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**Betting on Displacement:  
Oil, Violence, and the Switch to Civilian Rule in Nigeria,**

by

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**Abstract:** This paper presents an analytic narrative of three decades of oil and violence in Nigeria, assuming rational choice by all the actors. It argues that, in the 1980s and 1990s, the government had to choose between spending money on preventing pollution and terrorizing the population away from the Niger Delta states, where oil extraction is concentrated. Because of the uncertain outcome of out-migration, the latter solution seemed more efficient and was implemented by the military governments. However, xenophobic responses by the population in destination cities, where a lot of ethnic violence took place, proved out-migration to be much less attractive than expected. Niger Delta states' populations ended up being trapped in their polluted environment where "oil bunkering" and racketeering oil firms turned out to be the only viable sources of income for many people. The implied dynamics of violence sheds some light on the switch to civilian rule that occurred in 1999.

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“... the gasoline sold at filling stations in the United States and Europe is almost literally stained with Nigerian blood.” (Maier, 2000, p.xxiv)

## 1. Introduction

Many of the remaining violent conflicts in the world to day are somehow related to the exploitation of some exhaustible resource. Fearon (2005) has shown econometrically that oil exports are a significant determinant of the incidence of civil wars, in a multi-country panel-data analysis. Ghazvinian (2007) provides an intriguing itinerary through the oil countries in Africa, which suggests that violence is the rule rather than the exception in oil-producing countries. Gabon is probably the only trouble-free spot in oil-producing Africa, thanks to a sophisticated system of corruption and clientelism (see also Shaxson, 2007). Similar findings can be brought out in other oil-producing countries from other continents, like Iraq or Colombia, where armed conflict is raging. Several case studies from four continents are presented in Kaldor *et al.* (2007), suggesting that there is a definite tendency for oil-exports to go hand in hand with violence. However, there are also violent conflicts related to the exploitation of other natural resources like diamonds, which made the headlines with the wars in Angola, in Liberia and in Sierra Leone, and more recently coltan, the price of which has been boosted by the expansion of the use of cell phones, as well as of electronic games. It is at the center of a lot of the violence and ethnic cleansing that is currently going on in Eastern Congo (Ooms, 2008). Various militias are involved there, including the infamous *Interamwe*, who were the main killers in the 1994 genocide in neighboring Rwanda, as well as the Congolese army set loose. Nevertheless, Fearon’s econometric findings do not confirm statistically the importance of these other mineral resources in fueling violent conflict. Using a finer geographical disaggregation, Lujala (2009) shows that gems and oil have a similar impact on the severity of armed conflicts, measured by the number of combat deaths.

### *Violence against Civilians*

Moreover, these violent conflicts seldom involve proper battles between two organized armies, although it happens occasionally, while violence against civilians seems to be the mainstay of this kind of “wars”. This sort of one-sided violence has become the prominent characteristics of most conflicts in the course of the 20<sup>th</sup> century, as emphasized in particular by Cairns (1997). The bombing of the city of Guernica by the Condor legion during the Spanish civil war<sup>1</sup> may be seen as a watershed, as clearly perceived by the Catalan painter Picasso. There were no military targets in Guernica, just civilians to be terrorized. A recent data-set on this kind of violence over the recent period has been produced by Eck and Hultman (2007), together with an econometric analysis of its strategic determinants. Their findings support the view that violence against civilians responds to some clear strategic motivations. The present paper is an attempt at understanding further the kind of strategies that the players are pursuing in these resource-exploiting countries, and why violence against civilians seems to be so common in those cases. It clarifies how this kind of violence may be governed by two fairly distinct strategic logics. In the first case, violence is a joint product of reciprocal looting between two fighting sides, as analyzed by Azam (2002). In the second one, violence against civilians is used as a deterrent for preventing an escalation into fighting proper, the latter being potentially based on reciprocal looting of the kind just described above. This deterrence effect of violence against civilians has been analyzed in Azam and Hoeffler (2002). The present paper goes beyond that typology of violence and brings out the dynamics that may trigger a switch from one type of violence to the other. The latter prediction sheds some intriguing light on the transition to civilian rule that took place in 1999. Hence, the present modeling exercise provides a dynamic extension of the static theory of endogenous political regimes in Africa presented in Azam (2006). The resulting violence-

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<sup>1</sup> See Beevor (1982) on the Spanish civil war.

based rationale for the switch from dictatorship to democracy is markedly distinct from the credibility-based argument developed by Acemoglu and Robinson (2006).

The approach adopted here is in the spirit of the “analytic narrative” method advocated by Bates *et al.* (1998), which aims at shedding light on historical events by using rational-choice theory. This method uses the standard “revealed-preference” approach widely used in microeconomics and other fields of social sciences. It does not assume that all the players involved were fully conscious of the strategic choices that they were making, and thus cannot be used for allocating blame or guilt. It claims instead that they were acting “as if” they were pursuing a course of action that can be explained by the assumed rational-choice model. This methodology has been advocated ever since Milton Friedman published his founding *Essays in Positive Economics* (Friedman, 1953), and has proved to be a powerful tool for producing useful predictions about the real world and deriving effective policy implications.

We focus on the recent history of oil and violence in Nigeria, which has led to the killing of several thousand people and the displacement of many more. This conflict is mainly taking place in the Niger Delta region, where virtually all the oil produced in Nigeria comes from. However, we show below that it would be misleading to separate these events from other outbursts of “communal violence” that took place in various other cities elsewhere in Nigeria, where the victims were precisely migrants coming from the Niger Delta area. The narrative is structured by a simple model which is aimed at bringing out the rationality of the players. The latter could be easily overlooked when analyzing this kind of violent events that entail such a massive waste of lives and assets. The model presented below describes about three decades of oil exploitation and violence by distinguishing two clearly different periods. Under the various military regimes, during most of the 1980s and the 1990s, the most striking feature of the Nigerian history is the widespread use of indiscriminate violence against civilians, especially in the Niger Delta area. This is undoubtedly where the military have a

comparative advantage, and they have made use of it systematically<sup>2</sup>. Another important characteristic of that period is the large migration flows out of that region, mainly into other regions of Nigeria, although this phenomenon is not well measured in Nigeria (but what is well measured in Nigeria?). Nevertheless, it can be inferred indirectly from various facts, and it is also well documented by journalistic information. The third key characteristic of that period is the widespread pollution going on in the Niger Delta region. The model presented below suggests that these three phenomena are intimately related. It claims that violence against civilians during that period was really used as a deterrent, closely related to the Azam-Hoeffler analysis mentioned above.

Since the return of civilian rule in 1999, when the retired General Olusegun Obasanjo was elected president, the violence has taken a new twist, while it is claiming maybe even more lives. Although some one-sided violence against civilians is still going on, mainly perpetrated by the dreaded Mobile Police, the local populations are striking back in various ways. The most remarkable activity that takes place in that “war” is “bunkering”. This refers to the stealing of crude oil, especially at the beginning, or mainly kerosene nowadays, by the rebels. Ghazvinian (2007) offers a detailed description of the technology used by the people from the Niger Delta to perform this activity. It requires in most cases some corrupt accomplices inside the oil-producing firm. This phenomenon has been observed elsewhere, from Colombia to Iraq. A lot of fuel is thus stolen from the pipe-lines, and sold on the world market through well-organized illegal trading networks. The rebels have found other illegal means of raising some money, by abducting workers from the oil companies for a ransom, as well as by other forms of racketeering. Nevertheless, bunkering is the flagship of the popular

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<sup>2</sup> I am not aware of any systematic account of the violence against civilians perpetrated by the Nigerian government under the Military regimes. Some scattered information can be found in Ibeanu and Luckham (2007), Ghazvinian (2007), Shaxson (2007), Maier (2000), Reno (1998), Gboyega (1997) and Herbst and Olukoshi (1994). Violence was also used by the military regimes in various other regions of Nigeria than the Niger Delta. The standard practice was for the Mobile Police or the army to raze villages after killing a large number of its inhabitants and burning their houses. A more sophisticated approach was to ignite and support with some infiltrated armed soldiers some outbreaks of violence between neighboring communities.

response to the disruption entailed by the extraction of oil in their homeland. The money earned by these illegal activities is used both for ensuring some livelihood to the people involved, and for buying weapons (Ghazvinian, 2007). Then, occasional fighting between some organized rebel groups and the Nigerian army may take place, with a lot of casualties. There is no need to describe this fighting in the model, as it can be regarded as a joint product of the main illegal activity devoted on a day-to-day basis to bunkering and extortion.

