

Diamonds Are a Rebel's Best Friend

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1. INTRODUCTION

DURING the last decade, diamond production in African countries has been associated with rebel and terrorist funding, illegal smuggling and atrocious civil wars. This picture stands in stark contrast to the general image of diamonds in the Western world as being tokens of eternal love and symbols of extreme endurance and value. Although policy-makers in developed countries have become increasingly aware of the problem, the potentially destabilising effects of highly valuable minerals in some of the world's poorest countries have so far not received the attention that they deserve.

The purpose of this article is to analyse the linkages between the production of rough diamonds and economic development on a macro and micro level. In particular, I will try to explain why revenues from diamond mining have constituted a major impediment to social and economic progress in countries like Angola and Sierra Leone while they have been a cornerstone in the more successful development strategies of, for instance, Botswana and Namibia. I argue that two factors appear to have the greatest explanatory power in this regard; the strength of institutions of private property, as well as the nature of the extraction process. For reasons discussed further below, it is shown that so-called 'alluvial' mining is more strongly associated with negative externalities than 'kimberlite' mining. Furthermore, a single private player – the South African firm De Beers – has had a crucial impact on production and development in southern Africa.

The negative externalities from diamond extraction are maybe the most extreme example of the broader pattern of a 'curse of natural resources', i.e. the empirical finding of a negative relationship between natural resource abundance and economic growth in a cross-section of countries (Sachs and Warner, 1997; and Auty, 2001). The causal chains between natural resources and economic performance have recently attracted considerable attention in the economics literature. Several plausible theories of the negative relationship have been advanced, for instance that natural resource exports tend to cause 'Dutch disease' symptoms, i.e. an

appreciation of the local currency and a subsequent crowding-out of manufacturing sectors (Corden and Neary, 1982; and Sachs and Warner, 2001). Other hypotheses link natural resource dependence to poor human capital accumulation (Birdsall et al., 2001; and Gylfason, 2001), rent seeking (Torvik, 2002), the emergence of weak institutions of private property (Congdon Fors and Olsson, 2004), or even civil war (Collier and Hoeffler, 1998). Some scholars argue, however, that this current negative impact of natural resource wealth is not a universal phenomenon or one that has always been present. Botswana, Norway and indeed the United States provide examples of successful resource-driven developments. Auty (2001) shows that natural-resource-abundant developing countries tended to be richer than resource-poor developing countries until about 1980, whereupon the former category of countries started its decline.

In order to understand why some countries seem to have had more negative effects, attention has started to shift lately to what kind of resource that the country in question is endowed with. In a framework that many scholars now adopt, Auty (2001) argues that there appears to be a difference in the channels of influence between, on the one hand, highly concentrated 'point resources' such as minerals and oil, and more 'diffused' natural resources such as agriculture and forestry on the other. Point resources and their associated export revenues can be controlled by a small elite that divert a substantial share to their own personal fortune or to that of their clients. Such societies are often characterised by severe rent seeking. The rent seeking might even take extremely violent or 'quasi-criminal' forms such as armed rebellions with the primary aim of appropriating the valuable resource (Collier and Hoeffler, 2004; and Olsson and Congdon Fors, 2004). More dispersed natural resources such as farmland usually has a much more equitable distribution of its revenues and is less 'appropriable'.

Oil is sometimes included in the minerals category. The extraction of oil, however, has significant economies of scale and is often operated by state or parastatal companies. Oil is further mainly produced in middle- or higher-income countries that generally are less affected by the various forms of the 'curse'. Counter-examples are, of course, Sudan and Nigeria, where oil production has greatly contributed to social tension, in particular in the former country.

Highly valuable hard minerals are abundant in several low-income countries such as Angola (diamonds), Bolivia (tin), Botswana (diamonds), Zambia (copper, zinc), the Democratic Republic of Congo (henceforth DRC) (coltan, copper, diamonds, silver), Ghana (gold, aluminium), Namibia (diamonds), Niger (uranium), Sierra Leone (diamonds) and Sri Lanka (sapphires). Among these precious materials, diamonds have a special position. Firstly, the market for rough diamonds is characterised by a very high and relatively stable price. The reason is to be found in the market power of the one dominant firm: the South African firm De Beers. Secondly, unlike most other minerals, diamonds are extremely easy to smuggle or exploit in illegal dealings. In some countries, diamonds are

something of an alternative currency for terrorists and rebels. Thirdly, to a greater extent than any other valuable mineral, diamonds are found in several of the world's poorest and most unstable countries. All these characteristics call for a special focus on the rough-diamond market.

This article is organised as follows. In Section 2, I briefly outline some empirical facts showing that diamond production appears to be negatively associated with development for most countries. In Section 3, I discuss the main cause of this relationship – intense rent seeking and civil war – with an illustration from Angola. Section 4 then presents a theoretical framework for analysing an appropriative struggle over natural resources. Section 5 probes the nature of kimberlite and alluvial mining and the role of the private firm De Beers for understanding the very different experiences in Botswana on the one hand and the war-torn Central African countries on the other. The Kimberley process and the future of diamond mining in developing countries are discussed in Section 6 whereas Section 7 repeats the major conclusions.

