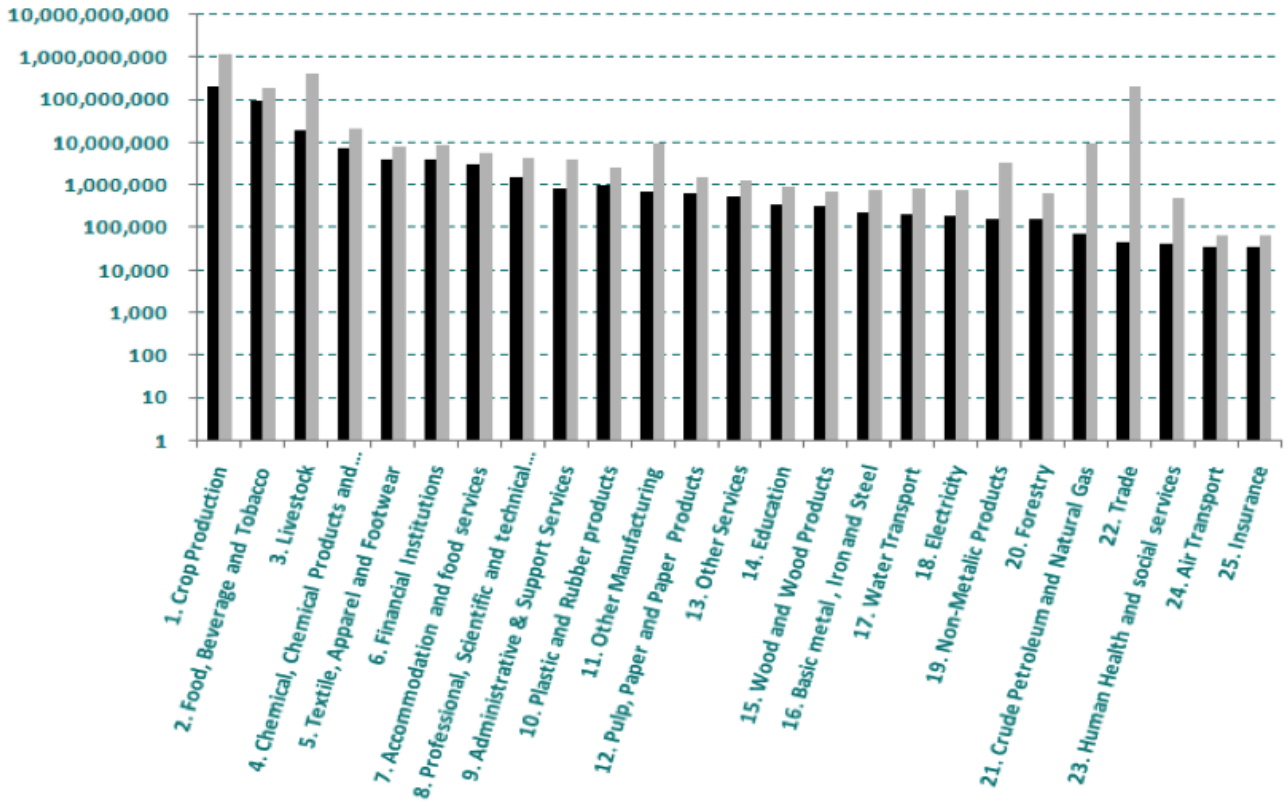

Figure 1: Direct backward and forward linkages for the top-25 conflict-affected industries by direct gains from farmer-pastoralist peace, log scale (in 1,000s of Naira). Total gains (direct, indirect, and induced) are shown in grey.

farmer-pastoralist peace are shown in Figure 1. (The detailed tables for all sectoral multipliers and effects are available upon request.) Direct gains reflect the wages and output of each industry hypothetically increased by heightened economic activity in the context of farmer-pastoralist peace (that is, the increased supply of each industry's product and the increase in each industry's demand in input and labor markets). Total gains include direct gains, as well as indirect and induced gains. In addition to the crop production, livestock, and trade sectors, total gains accrue most to the food and beverage industries, wage-earners, chemical products manufacturing, petroleum products industries, manufacturing, financial services, and textiles. That significant gains accrue to industries that conflict-affected households are likely to have minimal participation in, such as financial services, indicates that farmer-pastoralist conflict has far-reaching effects throughout the Nigerian economy.[20]