***Reciprocal Looting: Trading Bunkering against Pollution***

All this stealing and ransoming might suggest that the Nigerian story could be easily fitted within the framework of the famous “greed and grievance” framework, made popular by Collier and Hoeffler (2004). This would then put the emphasis on the “quasi-criminal” nature of the rebellion, as Collier (2000) puts it. However, our model shows that such a rebel-centered approach fails to capture the essence of the conflict, as emphasized in a broader context by Bates (2008). Zinn (2005) makes a related point in the specific case of Nigeria, emphasizing how misleading are the predictions derived from the Collier-Hoeffler framework. Our model points instead to the government as the leading player, while the rebellion is simply a predictable response to the former’s decisions. It is a risk that the government, which owns in fact all the oil resource in Nigeria, is prepared to take with a view to minimize the cost of oil extraction, in our inter-temporal framework. The Petroleum Decree of 1969 vests petroleum ownership in the Nigerian state, while the 1979 constitution entrenches state ownership of petroleum, minerals and natural gas. The foreign oil companies are mostly working under a production-sharing contract with the government. The latter gets most of the time about 60 % of the output, with significant variation about that number, after the companies have recouped their sunk cost (exploration and fixed investments).

Greed on the part of the rebellion, if one wishes to use this popular expression, is then a pretty natural response to grievance, the latter being rooted in the multi-faceted violence

perpetrated by the government and other actors. The largely avoidable destruction of the environment perpetrated by the oil-producing firms under the aegis of the Nigerian government could be included in the list of the forms of violence inflicted on the local populations. However, for the sake of precision, we choose here a more narrow definition of violence against civilians, restricted to the aggressions aimed directly at wounding or killing the targeted persons. Furthermore, we call “indiscriminate violence” the kind of one-sided violence against civilians that was consistently applied by the Nigerian army during the military regimes and at the very beginning of the civilian regime, to be distinguished from “fighting”, which means that the civilians are striking back somehow. Hence, pollution and bunkering might be regarded as a kind of reciprocal looting, each side stealing some exhaustible resource from the other one, almost like in the model analyzed in Azam (2002). While civilians are looting some of the oil, by bunkering, the oil firms are destroying the means of production of the former by polluting their land. This is also a form of looting, as the firms are thus avoiding to pay for one of their key inputs. Violence is then a mere collateral damage entailed by this looting activity, a cost-effective way to capture the booty as shown below. The Nigerian government’s cynicism about the fate of the people of the Niger Delta area is well represented by the following quote, extracted from a public lecture given in 1980 by a former federal permanent secretary in the Ministry of Mines and Power: “There is a nudging acceptance of the special needs of oil areas in the latest proposals being discussed by the government... Given, however, the small size and population of the oil-producing areas, it is not cynical to observe that even if the resentments of oil-producing states continue, they cannot threaten the stability of the country nor affect its continued economic development” (cited by Gboyega, 1997, p.174-75). The acknowledged cost of disrupting these people’s lives is clearly restricted in this quote to their limited ability to retaliate in a significant way. There

probably was some underestimation in that prediction, as the current conflict has led at times to a significant fall in oil exports, estimated at about one third of the trend level.

More than a hundred oil spills are observed each year, and hundreds of barrels are thus spilled every year on the soil and in the waters of the Niger Delta. An estimate by the WWF (World Wildlife Fund) suggests that the quantity of oil spilt *each and every year* in the Delta area over the last 50 years is equivalent on average to that spilt by the *Exxon Valdez* super-tanker when it was wrecked in Alaska in 1989. Then, a massive mobilization among conservationists occurred in the West, in view of the fragile equilibrium of the Alaskan environment. In fact, since the 1980s, more than half of the cases of oil spills in Nigeria are due to sabotage, responding to various motivations (political protest, racket for compensation, theft, etc.). In recent years, theft from the pipe-lines has become a true industry, but it ends up sometimes in deadly explosions and massive pollution (Ghazvinian, 2007). However, such criminal or politically motivated oil spills only account for a small share of the quantity of oil spilt, amounting for example to only 6 % in 2005 (ICG, 2006). Moreover, land has been nationalized in 1978, so that the people's property rights on land are essentially based on the good will of the civil service. This makes the prospect of any kind of monetary compensation for the local communities affected by such a pollution quite illusory (Olokesusi et Akpokodje, 2004). Moreover, the large quantities of gas contained in the oil deposits would be very costly to exploit, given the topography of the place, and are thus flared in the open on a continuous basis. This entails a huge atmospheric pollution in the area, with the resulting acid rains adding to the damage inflicted onto the environment.

### ***Outline***

The idea of backward induction has gained quite a lot of currency nowadays, due to the widespread use of game theory in social sciences. The argument of this analytic narrative can also best be understood by working backward in time. The next section provides some



stylized facts describing the current state of affairs in the Niger Delta states of Nigeria, and sketches the model used for analyzing the oil-related violence taking place there in the current period, labeled period 2. Section 3 then describes the strategy of violence adopted during the military regime, labeled here period 1, spanning most of the 1980s and 1990s, and that resulted in the current situation. Section 4 then discusses what kind of rationality led the government to engage Nigeria into that avenue of pollution and strategic violence. A very simple model of the government maximizing the present value of the profits from the oil sector is shown to predict the kind of outcomes described in the preceding sections.

## **2. Oil Bunkering in a Polluted Trap**

Nigeria hit the headlines in the West at the end of the 1960s, with the pictures of the famine triggered by the Biafra war (1967-70). The main ethnic group of the south-eastern part of the country, the Igbos, had then chosen secession, in order to keep for themselves a larger share of the oil revenues extracted from that part of the country. Most of the Nigerian oil reserves are located in that area of the Niger Delta, a swampy area partly covered with the equatorial forest, located just to the south of the Igbo traditional territory. The people living there mainly form small and unstructured ethnic groups, without much traditionally centralized political organization. The Ijaws are the only relatively large group in that area, surrounded by smaller groups like the Itsekiris, the Ogonis and the Urhobos. The Ijaws rank in the fourth place by their size in this country, behind the Hausas, the Yorubas and the Igbos. The oil extracted there is of such an exceptional quality that the “Bonny light”, named after a little town opposite Port Harcourt, has become a reference on the world market. The two major ethnic groups in the country, the Hausa from the North and the Yoruba from the South-West are much more numerous and structured, and they opposed that attempted secession. They fought against the separation of the Biafra republic, as it was then called, with a view to defend their claim on the oil rent. Although the military might of the Nigerian army was

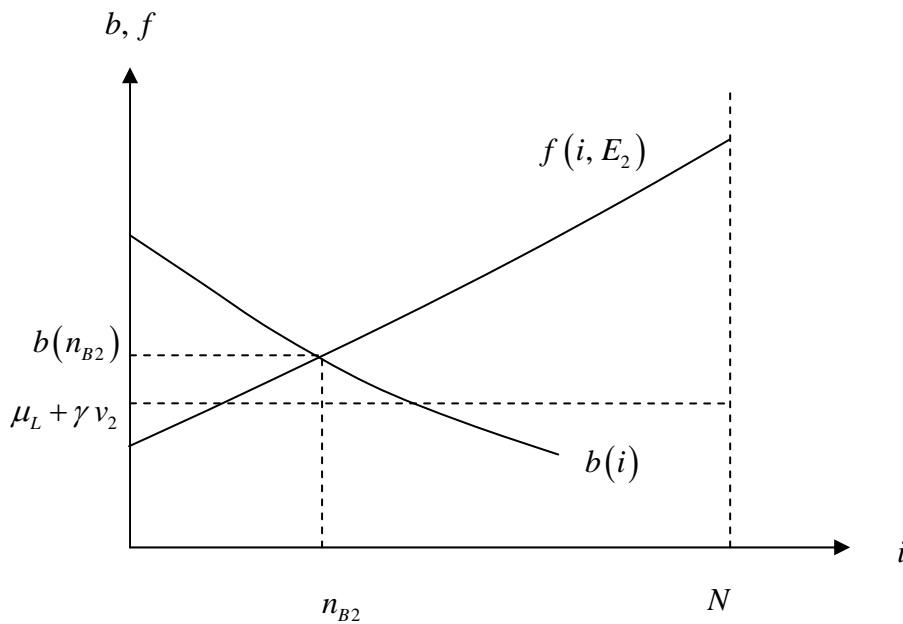
impaired by the difficult terrain of the Delta, a mangrove zone subdivided by countless divisions of the river, the scarcity of food organized by their government put down the Igbos' resistance.