2. THE CURSE

Before we discuss the impact of diamond production on economic development, some basic facts need to be presented. Table 1 presents four different indicators of rough-diamond production in the world for the period 1998–2002.¹ It is notable that only 20 countries in the world had any diamond production during the period. Out of these 20 countries, 14 are African, including the major producers, Botswana, DRC and South Africa.² In terms of total production, Australia is the biggest producer in the world with a production at 33.4 million carats in 2002. However, about 55 per cent of this total amount was industrial diamond of poorer quality. By far the greatest producer of valuable gemstones is Botswana. The third largest producer of industrial and gemstone diamonds combined is Russia at 23 million carats in 2002.

Botswana's extreme diamond abundance stands out even more clearly if we calculate a measure of diamond production per square kilometre, as shown in column 3 of Table 1. Botswana's annual production of about 50 carats per square kilometre is not really comparable to that of any other country, although diamond intensity is at about eight carats per square kilometre in DRC, South Africa and Sierra Leone. Lastly, column 4 shows the trends in total production during the

¹ Recent articles by Lujala et al. (2005) and Snyder and Bhevnani (2005) present alternative data on diamond prevalence and production. In their extensive longitudinal database, Lujala et al. (2005) identify 53 countries where diamonds have been discovered and 31 where production has occurred.

² Africa is also the continent that is believed to have the largest existing reserves (Olson, 2002).

TABLE 1
World Diamond Production, 1998–2002

<i>Country</i>	<i>Diamond Production 2002¹</i>	<i>Gemstone Percentage²</i>	<i>Production Per Sq. Km³</i>	<i>Percentage Change, 1998–2002</i>
Angola	6,000	90.00	4.815	117.08
Australia	33,600	44.94	4.374	-17.85
Botswana	28,400	75.00	50.088	43.43
Brazil	700	100.00	0.083	600.00
Central African Rep.	500	75.00	0.803	-5.66
Canada	4,984	100.00	0.541	2,355.17
China	1,190	19.75	0.128	5.31
D.R. Congo	18,200	50.00	8.028	-30.21
Côte d'Ivoire	250	64.00	0.786	-19.35
Ghana	963	79.96	4.242	17.01
Guinea	370	72.97	1.510	-5.61
Guyana	100	100.00	0.467	100.00
Liberia	200	60.00	2.083	-33.33
Namibia	1,350	100.00	1.640	-5.00
Russia	23,000	50.00	1.362	-2.13
Sierra Leone	600	75.00	8.333	140.00
South Africa	10,880	39.98	8.911	1.97
Tanzania	215	84.65	0.228	119.39
Venezuela	55	27.27	0.062	-43.30
Zimbabwe	0	0.00	0.000	-100.00
All	131,557			

Notes:

¹ In thousands carats. Includes both gemstones and industrial diamonds.

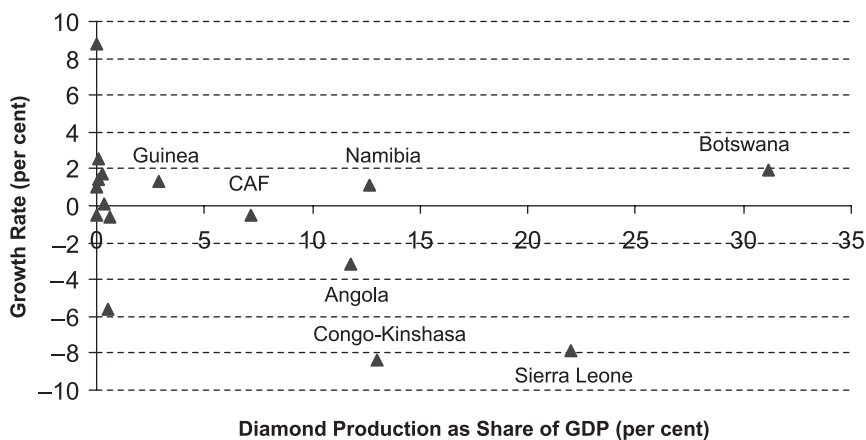
² Gemstone percentage of total production in 2002.

³ In carats.

Sources: Calculations based upon US Geological Survey (2002) and CIA (2003).

last five years. The country with the greatest proportional increase is Canada, with a growth at over 2,000 per cent. The new finds at the Ekati mine are also of very good quality and it is likely that Canada will become one of the major diamond-producing countries within the next five years. Trends are also positive in war-torn Angola and Sierra Leone. It should be pointed out that the level of production only gives a vague idea about the total value. The reason is that one carat of rough diamond is priced very differently depending on clarity and colour. The average prices of diamonds in the year 2001 from Namibia and Sierra Leone were US\$215 and US\$180 per carat respectively, whereas the equivalent price for Australian rough stones was only US\$11 (Rombouts, 2004). Another caveat is that the data in Table 1 are based on official statistics; production in countries like Sierra Leone and DRC is probably underestimated due to widespread smuggling and other illicit activities.