Discussion

This study contributes to the literature in four ways. First, it applies I-O analysis to a question that has not often been addressed with similar methods. Second, it derives not the costs of conflict to the Nigerian economy, but rather the benefits of peace—a distinction that is not often made. Third, it uniquely examines farmer-pastoralist conflict. Fourth, to our knowledge, it is among the first efforts to understand the effect of peace and conflict dynamics on all sectors of an economy.

We estimate that the potential benefit of farmer-pastoralist peace in the Middle Belt states amounts to around 2.8 percent of the official Nigerian GDP, or around 0.8 percent of total Nigerian GDP, inclusive of the informal sector. These numbers are substantial in size and suggest a major macroeconomic opportunity for the country. We separate these potential benefits by sector, showing that, overall, those who stand to gain the most are the crop production, food and beverage, livestock, and chemical and petroleum industries.

In the context of our study, at least four weaknesses of I-O analysis may apply. First, an I-O table is based on a static snapshot of the economy. It does not account for elasticities of demand or supply. While it is able to identify the proportion of inputs to outputs across sectors at a given point in time, it is unable to say whether each marginal dollar of output will entail

those same proportions of inputs, for instance. Older input-output studies on the effect of military expenditure on employment, such as those by Jacques Aben, showcase this deficiency in that they assume that input factors (in his case, labor) are uniform with constant prices. For this reason, most modern regional economic models, while using I-O tables as their central engine, come with extensive modifications that include marginal effects. We did not have access to such sophisticated models for Nigeria.[21]

Second, the Nigerian I-O we used to generate our estimates is now five years old. Given the rapid growth of the Nigerian economy, it is reasonable to assume that the structure of the economy has changed. That said, annually-updated I-O's are a luxury that most of the developing world cannot and does not afford. Indeed, the previous I-O for Nigeria dates to 1990. The current I-O takes into account a number of fundamental changes in macroeconomic structure that have occurred since then: For instance, telecommunications has grown hugely from a small number of land lines to 115 million cellular phone accounts, manufacturing has grown from 2 percent to 7 percent of GDP, and film making ("Nollywood") has grown from a minuscule industry to around 1.4 percent of GDP. One may debate whether the best available is good enough but, at a minimum, our estimates are indicative of the size of the potential benefit Nigeria could reap from peace in its Middle Belt states.[22]

Third, an I-O table is a picture of the formal economy only. Even in developed nations, the informal economy may be quite sizeable. In Nigeria, the I-O industries likely represent an even smaller subset of the total economic sectors that will benefit from increased consumption and production. Of course, advocacy for peacebuilding might very well be targeted precisely to formal private sector actors, so it is useful to have them singled out in the I-O table. But to make our predictions realistic, we will have to account for the fact that much of the so-called peace dividend, whether demand or supply driven, will go to the informal, rather than the formal economy.[23]

Fourth, this I-O's level of analysis is that of the nation as a whole, and it is not intended for sub-national modeling. The consumption patterns and inter-industry linkages modeled are based on country-wide averages, not necessarily on hypothetical average residents of the study area states. To the extent that the country as a whole is more urbanized than is the Middle Belt and that urban residents might be expected to exhibit more linkages with formal sector industries—whether backward via consumption or forward via employment—it could be argued that the direct and indirect effects reported here are biased upward, that is, overestimated. Moreover, the benefits we calculate based on the I-O will not necessarily be contained to the study area states, but rather ripple throughout the entire economy.[24]