Despite the reconciliation drive advertised by the government, the issue of the sharing of the oil revenues among the various regions is remaining up to now at the front stage of Nigerian politics. The Head of State was then Lieutenant Colonel Yakubu Gowon, whose proclaimed policy is summarized by the maxim: "No victors, no vanquished" (cited, among others, by Maier, 2000, p.53). In fact, since the end of the Biafra war, the victors have kept the benefit of oil revenues, and the vanquished have gotten the implied pollution. Whether under the ephemeral civilian governments or under the military regimes, the country has sunk gradually into a regime of generalized corruption and massive diversion of oil money into private accounts over the subsequent years. For many years, nobody with any bit of power has devoted any attention to the issue of preventing pollution. This has affected drastically the possibilities of gainful occupation open to the Niger Delta people. This is captured in a stylized way by the following model.

### ***The Occupational Choice between Farming and Bunkering***

Figure 1 helps us to understand the simple model used here to describe the "labor market" currently in operation in the Niger Delta states of south-east Nigeria. The function  $f(i, E)$  describes the level of productivity of each individual when employed in farming. It is an increasing function of  $i$ , the individual's index running from zero to a maximum value of  $N$ , and of  $E$ , which represents the state of the environment. In particular, this variable is meant to capture the result of the accumulated pollution inflicted in the past by oil spills and gas flaring. The farming-productivity curve is drawn with an upward slope with a view to capture the differences across individuals, the latter being ranked by convention by increasing order of productivity. One possible simple interpretation of the upward slope of this curve is

that the individuals indexed by  $i$  are ranked according to the shortest distance where they live from the oil installations. The further they are from a pipe-line or an oil plant, the less likely is their land to have suffered from pollution in the past, and the more productive it is thus likely to be. However, such a narrow interpretation should not be taken literally. What is called “farming” here is a stylization of all the productive activities that the people of the Niger Delta states can engage in, ranging from farming and fishing to various kinds of craft production, like basket weaving, etc. These are the kind of legal activities that any person from the Niger Delta can practice for a living. Their productivity is obviously not determined one-to-one by the distance at which they take place from the pipe-line, and various other determinants can affect the opportunity set of each individual  $i$ .



**Figure 1: The Niger Delta States’ “Labor Market”**

The alternative income-generating activities are illegal, and I call them generically “bunkering”, which is probably the most lucrative activity currently open to many people in the Niger Delta states, but it is also quite dangerous. The function  $b(i)$  describes the expected gain to be gotten from this activity, net of any risk premium that the individuals might take

into account when choosing their line of business. Some subjective or ideological value might be attached by the people involved in these illegal activities, e.g., by political activists who plan to invest some of that money into buying weapons or serving their cause by any other costly means. Then, the expected value of their distant political gain should be included in their subjective valuation of the catch  $b(i)$ . However, it seems likely that quite a lot of people involved in bunkering are just doing it for securing an income for themselves and their extended family. This function is drawn with a negative slope, in order to capture some kind of decreasing marginal returns that are bound to affect this activity. Two main arguments can be invoked for justifying this assumption. First, not all places are equally valuable as bunkering points, and one may safely assume that the first ones to engage in this activity will choose the best places, while the newcomers will have to do with less profitable locations. Second, there might be various forms of congestion effects, as more and more people engage in this line of business. In particular, the downstream activities, like transport and shipment, might have an upward-sloping supply curve, at least in the short-run, thereby reducing the net returns to bunkering.

In drawing figure 1, one additional assumption has been made for the sake of simplicity. The way the curves are drawn means that those for whom bunkering offers the largest reward are simultaneously those for whom farming is the least attractive. This assumed negative correlation is a simplified way of capturing the idea that those who live close to the pipe lines or the plants are facing the best opportunities to engage in bunkering, while their land is the most likely to be seriously polluted, as mentioned above, and thus to be the least productive. By contrast, those who live far away from the pipe lines or the plants are less likely to have a seriously polluted land, and are thus more likely to have a higher productivity in farming. They are also facing the highest cost of bunkering, both because of transport costs due to distance, and because of a lower opportunity that they have to collect

information from the local oil workers and to acquire the required connections inside the plants. This assumption results certainly in a simplified picture of the geographical situation in the delta, which might make the choices open to the agents overly sharp. There are also probably many idiosyncratic factors playing a part in such an occupational choice, which are bound to make the true picture fuzzier, but they can be neglected at this level of abstraction. Nevertheless, our simple model is consistent with the findings presented by Oyefusi (2008), which are based on micro-data on youth willingness to participate in the rebel movement in the Niger Delta states. The logit regressions estimated from this data set show that the number of oil wells present in the community where the interviewed person lives is a major determinant of that willingness to participate. This variable probably conflates the effects of both “closeness” to oil installations and community size, but the latter is somewhat controlled for by dummies in these equations. Hence, these findings support the view captured in our simple model that people who live “closer”, in some sense, to oil installations are more prone than the others to engage in oil-related illegal activity. Moreover, the results described below are obviously robust to some simple extensions of the model where this negative correlation is not holding in the whole space, but just in some neighborhood of the equilibrium point. The geometric presentation adopted here makes an extension to such more general cases very easy to imagine.

### ***The Closed Migration Door***

The third choice open to the Niger Delta states’ people is migration. The out-migration of Igbos and other people from south-eastern Nigeria to many Nigerian cities and abroad has been going on for ages. Lawal (2008) describes for example the migration flows to the Cameroons over the 1885-1961 period. His patchy data suggest that the Igbos and the Ijaws provided a sizable share of the migrants to the Cameroons over that period. He uses the word “Igbophobia” to describe the response of the local populations to the Igbos’ well-known

“drive and skill for trade” (Lawal, 2008, p.99). Unfortunately, while reliable data on the number of migrants across Nigeria are not available, we get an undisputable proof of their existence through reports of “communal violence” erupting in various Nigerian cities. For example, more than 30 000 migrants, mainly Igbos, had been killed by the mobs in various northern cities in 1966 (Maier, 2000). This triggered a massive return flow of impoverished Igbos to their homeland, and probably played an important part in triggering the Biafra war (Chimee, 2008, Maier, 2000). More recently, massive killing of Igbos and other south-eastern migrants, together with widespread burning of their shops and houses, etc., took place in the northern city of Kano, in 1991 and 1994. The religious divide between Kano’s Muslim inhabitants and the Christian migrants has been widely agitated on these occasions for mobilizing the mobs against the latter. Ibeanu and Luckham (2007) present a convenient table listing this kind of violent events by date of occurrence, although their series seems to be slightly incomplete. It is mainly at the end of the 1990s that Ijaws were significantly involved in this kind of “communal violence”, in Lagos and other southern cities like Yenagoa (Maier, 2000). Before that date, their small number confines them to the “Other South-Eastern Groups” category. This kind of “communal violence” has now become endemic in Nigeria, giving rise to a lot of inter-ethnic retaliation across distant regions and to a complicated situation of internal displacement (see e.g., Global IDP, 2005).

In the current period, then, out-migration from the Niger Delta states to other cities in Nigeria is known to be fairly hazardous, because of ethnic tensions and xenophobic response against the Niger Delta state people in those cities. This point is discussed in greater detail in what follows. At this stage, it is sufficient to say that migration is assumed to offer the prospect of an expected income  $\mu_L$ , measured net of the different migration costs. Moreover, assume that the government inflicts an expected cost  $\gamma v$  on each person living in the relevant area, by perpetrating a level of indiscriminate violence against civilians  $v$ , as was done in the

previous period under the military regime. Then, this provides an additional dividend to investing in migration, as it allows the migrants to escape from that violence, so that the total return to migration may be written as  $\mu_L + \gamma v$ . The latter is drawn in figure 1 below the intersection of the two previous curves, i.e., without any impact on the labor market equilibrium point. This reflects the low return to migration  $\mu_L$ , discussed above, assuming that it is not compensated by a commensurate increase in the level of violence in the current period  $v_2$ <sup>3</sup>. The latter assumption is further discussed below. Given this assumption, the equilibrium is found where the marginal individual is indifferent between engaging in farming and in bunkering. Denoting  $n_{B2}$  the index of the marginal individual, equilibrium occurs when the following arbitrage condition holds:

$$b(n_{B2}) = f(n_{B2}, E_2). \quad (1)$$

All the agents for whom bunkering offers a better income than farming will thus engage in the former, while all those with the opposite ranking will remain occupied in the legal activities. This is shown in figure 1 as the intersection between the two curves. A glance at arbitrage condition (1) shows immediately that the equilibrium number of people engaged in bunkering can be written as a function of the state of the environment only:

$$n_{B2} = n_B(E_2), \quad (2)$$

with:

$$\frac{d n_{B2}}{d E_2} = \frac{\partial f(n_{B2}, E_2) / \partial E}{b'(n_{B2}) - \partial f(n_{B2}, E_2) / \partial n_B} < 0. \quad (3)$$