FIGURE 1
Relationship Between Average Growth of GDP Per Capita, 1990–1999, and the Value of
Diamond Production as a Share of GDP in 1999



Source: Calculations based on data from Olsson (2006).

The total worldwide production of rough diamonds is usually around 120–130 million carats per year. From their place of origin, rough stones are brought (often via middlemen) to the major marketplaces in London, Antwerp and New York. Once sold, they are re-exported to the large cutting-centres in Gujarat, New York and Tel Aviv. When the stones of gemstone quality are then finally cut and polished, they are bought by jewellery firms from around the world, with the major markets being the United States and Japan. The average gemstone thus travels from Africa to London to Gujarat to the US before it typically ends up around a bride's finger.

As the brief presentation above shows, the process of cutting and polishing stones is geographically separated from the extraction of rough stones. In this article, the focus will be on the first stage in the chain. Figure 1 shows the relationship between the value of rough diamond production as a share of total GDP for 16 countries in 1999. A noteworthy feature is that the seven countries with the greatest production value to GDP are all African, with Botswana as an outlier. This is partly explained by the fact that African countries tend to have a lower GDP than countries from the rest of the world. However, simple visual inspection suggests that there appears to be a negative relationship between the variables, an inference which is corroborated if we use formal statistical analysis.³

³ An ordinary least squares regression shows that the slope coefficient is negative but not significantly different from zero. If the extreme outlier Botswana is excluded, the negative relationship becomes statistically very robust.

Hence, even for diamonds, there appears to be a negative impact of natural resource wealth on economic development.

What are the reasons for this relationship? We mentioned some of the most plausible candidates in the introduction. An often discussed channel of causation is Dutch disease, i.e. the crowding-out of the manufacturing sector as a result of the inflow of resource rents. Indeed, none of the highly diamond-abundant countries in the figure have or have had large manufacturing sectors. To some extent, this failure to develop modern sectors is surely due to natural resource wealth, but arguably not through the mechanism of exchange rate appreciation, as in some other countries.

A second macro explanation to the negative impact of natural resources is delayed or staggering human capital accumulation. True enough, the secondary school enrolment rate in 1998 is very low for most of the countries (Angola 16 per cent, Central African Republic 10 per cent (1996), DRC 18 per cent, Guinea 15 per cent, and Sierra Leone 17 per cent (1996)). But the same pattern prevails throughout most of sub-Saharan Africa regardless of the country's resource abundance. Furthermore, Botswana and Namibia have quite impressive levels of secondary enrolment (77 per cent and 59 per cent respectively) (World Bank, 2002). Thus, human capital accumulation is not an obvious link between diamonds and growth.

Is there is a clear link between diamond abundance and social institutions constraining rent seeking and kleptocratic governments? Once again, the picture is mixed. On the one hand, some of the world's most corrupt and investment-hostile countries in the world such as DRC, Liberia and Sierra Leone are producers of rough diamonds. But so are the far more investment-friendly countries like South Africa and Botswana. Besides, some collapsed states like Somalia hardly have any natural resources.

As do many others, I would argue that the most probable cause of the negative impact of diamonds on the economic development of certain African countries is their role as a prize in appropriative struggles that have deteriorated into full-scale civil wars. This is the topic for the next section.

3. DIAMONDS, REBELS AND TERRORISTS

Diamonds are known to have played a central role in the civil wars in Angola, Sierra Leone, Liberia and DRC. It is not hard to understand the reasons why diamonds often become the object of a predatory struggle. We mentioned above their extremely high average price, their small practical size which makes them suited to illegal dealings, and their relative abundance in some of the world's most unstable regions. We might add a fourth factor, which will be discussed further below: in central and western Africa, mining is carried out through a very

simple but labour-intensive technology that almost anyone can master. The basic activity is the sieving of river silt. Thus, any armed group that captures a diamond-rich area can immediately start extracting without costly investments in machines or skills. This simplicity of 'alluvial' mining is at the heart of the curse of conflict diamonds.

Angola serves as a good example of a modern resource war involving mainly diamonds and oil.⁴ The Angolan case is particularly interesting because the country borders are adjacent to both Namibia and Botswana in the south where gem production has had a very different impact on society. The civil war in Angola started soon after independence from Portugal in 1975.⁵ The first decade and a half of fighting might be described as a typical civil war of the Cold War era between Marxist MPLA on the one hand, supported by the Soviet Union and Cuba, and Unita, backed by the United States and some African neighbours such as South Africa and Zaire, on the other. After a temporary cease-fire, presidential elections were held in 1992. When it was clear to the Unita leader Jonas Savimbi that he would lose the election against the MPLA's Eduardo dos Santos, he once again resumed the war.