A deeper question, though, concerns the use of hypothetically averted microeconomic income losses as inputs, and the implicit equivalency between the microeconomic cost of conflict and the benefits of peace. This approach relies on the idea that the relationship between economic output and violence can be described mathematically by a function; that is, whether levels of violence are rising or falling, there is exactly one possible economic output at the given level of violence. Dynamic mathematical models of economic performance would indicate otherwise, implying that the benefits of peace may not entirely erase the cost of conflict in the short term. It may be that there are different possible economic outcomes for the same level of violence, depending upon the recent history of both violence and the economy. On the basis of these considerations, it could be argued that this study actually produces estimates on the macroeconomic cost of conflict, rather than of the benefits of peace. The nuances of dynamic models notwithstanding, equating the benefits of peace to the cost of conflict makes the research question much more tractable.[25]

The most useful output of this study may be the sectoral break-out of peace benefits. From the point of view of policy advocacy for peacebuilding and conflict resolution programs in Nigeria's north-central states (and potentially across the Sahel), the industries identified as standing to gain the most from peace constitute a potential private sector coalition that could advocate for improved long-term policy. In the wake of Nigeria's ascendancy to the position of Africa's largest economy, convincing diverse private sector actors that they have a large stake in farmer-pastoralist conflict amounts to a strategically important gambit.

Notes

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1. This study derives from research undertaken as part of a UK Department for International Development (DFID)-funded Mercy Corps project entitled "Conciliation in Nigeria through Community-Based Conflict Management and Cooperative Use of Resources" (CONCUR). That project also examined the effects of farmer-pastoralist violence on household wealth, income, and welfare, in addition to its effect on state-level internally generated revenue. The related study is McDougal, *et al*. (2015).

2. Niger delta: Hazen and Horner (2007); Hunt (2006); Obi (2010); Watts (2007). Northeast: Aghedo and Osumah (2012); Onuoha (2010). Pervasive violence in the Middle Belt and across the Sahara: Aghedo and Osumah (2012); Onuoha (2010); Benjaminsen, Alinon, Buhaug, and Buseth (2012); Hendrix and Glaser (2007); Odoh and Chigozie (2012); Sayne (2011).

3. Range of factors: Benjaminsen, *et al*. (2012); Blench (2010); Hendrix and Glaser (2007); Odoh and Chigozie (2012); Sayne (2011).

4. McKinsey paper: Dobbs, *et al*. (2014). Global Peace Index: IEP (2013, p0. 56, 57, 60). Roughly 40 percent: IEP uses a more comprehensive (and inclusive) measure of military expenditure than the principal international data authority, the Stockholm International Peace Research Institute (SIPRI). IEP's decision is based in part on the work of Brauer (2007).Questioned usefulness of GDP: Brauer and Dunne (2010).

5. Do not address lower-level conflict: As noted by Brück, de Groot, and Bozzoli (2012). Inter-communal conflict: See, e.g., Higazi (2013). Collier: Collier (1999). A survey of 24 countries: Staines (2004, pp. 13-14). IANSA: IANSA (2007, pp. 9, 26).

6. Nepal: Ra and Singh (2005). Rwanda: Lopez and Wodon (2005, p. 591). Sudan: Frontier Economics (2010). Sri Lanka geography of conflict: Skaperdas, Soares, Willman, and Miller (2009). Boosting defense and security budgets: Ali (2011, p. 16); Lai and Thyne (2007); Ra and Singh (2005).

7. Low degree of data differentiation: As noted by Brück, de Groot, and Bozzoli (2012). Disaggregation of conflict: Serneels and Verpoorten (2012). Different geographic dynamics: Skaperdas, *et al*. (2009).

8. One relevant study: Obiliki (2014). The author proposes: Following Jerven (2013). Somalia: Christopoulou, Makatsuris, and Shortland (2013). Slower growth in Plateau state: Obiliki (2014, p. 9).

9. The years following conflict: Brück, de Groot, Bozzoli (2012). Collier: Collier (1999, p. 176).

10. Small arms: See, e.g., Berman, Krause, LeBrun, and McDonald (2011); IANSA (2007). Male-female injury ratios in Nigeria: IANSA (2007, p. 33). United States: IANSA (2007, p. 14).

11. Nepal: Ra and Singh (2005). Mozambique: Brück (1997, pp. 36-37). Rwanda: Verpoorten (2009). Direct and indirect: Brück (1997); Verpoorten (2009). Even temporary departures: CRSS (2010). Nigeria: Mohammed (undated, p. 6).