Hence, this very simple framework predicts clearly that the number of people engaged in oil bunkering is an increasing function of the level of pollution of the environment. This captures the indirect impact of the deterioration of the environment on the value of bunkering

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<sup>3</sup> A technical condition for this result to hold is presented below, at section 4, as it involves some notation only introduced then.

relative to farming. By reducing the returns to farming, pollution thus reduces the opportunity cost of engaging in illegal activities, making bunkering more attractive. The quality of the environment mainly depends on decisions made in the past, and we may thus interpret (2) as reflecting the time bomb planted by environmentally damaging past oil production. More precisely, assume that the government had the possibility at period 1 to reduce the future level of pollution prevailing at period 2 by investing an amount  $a$  in pollution control, such that  $E_2 = E_2(a)$ ,  $E_2'(a) > 0$ . Then, (2) can immediately be translated into:

$$n_{B2} = n_{B2}(a), \quad n_{B2}'(a) < 0. \quad (4)$$

This result illustrates a variant of a finding described in the reciprocal looting model of Azam (2002) as “strategic complementarity”. In that model, when more looting is performed by one side, this reduces the productivity of the farmers of the other side, net of the expected value of the loss to looting, and thus reduces the opportunity cost of the latter engaging in looting the former. This entails a kind of multiplier effect, because it provides the first side with an incentive to engage in even more looting, etc. Here, we find a similar result, but with an inter-temporal dimension. More looting performed yesterday by the government, in the form of increased pollution, results in more looting performed today by the victims of that pollution, in the form of bunkering. We will discuss below whether the prospect of future bunkering reduces or increases the incentives faced by the oil-producing firms and the government to protect the environment in the first place.

Moreover, this equilibrium point also implies that indiscriminate violence, of the type that was performed in the previous period by the military regime would be pointless in period 2, as long as out-migration was unattractive. To see this, assume that the army can inflict an expected cost  $\gamma v$  on each person living in the relevant area. Then, the expected benefit of farming, net of the expected cost of indiscriminate violence becomes  $f(i, E_2) - \gamma v_2$ , while



the expected benefit of bunkering becomes  $b(i) - \gamma v_2$ . Because this indiscriminate violence is affecting the people irrespective of the activity in which they engage, it does not affect their arbitrage decision. The equilibrium condition then remains (1), provided the two curves intersect above  $\mu_L + \gamma v_2$ . This prediction sheds an interesting light on the change of strategy adopted by the Nigerian government with the return of power to civilians after the democratic election that took place in 1999. The new president dismissed a lot of military officers and cut down drastically the number of soldiers (Maier, 2000). This was interpreted at the time as a symbolic gesture aimed at signaling the beginning of a new era. The present model offers a different viewpoint: the value of indiscriminate violence had by then fallen drastically<sup>4</sup>. This was not so in the previous period, when the expected returns to migration were not known to be so low, as captured by our  $\mu_L$  in the present model.

### 3. Two Decades of Violence against Civilians

The simple setting used above for discussing the current state of the oil conflict in the Delta states can be amended marginally to understand how different the situation was when the military made the decision to use violence against civilians strategically as a way to minimize the costs of oil extraction.

#### *The Promises of Out-Migration*

For more than a decade after the end of the civil war, under the probable influence of Gowon's "no victors, no vanquished" motto, no significant communal violence broke out in Nigerian cities against migrants. Chimee (2008) suggests that a new wave of out-migration from Igboland occurred in the wake of the civil war, partly as a result of deteriorated economic conditions. This suggests also that the memories of pre-war xenophobic violence

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<sup>4</sup> This might explain why the former military dictator Babangida has provided a lot of support to former general Obasanjo for presiding over the return to civilian rule in 1999. Some implicit collusion seems plausible between the former military rulers and the newly elected civilian government at that time (see e.g., Maier, 2000, chapter 1, Global IDP, 2005, p.11).

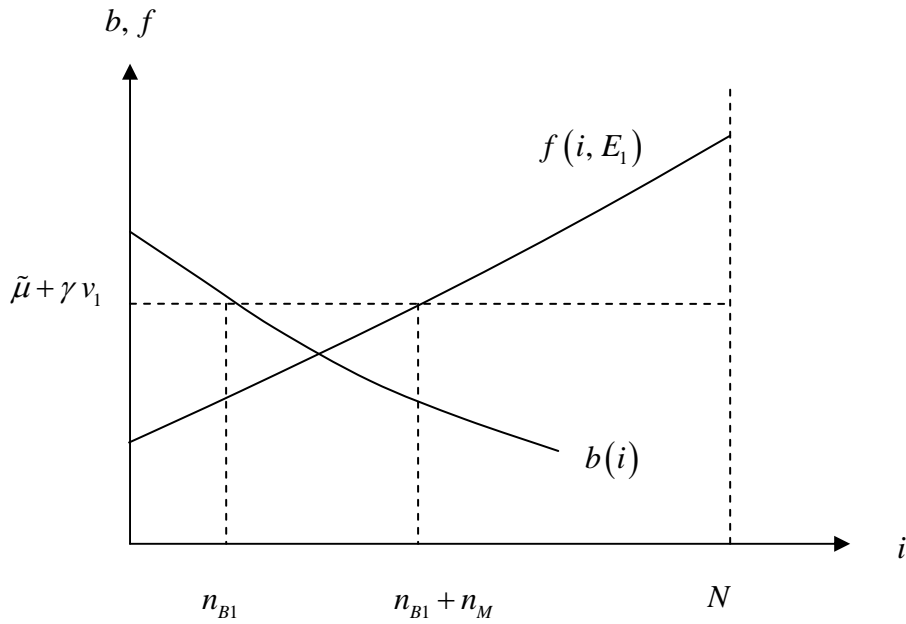
against migrants in northern cities had been discarded, as if the war had laid the foundations of a new era. This view was actively supported by the government's well publicized reconciliation policy. In fact, we only need to change one assumption for capturing this post-war renewed faith in migration, namely the one regarding the expected returns to migration as seen by the people living in the Niger Delta states area.

Now, assume that they did not know for certain whether the returns to migration would turn out to be high, at  $\mu_H$ , or low, at  $\mu_L < \mu_H$ . For the sake of simplicity, we assume that  $\mu_H \geq b(0)$ , i.e., that in the best-case scenario, migration makes people better-off than even remaining the last one practicing bunkering from the best place. Assume instead that they formed a subjective probability distribution about this value, attaching a probability  $\pi$  to the high return to migration  $\mu_H$ , and the complementary probability to the low return  $\mu_L$ . Hence,  $\pi$  can be interpreted as an index of optimism on the part of the prospective migrants. The latter clearly has a positive impact on their propensity to migrate, *ceteris paribus*. Then, denote  $\tilde{\mu}$  the expected value of the return to migration under this assumption:

$$\tilde{\mu} = \pi \mu_H + (1 - \pi) \mu_L. \quad (5)$$

There is no need to assume that the government had a different belief about the probability distribution governing the returns to migration, and there is no particularly interesting bias in its beliefs that could shed some light on the decisions taken at the time. Let us thus assume that the beliefs described at (5) were the same for the government and the civilian population in the Delta states area. What matters, however, for the main thrust of the argument about the government's choice to inflict indiscriminate violence against civilians as an inducement to migrate is what the government believes about  $\pi$ . Hence, most of the results derived below would hold qualitatively unchanged were the government assumed to over-estimate the latter.

*The Effectiveness of Indiscriminate Violence*



**Figure 2: Violence as an Incentive for Out-Migration**

Figure 2 demonstrates the changes entailed relative to figure 1 if we assume that the prospective migrants in period 1 had beliefs that were optimistic enough to put the expected returns to migration  $\tilde{\mu} + \gamma v_1$  above the intersection between the two curves  $b(i)$  and  $f(i, E_1)$ . This entails that migration was then providing a third relevant alternative in the decision facing the potential migrant. Define the number of people engaged in bunkering as  $n_{B1}$  and the number of migrants as  $n_M$ . Figure 2 makes it clear that there is no need to assume that the government is really inflicting indiscriminate violence on all individuals. What matters for the analysis performed below is that the government threatens credibly to inflict the right level of violence over the people located in the right neighborhood of the equilibrium point. For example, if the government was perfectly able to target its violence, then it would be enough to inflict enough violence to a fraction of the individuals located between  $n_{B1}$  and  $n_{B1} + n_M$  on figure 2 to convey the information that people living there had better move away.