The phase of the war that followed during the next couple of years is sometimes referred to as *Guerra das Cidades* (the War of the Cities) because, unlike before, the war was now fought in the larger cities with an increased intensity. During 1992–1994, it is believed that some 500,000 people were killed and more than a million were internally displaced (Le Billon, 2001). Despite the signing of the so-called Lusaka Protocol in 1994, fighting continued on a smaller scale with Unita now in the position of a more or less marginalised rebel movement hiding in the interior of the country and subject to UN sanctions. The fall of Zaire's dictator Mobutu in 1997, and the stronger international restrictions on diamond exports from rebel-held areas, further weakened Unita's potential for a successful rebel campaign. In February 2002, Unita leader Jonas Savimbi was then shot by government forces near the Zambian border and a new cease-fire was signed a couple of months later. Due to the apparent collapse of Unita after Savimbi's death, it is generally believed that peace might finally have a realistic chance in Angola.

From having been a typical 'Cold War-civil war' until 1992, it seems that the Angolan conflict changed its character thereafter to be a struggle driven and motivated by natural resource rents. As in many other countries, this change was to a large extent caused by the drying up of financial support from the former Cold War allies (Klare, 2001). The MPLA government in Luanda controlled

⁴ The role of diamonds and other natural resources in the Great African War on Congolese soil is described in Olsson and Congdon Fors (2004), as well as in United Nations (2001). For accounts of the gruesome war in Sierra Leone, see Campbell (2004) and Klare (2001).

⁵ The general information about the war in Angola relies on Global Witness (1998), Le Billon (2001) and Guidolin and Ferrara (2004).

the oil production from offshore sites, whereas Unita controlled most of the diamond-rich regions in the interior of the country, including the exceptionally rich areas of Lunda Norte and the Cuango valley in the north-eastern corner, bordering DRC. These areas had been mined since the early twentieth century and a network of trading routes into DRC was well established. From having mostly squeezed tributes from existing small-scale producers, Unita soon started to organise the extraction of diamonds themselves. This also led to the influx of thousands of illegal Congolese *garimpeiros* (illegal diggers). The scale of production was enormous; some mines allegedly employed more than 30,000 *garimpeiros* and total revenue until 1998 is estimated to have been in the vicinity of US\$4 billion (Global Witness, 1998).⁶

Whereas offshore oil production was sheltered from rebel attacks, the diamond fields became the target also for MPLA offensives in the interior. In the late 1990s, reports by NGOs such as British-based Global Witness (1998) finally made the international community start to recognise that Unita's diamond exports constituted a major impediment to peace in Angola. In an attempt to curb the flow of conflict diamonds, the UN Security Council in 1998 adopted resolutions 1173 and 1176 that prohibited direct or indirect import of all Angolan diamonds that were not certified by the government. Although this initiative, in combination with the fall of the old regime in Zaire, put a strain on Unita's activities, they did not cease. However, with the withdrawal of diamond purchases from dominant firm De Beers and the launch of the Kimberley process, aimed at eliminating all trade in conflict diamonds, Unita's strength eventually withered.

The Angolan example is maybe unique in the sense that government and rebels controlled one extremely valuable resource each. However, similar scenarios with a violent appropriative struggle between government and rebel groups over diamond deposits have been in place in at least Sierra Leone, Liberia and DRC. Diamonds have also been a source of intense rent seeking, corruption, smuggling and other illegal activities in the Central African Republic, Côte d'Ivoire, Guinea, Uganda and the Republic of Congo (Congo-Brazzaville) (United Nations, 2001; and Global Witness, 2004a).

Apart from being a potentially destabilising factor within the diamond-rich countries, the trade in gems in West Africa also appears to have contributed to the financing of terrorist groups whose main targets are the rich Western countries. The primary reason for this linkage is probably that much of the middleman activities in West Africa are carried out by Lebanese traders. According to some estimates, there are around 120,000 Lebanese scattered around the West African countries, most of whom have lived there for generations (Campbell,

⁶ The relative efficiency of Unita's mining of diamonds is perhaps reflected by the fact that the killing of Savimbi in 2002 resulted in a fall in the stock value of the firms holding concessions in the country (Guidolin and La Ferrara, 2004).

2004). Although the majority of the Lebanese engaged in the diamond trade probably have nothing to do with terrorism, it has long been a well-known fact that the Lebanese diaspora has been an important financier of the rebel group Hezbollah, operating in southern Lebanon and conducting frequent attacks on Israel.