12. I-O analysis: Leontief (1936). Static information: Kula (2008). Military expenditure: Leontief and Duchin (1983). In addition, see, e.g., Dunne (1991); Molas-Gallart (1992). Regional: See, e.g., Acharya and Hazari (1971); Fujita, Krugman, and Venables (1999, p. 286); Isard (1951; 1960); Isard, *et al*. (1998); Nimoyina (1987). Sectoral: See, e.g., Bon (1988); Bon and Minami (1986); Panchamukhi (1975); Polenske and McMichael (2002); Polenske and Sivitanides (1990).

13. Rebased Nigerian GDP: See Economist (2014).

14. Other matrix formulae have been used in various contexts to assess a change in one sector on the economy in terms of its (a) power of dispersion, (b) sensitivity of dispersion, (c) coefficient of variation (for backward and forward linkages), (d) employment backward and forward linkage indices, and others. For an overview on various approaches and their calculations, see Polenske and Sivitanides (1990).

15. The savings rate can be derived from the corresponding question in the survey administered for the study by McDougal, *et al*. (2015). For the sake of parsimony, the outcome is described here as deriving from a single "agricultural" sector. In reality, this is the sum of three separate sectors of the I-O table, corresponding to the main rural livelihoods: crop production, livestock production, and trade.

16. The survey included four questions to determine the sources of a household's income: (1) "What portion of your household income comes from crop farming?"; (2) "What portion of your household income comes from raising livestock/ pastoralism?"; (3) "What portion of your household income comes from trading?" and (4) "What other sources of income do you have?" The response choices for the first three questions were given as a Likert scale as opposed to percentages because, after piloting the survey, Mercy Corps staff found that the Likert scale was more easily understood by survey respondents.

17. We take this approach rather than using adjusted predictions of the regression models because the household livelihood variable in the dataset used to estimate the microeconomic costs of violence at the household level does not sum to 1, either, causing the analysis to fail.

18. Reverse not necessarily true: As discussed in McDougal, *et al*. (2015), survey sampling frames typically have an inherent bias toward sedentary and semisedentary respondents, often underrepresenting nomadic peoples. Our survey was no exception: While we strove to maintain rough parity in response numbers, sampling weights were likely negatively biased by an inability to find nomadic communities—probably especially those most affected by conflict. Farming sector incurring a greater share of losses: Furthermore, the survey sampling weight used in our original survey accounts for

relative populations of farmers and pastoralists, alleviating any bias that would result from surveying a greater number of farming households. However, our sampling weight is derived from imperfect relative population estimates at the cluster level. Better population data, disaggregated by livelihood and adequately accounting for nomadic and seminomadic households, would make our estimates more precise.

19. Size of informal economy taken from Ogbuabor and Malaolu (2013).

20. Wage earners: Wage-earners appear as an industry because backward linkages were calculated in a "closed" matrix, including wages as inputs and household consumption as outputs. They represent the fifth-most benefitted "sector" by total gains, but do not appear in Figure 1 because none of their gains are direct.

21. Older studies: See Molas-Gallart (1992, pp. 11-15) who refers to Aben (1992). Extensive modifications: Fujita, *et al*. (1999, p. 286); Treyz (1993, pp. 291-322).

22. Film making: Economist (2014).

23. I-O industry represent small subset: Ogbuabor and Malaolu (2013) have estimated the size of the informal economy in Nigeria as 71.18% of the total in 2010. This exceeds the sizes of informal economies across Latin America as a proportion of the total economy as calculated by Vuletin (2008)), whose estimates range from around just 15 percent in the Bahamas to over 65 percent in Paraguay.

24. Nigeria more urbanized than its Middle Belt: According to the 2013 National Demographic and Health Survey (Nigeria National Population Commission, 2013, p. 9), the population of Nigeria is 57.9 percent rural, while the rural population percentages in the four study states are 81.4 in Benue, 65.5 in Kaduna, 81.3 in Nasarawa, and 65.28 in Plateau.

25. Dynamic models: See, e.g., Fujita, *et al*. (1999, pp. 27-28).

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