However, if the people most inclined to move are not so easy to identify as in our simple model, then more extensive violence might be necessary to get the same result.

The migration equilibrium depicted in figure 2 clearly shows that the arbitrage condition (1) must be replaced by the following two arbitrage conditions:

$$b(n_{B1}) = \tilde{\mu} + \gamma v_1, \quad (6)$$

and

$$f(n_{B1} + n_M, E_1) = \tilde{\mu} + \gamma v_1. \quad (7)$$

Condition (6) shows immediately how different was the situation when migration was a relevant alternative. Then, the number of people engaged in bunkering was a decreasing function of the expected level of indiscriminate violence inflicted on civilians, with the following marginal impact:

$$\frac{\partial n_{B1}}{\partial v_1} = \frac{\gamma}{b'(n_{B1})} < 0. \quad (8)$$

This negative impact can also be found by inspecting figure 2. If  $v_1$  increases, the dashed horizontal line marked  $\tilde{\mu} + \gamma v_1$  shifts upwards, resulting in a fall in the number of people engaged in bunkering  $n_{B1}$  and in an increase in the number of migrants  $n_M$ . Consequently, the number of remaining farmers, equal to  $N - (n_{B1} + n_M)$ , falls. Notice that the resulting fall in the level of farming output is liable to reduce the economic value of the environment  $E$ . This might provide the government with an indirect incentive to reduce its effort at preventing pollution, but we neglect this refinement for the sake of simplicity.

Condition (6) also entails that an increase in optimism, i.e., an increase in  $\pi$ , would also shift the horizontal dashed curve upwards, with a similar impact as the one just described. Its marginal impact would be:

$$\frac{\partial n_{B1}}{\partial \pi} = \frac{\mu_H - \mu_L}{b'(n_{B1})} < 0. \quad (9)$$

The number of migrants would go up, entailing a fall in the number of people engaged in bunkering as well as in the number of those engaged in farming.

The next section shows that this parameter  $\pi$ , which captures the degree of optimism felt by the prospective migrants about the success of their re-location, is liable to affect decisively the initial choice made by the government about inflicting a lot of indiscriminate violence against civilians and investing in the prevention of pollution.

#### **4. Migrants' Optimism and the Strategic Choice of Violence and Pollution**

Let us now assume that the Nigerian government had to choose rationally in the late 1980s or early 1990s its policy mix concerning two strategies for minimizing the cost of oil extraction in the Niger Delta states: one based on pollution control, and the other one based on indiscriminate violence against civilians. It is then natural to assume that all the predictions derived in the previous sections about the response of migration and bunkering to these strategies were correctly appraised by the government, and duly taken into account in its economic calculations.

##### ***Optimizing Violence and Pollution***

There are two periods, labeled 1 and 2 like in the previous sections. At period 2, there are in fact two possible states of the world: either the return to investment in migration is high, at  $\mu_H$ , or it is low, at  $\mu_L$ . For the sake of simplicity, assume that  $\mu_H > b(0)$ , so that it is optimal for the potential migrant to go away rather than to engage in bunkering in the best-case scenario. In other words, the equilibrium outcome analyzed at section 2 is the bad one, which occurs with probability  $1 - \pi$ , as seen from period 1. With probability  $\pi$ , the best-case scenario occurs, with a lot of migration and no bunkering. We now analyze the government's decision in period 1, assuming that it foresees correctly the response of the occupational choice by the Niger Delta states' people to its decisions, as described in the previous sections.

For the sake of saving notation, define the total value of the catch from bunkering as:

$$B_j = \int_0^{n_{Bj}} b(i) di, j \in \{1, 2\}. \quad (10)$$

Given the function  $b(n_{Bj})$ , one can check easily that the comparative-statics of this catch can be derived easily from the fact that  $dB_j = b(n_{Bj})dn_{Bj}$ . The comparative-static analyses performed in the previous sections about this number of people engaged in bunkering have shown that this variable is not influenced by the same determinants at the two dates. In particular, we can immediately derive from those results that:

$$B_1 = B_1(v_1, \pi) \quad (11)$$

and

$$B_2 = B_2(a), \quad (12)$$

under the assumptions spelt out in the previous sections.

Assume that the unit cost to the government of indiscriminate violence is  $\omega$ , while the level of this violence is respectively  $v_1, v_{2L}$  and  $v_{2H}$  in the two periods and the two states of the world. Denote  $p_1, p_{2H}$  and  $p_{2L}$  the values of the oil output, assumed exogenous in each period and each state of the world, for the sake of simplicity, and  $\delta$  the government's discount factor. The latter may reflect in particular the probability that the period 1 incumbent government attaches to being still in that position in period 2. Lastly, let  $\xi$  denote the unit cost of bunkering to the oil firm and the government. It seems fairly natural to assume that  $\xi > 1$ , reflecting the inefficiency of this method of transferring oil from the firm to the bunkerers. Then,  $\xi - 1$  measures the gap between the cost of bunkering to the firm and its benefit to those who perform this activity. Moreover, any damage inflicted by the rebels to the oil firms and the government, using weapons purchased with the money acquired by bunkering and other oil-related illegal activity, should be reflected in this parameter  $\xi$ .

However, we have defined  $b(n_{B_j})$ ,  $j \in \{1, 2\}$ , as including as well the subjective or ideological value attached by the bunkerers to their catch, so that  $\xi < 1$  is also possible.

Then, assume that the bargaining process between the government and the oil firms is efficient, noting that the former is also the main shareholder of the oil firms. Disregarding the issue of the sharing of the rent, which is irrelevant for our purpose, this efficiency assumption entails that these two players will seek to maximize the size of the bargaining set, taking due account of their total costs and benefits. Then, assuming for the sake of simplicity that the government and the firms use the same discount factor  $\delta$ , the chosen policies will seek to maximize the present value of the expected profits from the oil sector, broadly defined:

$$W = p_1 - a - \omega v_1 - \xi B_1 + \delta \left( (1 - \pi)(p_{2L} - \omega v_{2L} - \xi B_2) + \pi(p_{2H} - \omega v_{2H}) \right). \quad (13)$$

A glance at this expression, keeping in mind the functions (11) and (12) that govern the cost of bunkering, shows immediately that the government will choose  $v_{2L} = v_{2H} = 0$  under the assumptions spelt out above in section 2. Indiscriminate violence against civilians is thus worthless in period 2, in the two possible states of the world, for different reasons that are discussed above. Then, the government's problem at period 1 can be simplified to that of choosing a pair  $\{a^*, v_1\}$  that minimizes the following cost of oil extraction:

$$c(a, v_1, \pi) = a + \omega v_1 + \xi \left( B_1(v_1, \pi) + \delta(1 - \pi)B_2(a) \right). \quad (14)$$

The profit-maximizing investment level in pollution control must fulfill the following first-order condition:

$$-\xi \delta(1 - \pi) \frac{\partial B_2(a^*)}{\partial a} = 1. \quad (15)$$

This expression says that the government will push its investment in pollution control to the point where the present value of the expected reduction in bunkering cost is equal to the unit cost of this investment. A glance at this expression immediately hints at the effect of

optimism regarding the success of out-migration  $\pi$ . An increase in the latter reduces the expected value of the future reduction in bunkering cost. Assuming that the second-order condition holds, then one can easily derive by differentiating (15) that pollution control will thus be a decreasing function of this index of optimism:

$$\frac{d a^*}{d \pi} = \frac{-1}{\xi \delta (1-\pi)^2 \partial^2 B_2(a^*) / \partial a^2} < 0. \quad (16)$$

In simple terms, this implies that the government will invest less in pollution control, the larger is the propensity of the affected population to migrate. This effect is channeled by the fall in the probability of the worst scenario to happen, when high pollution backfires at period 2 by giving rise to a high level of bunkering.