What journalist Douglas Farah (2001) and later Global Witness (2003) showed was that Hezbollah-connected Lebanese based in Liberia had helped to bring together members of the diamond-mining RUF guerilla in Sierra Leone with buyers who belonged to Osama bin Laden's al-Qaeda network. When the story broke in 2001, these connections seem to have been in place for some time and several deals had probably been made. From the rebels' and the terrorists' perspective, these dealings made perfect sense: the RUF received cash that could buy arms and al-Qaeda received an extremely valuable commodity at a price far below the market price that was nearly impossible to trace, easy to hide and which at any time could be converted back into cash. Since all this came to light only months after the 11 September attacks, reactions were swift. Within a month, the US Congress had passed the *Clean Diamonds Act* which authorised the president to impose sanctions on countries or organisations that contributed to financing rebel or terrorist groups through trade in rough diamonds.

4. A THEORETICAL PERSPECTIVE

As the sections above have shown, the macro-level impact of diamonds on developing countries is complex and multi-dimensional. The most obvious linkage between the abundance of valuable point resources like diamonds and economic development still appears to be that rough gems tend to become prizes in an appropriative struggle between different groups in society. This struggle might take the form of ordinary rent seeking which has been studied extensively in the public-choice literature. But in several African countries, the struggle over rents has degenerated into civil wars with millions of casualties, a scenario that goes far beyond the pure rent-seeking models, designed to describe the realities of Western countries.

Conflict theory as pioneered by Hirshleifer (1991), Grossman (1991) and Grossman and Kim (1995) offers a more appropriate framework for studying the issues at hand. This literature was for long purely theoretical and was not extensively used for the empirical study of conflicts. However, in the wake of Collier and Hoeffler's empirical analysis of the determinants of civil war, interconnections between the two traditions have gradually emerged.

In Olsson (2006) and Olsson and Congdon Fors (2004), we modelled the strategic interaction between two main combatants in a predator-prey setting where the object of the struggle is natural resources like diamonds. The basic

framework is a sequential game between a ruling group, initially in control of a flow of natural resource rents, and a potential rebel group that considers the alternatives of either starting a predatory rebellion or remaining as peaceful subsistence producers. The latter group does not take part in the formal economy of the country and does not belong to the favoured segments of society. It is assumed that their only source of utility is income, and possible ideological motives are left unmodelled.⁷ The kleptocratic ruler receives utility from tax incomes and resource rents. He also diverts a certain amount of the natural resource rents to his own pockets instead of spending them on public goods.

One of the central results in Olsson and Congdon Fors (2004) is that the size of the natural resource rents will not matter for the initiation of the war. The intuition is simple: although the rebel group's motivation for starting a predatory rebellion is strong when resource rents are great, the ruler's military strength will also be great when resources abound. Hence, the two effects tend to balance each other, deterring the rebel from starting a rebellion. The key aspect is instead the 'grievances', i.e. the relatively weak social institutions prevailing in the informal sector which the ruler has installed on purpose. Such social institutions might be the strength of property rights or indeed citizenship. If these institutions are very weak, at the same time as the ruling group's military strength is faltering, the likelihood of an armed rebellion is substantial.⁸

However, a further important insight from Olsson and Congdon Fors' (2004) model is that once a conflict equilibrium has arisen, the sizes of the armed forces will increase with natural resource rents. In other words, if the war is not immediately won, rents from natural resources will fuel the war and contribute to an expanded duration. This result appears to be consistent with experiences from the war in DRC, as well as with more formal statistical analyses of civil wars in general (Fearon, 2004).

In Olsson (2006), I also derive the implications for the overall growth of the economy of the prevalence of an easily appropriable natural resource like diamonds. It is shown that natural resource abundance has two potential effects:

⁷ This type of assumption distinguishes the conflict theory literature from the political science discourse where ideology or ethnic grievances play a central role (an important exception of this tendency among political scientists is Snyder and Bhavnani, 2005). However, in countries like Sierra Leone and the DRC, it is indeed hard to see any clear ideological basis for the rebellions after 1990. For a discussion on the relative importance of economic factors in African conflicts, see Herbst (2000).

⁸ This was indeed the situation in Zaire prior to the insurrection against Mobutu. The Tutsi-related Banyamulenge, who had lived in eastern Zaire for generations, were suddenly denied their citizenship by Mobutu in 1996 shortly after the genocide on Tutsis in Rwanda. The reaction was an armed uprising supported by the new Tutsi regime in Rwanda. The long-neglected Zairian army was more or less powerless against the battle-hardened Rwandan army and could neither prevent the ousting of Mobutu nor the instalment of Laurent Kabila as the new president of the Democratic Republic of Congo.

to expand the government's spending on public goods and to expand the labour effort devoted to unproductive protection of the natural resource rents. Which effect that dominates will critically depend on the exogenously given strength of constraints against the executive. If the ruling group uses a great fraction of rents for their own enrichment, natural resource abundance will rarely be spent on public goods and a large fraction of the labour force will be devoted to defending the rents against the predatory rebels. The model thus predicts that the direction of relationship between natural resources and growth depends on the quality of institutions. Indeed, this prediction is by and large supported by data in the same article, as well as in another article by Mehlum et al. (2002), using a broader measure of natural resource abundance.

Nonetheless, although there appears to be a general negative relationship between diamond abundance and growth that is driven by appropriative struggles, one or perhaps two countries do not fit well into the model. The most obvious anomaly is of course Botswana which has attained very high levels of income per capita for being a sub-Saharan country (real GDP per capita in 1999 was US\$3,711 as compared to US\$520 in neighbouring Angola). The other country is Namibia, also substantially richer than most of its neighbours (GDP per capita in 1999 was US\$2,097). Both are among the most diamond-dependent countries in the world, as Figure 1 shows, yet they have somehow avoided the catastrophes of Angola, DRC and Sierra Leone.

One potential answer to this paradox is that Botswana in particular had rather strong institutions already before diamond deposits were found in the early 1970s. This hypothesis, advanced recently by Acemoglu et al. (2003), suggests that the dominating tribe the Tswana employed an unusual form of tribal democracy that somewhat resembled Western parliamentarism. The British colonialists had no particular interest in the Kalahari desert areas of Bechuanaland except as a strategic barrier to German rule in Namibia. Hence, they let the Tswana have a certain autonomy. Upon independence in 1966, the country was very poor but with reasonably good institutions of private property. Already in 1967, the Mines and Mineral Act gave the state all rights to potential mineral wealth at the expense of the individual tribes (Acemoglu et al., 2003). Unlike in DRC and Angola – where natural resources had been ruthlessly extracted since colonial days – Botswana was thus 'institutionally prepared' when exceptionally rich diamond deposits were found only a few years later. Throughout the 1970s and 1980s, Botswana would then be one of the fastest-growing economies in the world, with heavy investments in infrastructure and human capital.

This explanation is attractive and surely accounts for some of the differences in development between Botswana and her neighbours, Angola and DRC. However, I believe that two crucial aspects also need to be carefully addressed in the Botswana case: the nature of mining and the nature of the government's private partner, De Beers.

5. ALLUVIAL VS. KIMBERLITE MINING

Diamond deposits have two basic forms: *alluvial* and *kimberlitic* (sometimes also respectively referred to as *secondary* and *primary* deposits). In order to understand the difference between the two different forms of mining, it is necessary to briefly recapitulate some basic geology. Diamond is pure carbon that is crystallised under very high pressure and temperature in the earth's interior. The stones are embedded in kimberlite pipes that might reach several kilometres down though the earth. Erosion on the ground often causes the diamonds to be redistributed via rivers and streams, which is the reason why rough diamonds might be found both in alluvial sources and in kimberlitic rock. Whereas alluvial mining therefore takes place in rather wide riverine areas, kimberlite mining involves drilling through diamondiferous rock at the specific location of the kimberlite pipe.

Alluvial mining is the basic method that must be used in Angola, DRC, Sierra Leone and the other West African countries, whereas kimberlite mining is practised in Botswana, Namibia and South Africa, as well as in Australia, Canada and Russia. Some kimberlite mining is also carried out in DRC (Mbuji-Mayi area) and in Angola. As hinted at above, alluvial mining basically involves the digging and sieving of river silt. Auxiliary activities such as damming and pumping might also be required but, in general, this type of mining is labour intensive and simple. Concessions and property rights are difficult to define and enforce in alluvial areas. Kimberlite mining, on the other hand, is highly capital intensive, requires substantial initial investments before operations can begin, and can relatively easily be fenced off. In, for instance, Namibia, most diamond deposits are located in the Atlantic Ocean, and mining depends on very sophisticated technologies for offshore drilling. On top of this, one might add that kimberlite deposits often are found in deserts (Botswana) or in arctic areas (Canada, Russia) whereas alluvial deposits usually are surrounded by jungle where it is easy to hide. With these characteristics in mind, it is not hard to see why alluvial diamond fields often become a prize for rebel groups while kimberlite mines do not.

It is worth noting, however, that far from all countries with alluvial diamonds have become zones of violent conflict. In a comparison between similarly endowed countries like Sierra Leone, Guinea and Ghana, Snyder and Bhavnani (2005) argue that the hazards of alluvial mining might be neutralised if an alternative, non-lootable resource is present. Despite widespread alluvial mining in Ghana and Guinea, the prevalence of industrial gold mining in Ghana and bauxite mining in Guinea provided these governments with alternative sources of foreign exchange earnings and a more favourable revenue structure which helped them to resist rebellious tendencies.