It is immediate to check that an increase in the cost  $\xi$  to the firm of bunkering or in the probability  $\delta$  of the incumbent government still being in power at period 2 will have a positive impact on the effort made at controlling pollution. This implies in particular that political stability, understood as a high probability of the period 1 incumbent government to be still in power at period 2, is playing a favorable role in the preservation of the environment. This probability plays a key role in giving the local people the power to punish the polluting government at period 2 by spontaneously increasing the cost inflicted to the oil firms and the government by bunkering.

The profit-maximizing level of indiscriminate violence against civilians at period 1 must fulfill the following first-order condition:

$$-\xi \frac{\partial B_1(v_1, \pi)}{\partial v_1} = \omega. \quad (17)$$

This expression says that the government will push its investment in indiscriminate violence against civilians to the point where the value of the reduction in bunkering cost is equal to the unit cost of this investment. This result can be used for characterizing further the policy-mix chosen by the government at period 1. It can be easily checked from (10) that:



$$\frac{\partial B_1(v_1, \pi)}{\partial v_1} = b(n_{B1}) \frac{\partial n_{B1}}{\partial v_1}. \quad (18)$$

Then, substituting in (17), and using (8), one finds that the profit-maximizing level of bunkering chosen by the government at period 1 is uniquely determined by the set of parameters  $\{\xi, \gamma, \omega\}$  under some simple regularity conditions, as:

$$\frac{-b'(n_{B1})}{b(n_{B1})} = \frac{\gamma}{\omega/\xi}. \quad (19)$$

The numerator of this ratio measures the effectiveness of indiscriminate violence at strengthening the incentive to migrate, while the denominator measures the unit cost of perpetrating that violence expressed in terms of the unit cost of bunkering. Hence, the parameter ratio in (19) measures the benefit/cost ratio of violence against civilians, as a means of reducing bunkering. Then, it can be checked easily that  $n_{B1}$  is uniquely determined as a decreasing function of this ratio if  $b''(n_{B1}) > (b'(n_{B1})^2)/b(n_{B1})$  for all values of  $n_{B1} \geq 0$ . The latter ensures that the second-order condition for minimizing the cost function (14) holds everywhere in the relevant range. A sufficient condition for an interior solution where (19) holds to exist is that  $-b'(0)/b(0) > \xi\gamma/\omega$  while there exists a large enough  $i_H > 0$  such that  $b'(i)/b(i) = 0$  if  $i > i_H$ .

Therefore, using (8) and (9) jointly, one finds easily that the chosen level of indiscriminate violence against civilians is a decreasing function of the migrants' level of optimism about the success of their out-migration:

$$\frac{d v_1}{d \pi} = -\frac{\mu_H - \mu_L}{\gamma} < 0. \quad (20)$$

The reason for this result is pretty obvious from the analysis performed at the previous section: the more optimistic the potential migrants are, the larger the number of migrants that will be produced by any level of indiscriminate violence, and in turn the lower the number of

people left bunkering in the Delta states. Therefore, given the profit-maximizing level of bunkering implied by (19), a higher level of optimism on the potential migrants' part allows the government to reduce its investment in indiscriminate violence against civilians. Conversely, this result implies that the government will step up its level of indiscriminate violence as the potential migrants lose some of their optimism regarding the returns to migration. Maybe, this finding explains the build up of violence against civilians perpetrated by the military regimes, from Buhari to Babangida up to 1993 and culminating with Abacha up to 1998, and even at the beginning of the civilian government, as the incidence of communal violence against migrants was increasing steadily in Northern cities and in the Middle Belt area (see Maier, 2000, Global IDP, 2005). Our model would thus suggest that Abacha's escalation of violence against civilians might have been a natural response to their decreased propensity to migrate due to the increased incidence of xenophobic response in potential destination cities<sup>5</sup>. However, this model also implies that the response of indiscriminate violence to the potential migrants' reduced optimism might be discontinuous, as one moves from the case of figure 2, where out-migration is a viable alternative, to that of figure 1, where the migration door turns out to be closed. This discontinuous response of violence can now be described in slightly more general terms.

### ***The End of Deterrence and the Switch to Civilian Rule***

We are now in a position to express the technical condition for the case of figure 1 to hold, announced in section 2 above. Denote  $n_{Bj}$ ,  $j \in \{1, 2\}$  the level of employment in bunkering at either period and denote  $n_{BEj}$  the value of  $n_{Bj}$  if it was determined like  $n_{B2}$  is in figure 1, *mutatis mutandis*, i.e., were the option of out-migration closed. This notation is

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<sup>5</sup> Explaining the gradual increase in communal violence falls outside the scope of this paper. It would be tempting to make it endogenous, as an increasing function of the number of south-eastern migrants present in the northern or south-western cities of Nigeria. However, one cannot dismiss either an explanation based on the exogenous rise in Islamic fundamentalism, imported from Iran and the Middle East, as the adoption of the Sharia in Northern states seems to have played a key role in igniting the communal violence in that part of the country, with potential contagion effects elsewhere (Maier, 2000). Some additional evidence and analysis is certainly needed for clarifying this issue. This shows the way to further research.

meant to emphasize that the state of the environment is then the proximate determinant of the employment level in bunkering, as seen at section 2. Denote also  $v_j$ ,  $j \in \{1, 2\}$ , the level of indiscriminate violence perpetrated against civilians at any period. Define also:

$$\Delta B_j \equiv \int_{n_{Bj}}^{n_{BEj}} b(i) di, \quad (21)$$

as the difference in the total amount of bunkering performed between the cases where migration is active or not.

Then, proposition 1 provides the key condition that is required for producing the case of figure 1, where the door of migration is closed, which yields qualitatively different predictions from that of figure 2, where out-migration is a viable option. It has also broader implications that are brought out below.

**Proposition 1:** Assume:

$$b(n_{BEj}) \geq \mu_L + \frac{\xi \gamma}{\omega} \Delta B_j, \quad (22)$$

and define:

$$\pi_H = \frac{b(n_{Bj}) - \mu_L}{\mu_H - \mu_L} \text{ and } \pi_L = \pi_H - \frac{\xi \gamma \Delta B_j}{\omega(\mu_H - \mu_L)}. \quad (23)$$

Then, the profit-maximizing level of indiscriminate violence is positive if  $\pi_L < \pi < \pi_H$  and zero otherwise.

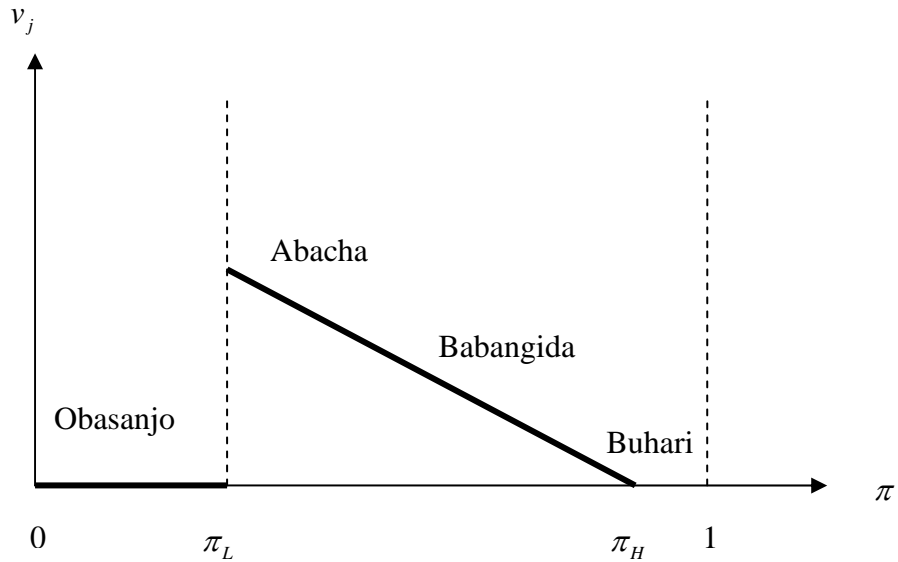
The proof is a bit lengthy and it is rejected in the appendix. The basic intuition underlying this result is extremely simple and says that for violence to be used, it must be effective enough. Otherwise, uncontrolled bunkering is less costly. Migrants' optimism is the key parameter that determines whether violence is effective or not, and violence is not worth the cost of inflicting it unless the migrants are optimistic enough. Then, the discontinuous response of violence to a fall in migrants' optimism occurs when its cost is already very high,

i.e., when indiscriminate violence has reached its climax. Moreover, if prospective migrants are highly optimistic, then there is no need to add any incentive to move by means of indiscriminate violence.