On a micro level, the differences between alluvial and kimberlite mining are also striking. A recent investigation by Global Witness (2004a) on alluvial or

'artisanal' mining in Africa estimates that there are around a million artisanal miners across the continent, the great majority of them (700,000) in DRC. Artisanal mining is to the greatest extent an informal activity and often illicit, carried out without licences or concessions. The work-day is typically eight hours from dusk to dawn of digging and sieving under humid and unhealthy conditions. Work hazards include pits and dugout river-beds that frequently collapse, as well as a significant exposure to disease-carrying mosquitos. Environmental degradation is inevitable in these sites, which makes living conditions even harder. Quite often – particularly in rebel-held areas – workers are guarded by armed soldiers who do not hesitate to mutilate or kill workers that try to keep stones for themselves. A substantial fraction of the labour force is made up of child labour⁹ or of illegal immigrants from neighbouring countries. Sexual abuse is common and the spread of HIV is faster in these areas than in non-mining areas. For work like this during peaceful times, the average digger receives US\$0.5–1 a day, two cups of rice and a tiny share of the value from each stone found (Campbell, 2004; and Global Witness, 2004a). Still, the highly unrealistic prospect of finding a large stone that can be sold for maybe US\$100,000 makes thousands of African men, women and children enter the diamond sector more or less freely. In areas held by Unita, the RUF and some Congolese guerrillas, production is of course more appropriately described as slavery.

In Botswana, all production is carried out at only three mines – Orapa, Lethlakane and Jwaneng – and the whole industry employs no more than 6,000 people (Rombouts, 2004; and Global Witness, 2004a). Diamond output per worker in 2002 was thus 4,733 carats if we use the production data in Table 1. The equivalent figure for DRC – assuming a labour force of 700,000 people – would be 26, implying a labour productivity that was 182 times greater in Botswana. This might be partially explained by the far more advanced capital used in the latter country. In Botswana, workers mainly operate computerised production machinery and rarely come into physical contact with the stones (Cockburn, 2002).

It is further inevitable to discuss the role of De Beers in southern Africa. Soon after the first diamond deposits were found, De Beers formed a joint venture with the Botswanan state called Debswana. Since 1975, ownership of the company is split with 50 per cent each to De Beers and the Botswanan state. This venture has been enormously successful, and Debswana now actually owns a significant share of the mother company. Arrangements are very similar in Namibia. Namdeb is also a joint venture between De Beers and the Namibian state, a cooperation that has been going on since colonial days. In addition, De Beers is also directly involved in production in Tanzania.

⁹ A survey carried in Angola's Lunda Norte province showed that 46 per cent of all workers were between five and 16 years old (Global Witness, 2004a).

De Beers' geographical power base has always been South Africa. Founded by the notorious Cecil Rhodes, the firm gradually took control of mine after mine in the booming diamond industry of the late nineteenth century. In 1888, Rhodes managed to merge his own firm De Beers Mines with the firm controlling the nearby and enormously rich Kimberley mine and formed De Beers Consolidated Mines.¹⁰ With this move, Rhodes controlled 90 per cent of world production (Campbell, 2004).

Even today, De Beers has a near monopoly on diamond mining in South Africa, alongside their joint-venture monopolies in Namibia and Botswana. In the global market, De Beers is a typical quantity leader, controlling the supply and hence the price of rough diamonds through their strategic use of a huge stockpile of diamonds in their London headquarters. Although it is not openly declared, De Beers operates what must be described as a cartel through its influence on several other of the world's major producers. As a result, prices have been kept relatively stable at a high level. Without De Beers' unproportional market power, it is highly likely that the price of diamonds would have dropped significantly. It is also likely that such a dominant position would not have been accepted by anti-trust authorities had the firm been located in the United States or within the European Union, rather than in South Africa.

In other words, the firm that the governments of Botswana and Namibia have chosen as their partner is not just any private firm but the world leader who happened to be based a few hundred kilometres away. One should not underestimate the importance of this circumstance when assessing the economic success of the countries in the Kalahari desert.

6. THE KIMBERLEY PROCESS: A FUTURE OF 'DEVELOPMENT DIAMONDS'?

In the late 1990s, the problem of conflict diamonds was finally recognised by the world community and by the diamond industry. In May 2000, a meeting was held in Kimberley, South Africa, with representatives from African governments with the purpose of establishing a certification scheme for rough-diamond production and export. The initiative was supported the same year by the United Nations General Assembly and discussions were held with the World Trade Organisation. In 2002, the Kimberley Process Certification Scheme (KPCS) was then signed by the diamond-producing countries, including Angola, DRC and Sierra Leone, as well as by the United States and the European Union.

The KPCS regulates the production, export and import of rough diamonds with the aim of eliminating the flow of conflict diamonds into the international

¹⁰ De Beers was the name of the farmers who had owned the land on which Rhodes' first acquired mine was situated.

trade. Regulations include measures such as that all shipments must be accompanied by duly validated certificates and that the stones should be exported and imported in tamper-resistant containers. Furthermore, an internal control system should be set up to ensure that diamonds from rebel-held areas do not enter the system. The KPCS also recommends that all artisanal mining should be based on licences issued by the government and that middlemen (*comptoirs*) should be officially registered and approved (Kimberley Process, 2004).