Notice by inspecting (22) that this condition is more likely to hold, the higher is the direct cost of violence  $\omega$  relative to its effectiveness at reducing the cost of bunkering for the oil firms and the government  $\xi\gamma$ . This is amplified by the fact that  $\Delta B_j$  is also reduced when  $\omega$  increases relative to  $\xi\gamma$ . It can be argued that the cost of running the army in Nigeria had also increased under Abacha. The risk of a coup was probably felt to be high. Corruption was rampant in the military, and contracts for importing weapons were becoming a major channel for buying off potential rivals. Howe (2005) illustrates how out-of-order tanks, for example, were purchased at high cost to the budget, with a view to maximize kickbacks in favor of high-ranking officers. Moreover, Adebajo (2002) suggests that the ECOMOG, the mainly Nigerian international peace-making force of the ECOWAS in Liberia and Sierra Leone, was used to a large extent as a conduit for bribing high-ranking officers and keeping them at bay. Lastly, it is plausible that Reno's concept of "sobels", i.e., soldier by day and rebel at night (Reno, 1998), applies in the case of many military officers in the Niger Delta states. This would imply that some of them would also engage in bunkering, purely for money.

Figure 3 describes the government's profit-maximizing level of violence against civilians at any period  $v_j$ ,  $j \in \{1, 2\}$ , as a function of  $\pi$ . For  $\pi_L < \pi < \pi_H$ , the level of indiscriminate violence is positive and decreasing with  $\pi$ , as shown by (20), while it is zero outside this range. Then, figure 1 corresponds to the value  $\pi = 0$  that we assumed to hold at period 2, while figure 2 describes the case where  $\pi > \pi_L$ , which we assumed to hold at period 1. This complete picture of the government's supply of violence function brings out the limits of indiscriminate violence against civilians as a deterrent for bunkering and other oil-related illegal activities. There is a "capitulation" threshold for  $\pi$  below which the cost inflicted to

the government by bunkering becomes lower than the cost of trying to prevent it by indiscriminate violence. The latter is then given up<sup>6</sup>.

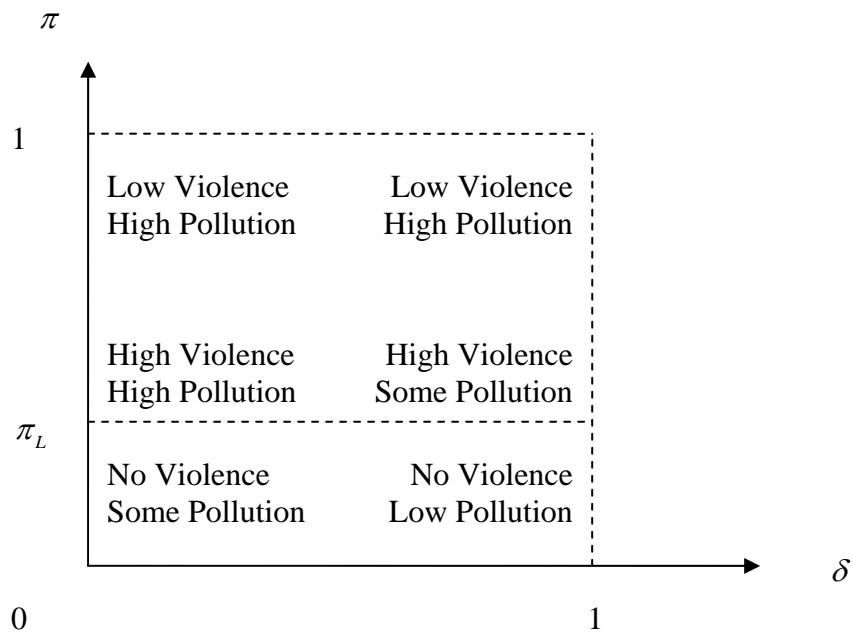


**Figure 3: Indiscriminate Violence and Migrants' Optimism**

The names of the successive Nigerian rulers written along that supply curve provide a suggested interpretation of their policies about indiscriminate violence against civilians, as the increased incidence of communal violence in various Nigerian cities was gradually cutting down the prospective migrants' optimism. There seems to be some rough positive correlation between the observed gradual increase in communal violence and the increased use of indiscriminate violence by successive rulers under the military regime. Moreover, this diagram suggests an endogenous explanation for the move to civilian rule, when  $\pi$  falls below the "capitulation" level presented above. Hence, our theoretical framework offers a dynamic interpretation of the change in the type of violence that occurred in Nigeria at the end of the 1990s and the beginning of this century. During the military regimes,

<sup>6</sup> Notice that violence might thus lose its effectiveness even if there is some residual out-migration without violence, if  $\pi_L$  is high enough. The case of figure 1 assumes in addition that  $\pi = 0$  and  $\mu_L \leq b(n_{BEj})$ , although it is robust to some relaxation of the latter two assumptions with  $0 < \pi \leq \pi_L$ , provided  $\tilde{\mu} \leq b(n_{BEj})$ .

indiscriminate violence against civilians was used as a deterrent, as described in section 3 above, after Azam and Hoeffler (2002). However, this strategy was only profit-maximizing as long as the level of optimism of the potential migrants was high enough to make violence affordable. Then, that optimism waned over time, as communal violence was gradually closing up the migration door for the Niger Delta states' people. Then came a point when this deterrence strategy became too costly relative to the expected cost of a limited war against the long-deterred rebellion. At that point, the military handed down the government to the civilians, who gave up deterrence and chose to face the war of the reciprocal-looting kind analyzed in section 2.



**Figure 4: The Profit-Maximizing Policy Mix**

Figure 4 presents the main results of this model in a synoptic fashion. It highlights the simultaneous influence of the two main parameters  $\{\pi, \delta\}$  that determine the government's policy mix of violence and pollution. It brings out clearly that two conditions must be met for the government to choose the good outcome, with low violence and low pollution. This requires both a low  $\pi$  and a high  $\delta$ , i.e., a fairly conservative society with a stable

government and a fairly sedentary population. Otherwise, the government's behavior will display a kind of trade-off, where either violence or pollution will reduce the affected population's welfare, depending on the parameters values. The profit-maximizing government might even rationally choose the worst combination of high violence and high pollution, somewhat reminiscent of the Nigerian situation under the Military regimes, when political stability is low and migrants' optimism lies in the middle range.

## **5. Conclusion**

This paper has tried to make some sense of the recent history of oil and conflict in Nigeria. It offers a simple model where a perfectly rational government chooses to inflict some indiscriminate violence on civilians rather than to protect their environment against pollution for the sake of minimizing the cost of extracting oil from their land. It assumes that the people affected initially have the choice between three kinds of occupations: working in the legal production sector, moving to illegality for stealing oil and extorting money from the oil firms, and migrating away.

Then, if migration offers a high enough expected return, or is perceived that way by the government, the latter might choose to exert some indiscriminate violence against civilians in the first period, as a way of strengthening their incentive to move away. In so doing, they reduce the amount of revenue lost by the oil sector to bunkering and other illegal gainful activity by the local population. In that case, the returns to investing in environmental conservation are pretty low anyway, as few people remain in the area, but the model presented above abstracted from this refinement. However, if the return to migration turns out to be lower than expected initially, a bad outcome emerges at the second date where a high level of illegal activity is the predictable response to the highly polluted environment that the local people have to live in. Nevertheless, if the initial probability of such an event occurring is low enough, then it is rational for the profit-maximizing government to take a chance and bet on

displacement for minimizing the expected cost of oil extraction. In the case of Nigeria, the bad news came when the migrants from the Niger Delta states started to be victimized by their host populations, after more than a decade of communal peace following the end of the civil war. A lot of them were murdered in a series of violent outbreaks, thus shifting downwards the expected returns to migration. These events became endemic over time, and this closed the door of migration to a large extent, cornering the people from the Niger Delta states in their polluted land where illegality and violence are the only coping strategies left for most of them. Then, violence took the form of two-sided violence, with the local population fighting back by various means, including at times some proper battles against the Nigerian army. In Port Harcourt in the summer of 2004, for example, the Ijaw Youths Movement led by Dokubo Asari had turned into a 2000-men-strong rebel army and confronted the Nigerian army, causing a lot of casualties on both sides (Maier, 2000). They had put oil exports to a halt for the duration of their operation. The rebels' weapons had been paid for using bunkering and extortion money. Obasanjo was able to stop the fighting and let exports resume by "buying" Asari's group's AK47s for about 1 million US \$ (ICG, 2006, Ghazvinian, 2007).