The KPCS is undoubtedly a great improvement compared to the situation in the 1990s. The process has probably contributed to the demise of violent activities in Angola and Sierra Leone and to reduce the previously widespread smuggling between countries. However, as has been pointed out by Global Witness (2004b), there is still scope for large improvements. Internal controls in a vast country like DRC still suffer from major weaknesses and the KPCS participant Republic of Congo (Congo-Brazzaville) was even thrown out of the agreement in July 2004 due to the apparent inflow of stones smuggled from neighbouring DRC. As a matter of fact, buyers of polished diamonds can still not be sure that they have not acquired a stone mined by rebels. Although the production of new rough diamonds appears to be more or less clean (partly because most of the violent conflicts have ceased), there is no guarantee that the stockpile of diamonds held and gathered over decades by De Beers might not still contain a large fraction of blood diamonds (Campbell, 2004).

A broader aim of the KPCS is to make the diamond industry a vehicle for economic development in the African countries. The slogan 'development diamonds' is sometimes used with the inherent assertion that it should be possible for countries like Angola to enter the same path as Botswana, if only the wars are brought to an end and sectoral reforms are successfully carried out. Global Witness (2004a) argues that this is probably an over-optimistic view. Even with reforms, the nature of alluvial mining in Central Africa makes taxation nearly impossible. Among the roughly one million artisanal diggers, the average income per day is currently around one dollar, which means that even if wages increased by 50 per cent, the average digger would still have to live on maybe US\$450 per year.

Although it is probably true that alluvial mining could never on its own bring true prosperity to a country, the picture outlined above might be overly pessimistic. In, for instance, Angola, there still appears to be a certain potential for kimberlite mining, perhaps with the help of foreign investors. With investments in modern equipment such as pumps and excavators and with a more efficient organisation, the marginal product of labour should be able to increase substantially, even in alluvial mining. A major obstacle to higher wages for the individual digger is, further, the great asymmetries in information that prevail between the artisanal miners and the middlemen. Although the valuation of a rough diamond in the field is quite complicated, it should not be impossible to

provide workers in this sector with some basic education about carat, colour and clarity, as well as a feeling for the current world market price. This should reduce the great mark-up that middlemen (who are often foreigners) now make big money from. Also, the restoration of peace and order in DRC, Sierra Leone and Angola should mean a greater competition among buyers of rough stones in the field.

Two fine examples of sensible institutional reforms are found in Ghana and DRC. In Ghana, West Africa's first diamond bourse has emerged where registered buyers from all over the world buy stones at competitive prices and under the control of the Ghanaian state. The diamond bourse has increased transparency significantly and contributed to reducing illicit dealings in the region. In DRC, an autonomous government body called SAESSCAM was created in 2003 through an initiative by President Joseph Kabila with the aim of organising and assisting the small-scale mining sector so that it will gradually be incorporated into the formal economy. SAESSCAM helps artisanal miners to create cooperatives, to get a basic education about mining, and even provides small loans. So far, the organisation works only in one area, but operations will hopefully be expanded (Global Witness, 2004b).

On a macro level, the development of the diamond sector in sub-Saharan Africa will of course greatly depend on the development of general institutions ensuring private property rights, protection against government expropriation and freedom of corruption; in other words, the fundamentals of a functioning market economy. Of particular relevance for diamond mining will be the creation and enforcement of mining codes, rules for the granting of concessions, and a continued recognition in the Western world of the importance of keeping the Kimberley process on track. The direct benefits of the KPCS in terms of rapid economic progress are perhaps not overly large, but the potential misery and human suffering that could be the result of a failed process in Central Africa are without doubt gigantic.

7. CONCLUSIONS

In this article, I have addressed the issue of why countries with highly valuable mineral resources have tended to experience a relatively poor economic development. Out of all precious minerals, diamonds have the highest value per unit of weight, are very easily smuggled or extracted illegally, and are unproportionally abundant in some of the world's poorest countries. There also appears to be a rough negative statistical relationship between diamond wealth and growth with extremely abundant Botswana as an outlier. The most plausible channel of causation from diamonds to poor economic development seems to be that diamond fields easily become a prize in detrimental appropriative struggles. At least, this is what has happened in the recent civil wars of Angola, DRC and Sierra Leone.

The theoretical framework in the paper further shows that the probability of such appropriative struggles falls with strong institutions constraining the ruling elite from expropriating rents.

However, this explanation fails to explain why diamond-abundant countries like Botswana and Namibia have been success stories. I argue that the key factor behind the different development in these countries is to be found in the nature of kimberlite mining, as opposed to alluvial mining, which is carried out in Central Africa. Kimberlite mining requires advanced technology, is capital intensive, and is easily taxed and controlled. Apart from this, Botswana and Namibia also had the fortune of being located close to the world giant in the industry, De Beers, with which the governments have formed joint ventures. Given the differences in the nature of mining, it is unlikely that countries like Angola and DRC will experience diamond-led growth as in Botswana. The Kimberley process – aimed at cleaning up the prevalence of conflict diamonds – should, however, contribute to improving conditions for the roughly one million artisanal diggers in the region, as well as to establishing a certain stability in diamond-rich rural and border areas.

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