This analysis points at environmental improvement as a potential avenue for reducing the level of reciprocal violence and illegality in the Niger Delta area. At the very least, gas flaring should be discontinued, as a symbolic gesture announcing a change in policy. However, after decades of neglect, such a program of environmental recovery seems quite hopeless in the short run, while only a slow and costly process could reverse some of the most detrimental pollution. Hence, a complementary policy must be found for venting some of the desperation prevailing in these areas. The simple model presented above suggests that two main avenues should be envisaged for finding the required solutions. First, it seems obvious that quite a large share of the local population must migrate in order to improve its lot. The failure of the previous waves of out-migration can be traced to a large extent to the lack of



accompanying measures for helping the migrants settle down in their new destinations without upsetting the host population. It is not certain that the slide into endemic communal violence could have been averted by adopting appropriate policies in Nigeria. However, there are examples of successful inter-ethnic reconciliation in other countries, like in Malaysia (see e.g., Jomo, 2001). The key idea in such success stories is to create some positive links between the migrants' achievements and the incentives of the host population. In Malaysia, the interests of the highly entrepreneurial Chinese migrants and those of the more conservative native Bumiputras were aligned in particular by a temporary policy of compulsory joint ventures between the two communities. That policy was eventually reversed as the emerging Bumiputra business elite felt it would not need it any more. Some imaginative policies along these lines, duly customized to the Nigerian setting, would probably be worthwhile.

The second policy suggested by the present analysis is that some substitute to bunkering should be found to transfer some oil income to the local population in a more efficient and less violent fashion. One of the revealing decisions made by the newly-elected president Obasanjo was to increase the share of oil revenues going to the local state-level governments through the so-called derivation fund from 3 % to 13 %. However, the level of corruption prevailing at this level of government precludes any kind of "trickle down" of that money to the benefit of the local population. Bunkering might thus be seen as a relatively efficient way of handing over some of the oil money to the local population by bypassing the corrupt state-level governments. One of the attractions of bunkering is that it screens out to some extent the beneficiaries of this booty by rewarding only the most daring people in the area. Moreover, it is an effective way of venting the excess frustration by channeling the energy of these potential activists into some privately lucrative activity while separating them from the rest of the local population. This undoubtedly reduces their incentive to organize the

local population into an active movement with a more explicit political agenda, which could become eventually a threat to the government. In fact, there is some evidence that bunkering is somehow tolerated knowingly by the oil firms. In July 2004, an expatriate Shell engineer admitted that the company was keeping a map of their pipelines showing the points where bunkering was tolerated. He explained that: "It is to keep the locals happy" (cited in ICG, 2006, p.10). Shell officials have quickly denied this information. Nevertheless, bunkering is a dangerous activity, from both the human and the environmental points of view. Probably, the interests of the local communities and those of the oil firms could be aligned in a more efficient way by organizing some safe sales of kerosene at a well-chosen discount price at some carefully selected points along the pipe lines. This would still favor the most entrepreneurial people in the area, those connected to the international networks for on-selling the fuel, while insuring some effective transfer of oil money to the local population. However, this would reduce somewhat the thrill plausibly involved in bunkering proper, thus reducing further the optimal discount price to be charged at these points. Nevertheless, such a scheme would raise some serious implementation problems, which explain probably why it has not yet been explicitly tried. The key issue is to make sure that the beneficiaries of these cheap sales would not be chased later by the police and punished or racketeered. Probably, the credibility of such a scheme would require the intervention of some foreign security firms or NGOs with a strong reputation of independence from the oil firms for protecting the smugglers from the police. If such a scheme turned out to be politically unacceptable, then illegal bunkering would probably remain the second-best outcome for the time being, now that deterrence has become unprofitable.

#### **Appendix: Proof of Proposition 1.**

At any date  $j$ , the government will use a positive level of violence against civilians  $v_j$  if:

$$\min_{v_j} \omega v_j + \xi \int_0^{n_{Bj}} b(i) di < \xi \int_0^{n_{BEj}} b(i) di, \quad (\text{A1})$$

while the migration equilibrium implies that the level of bunkering is determined by the arbitrage condition:

$$b(n_{Bj}) = \mu_L + \pi(\mu_H - \mu_L) + \gamma v_j. \quad (\text{A2})$$

In this case,  $n_{Bj}$  is uniquely determined by the triplet of parameters  $\{\xi, \gamma, \omega\}$  as the interior solution implies (see (19)):

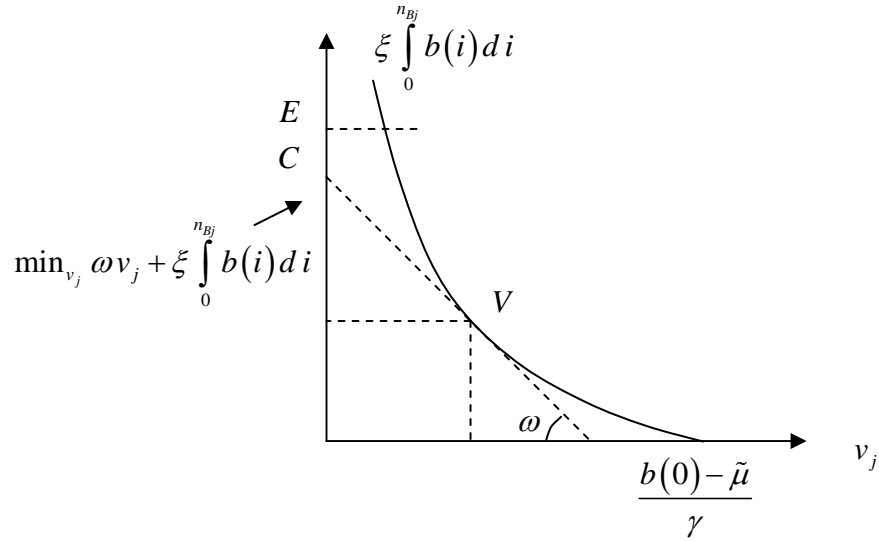
$$\xi b(n_{Bj}) \left( \frac{\gamma}{-b'(n_{Bj})} \right) = \omega. \quad (\text{A4})$$

The left-hand side of this expression measures the marginal benefit to the firm and the government of discouraging more individuals from engaging in bunkering by increasing violence by one unit, while the right-hand side measures the marginal cost of doing so. The left-hand side is decreasing in  $v_j$  by the second-order condition. Hence, the optimum level of violence is unique. This entails that the cost-minimizing level of violence against civilians is a decreasing function of  $\pi$  (see (20)) such that:

$$\frac{\partial v_j}{\partial \pi} = -\frac{\mu_H - \mu_L}{\gamma} < 0. \quad (\text{A5})$$

Now define  $\Delta B_j$  as in (21) above. Condition (A1) may then be written as  $\omega v_j < \xi \Delta B_j$ , where the left-hand side is decreasing in  $\pi$  while the right-hand side is independent of it. Therefore the cut off value  $\pi_L$  given by (23) is such that  $v_j = 0$  if  $\pi \leq \pi_L$ . Then, condition (22) is sufficient for making this cutoff relevant, i.e. to have  $\pi_L \geq 0$  in the relevant range of parameter values. It is more likely to be fulfilled, the lower is  $\xi \gamma / \omega$ , i.e., the lower is the effectiveness of violence at reducing the cost to the firms of bunkering relative to the cost of perpetrating the latter violence.

Figure A1 may be used to get an intuitive understanding of this result. The downward-sloping curve measures the cost of bunkering incurred by the firm, as a function of the level of violence inflicted on the civilians. The profit-maximizing level of violence is found at point  $V$ , where the slope of the bunkering-cost curve is equal to  $-\omega$ . Then point  $C$  measures the left-hand side of (A1). The latter can then be compared to the right-hand side of (A1), e.g., point  $E$  on the diagram. In order to understand intuitively the discontinuous jump in the optimal level of violence, notice that a fall in  $\pi$  shifts the curve rightwards, without changing its slope. Then,  $v_j$  increases for a while, until point  $C$  reaches point  $E$ , where the optimal level of violence against civilians falls discretely to zero.



**Figure A1: The Optimum Level of Violence and Bunkering**

The other part of the proposition follows immediately from writing (A2) as:

$$v_j = \max \left\{ \frac{b(n_{Bj}) - \tilde{\mu}}{\gamma}, 0 \right\}. \quad (\text{A6})$$

Then,  $\pi_L < \pi < \pi_H$  provides the condition for violence to be positive. **QED**

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