Diamonds Are Forever, Wars Are Not: Is Conflict Bad for Private Firms?

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Civil wars have come to the forefront of the economic debate due to an increased number of conflicts in recent years and to the dismal economic performance of many countries plagued by internal wars, most notably in Africa. It is recognized that political instability discourages private investment and that firms operating in war-torn economies face increased uncertainty in production and higher operating costs. Yet many businesses thrive on war, not just the defense industry. Despite being the object of vocal nongovernmental organization (NGO) advocacy and recent United Nations scrutiny, this point has been overlooked in much of the economic debate. Our paper is an attempt to provide evidence that under some circumstances violent conflict may be perceived by investors as *beneficial*, not detrimental, to incumbent firms.

We focus on the Angolan civil war and on one of the sectors most affected by the war, diamond production, to explore investors' reactions to conflict-related events. The Angolan conflict is an interesting case study for at least two reasons. First, it is a typical "resource war," as both the government and the rebel movement financed the war by exploiting natural resources (oil and diamonds, respectively). Second, and most relevant from a methodological point of view, the Angolan civil war suddenly ended with the death of the rebels' leader, Jonas Savimbi, on February 22, 2002. This allows us to conduct an event study to assess investors' reactions to an exogenous conflict-related event, and one in which one party gained an unambiguous victory over the other. Restricting our analysis to the diamond mining sector is useful because, unlike oil production sites, which are located offshore and were removed from the fighting in the mainland, the activities of diamond extracting firms were located in areas very much at the heart of the conflict. A priori, one would therefore expect the (negative) impact of the war to be maximal for these firms.

Our main finding is that the cumulative abnormal returns of "Angolan" stocks experienced a significant drop in correspondence to the end of the conflict, while those of a control portfolio made of otherwise similar diamond mining companies *not* holding concessions in Angola did not. In other words, international stock markets perceived Savimbi's death (and later the ceasefire) as "bad news" for the companies operating in Angola, but not for others. On the event date, the abnormal returns of the "Angolan" portfolio declined by 4 percentage points, and the difference between "Angolan" and control abnormal returns was −7 percentage points. This suggests that, no matter how high the costs to be borne by diamond mining firms in Angola during the conflict, the war appears to have generated some counterbalancing "benefits" that in the eye of investors more than outweighed these costs. Although our result is based on a small sample of seven firms that were operating in Angola and were also listed on major international stock exchanges, this is a (sad and) striking result which suggests that much of the wisdom on the incentives of the private sector to end conflict may need closer scrutiny. We offer a number of interpretations for our finding, including the fact that during the conflict: (a) entry barriers

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for new diamond producers were higher; (b) the bargaining power of Angolan authorities was lower, hence licensing (and rent-seeking) costs for incumbent firms were lower; and (c) the lower transparency standards permitted by the ongoing war allowed for relatively profitable unofficial dealings.

This paper is related to two strands of literature. The first is a growing body of political event studies—e.g., Brian E. Roberts (1990), Raymond Fisman (2001), and Simon Johnson and Todd Mitton (2003)—which examines events that affected specific political figures to estimate their impact on companies that had different degrees of political connections with those figures. Our analysis differs from these papers because we have no prior on which companies had links with government or rebel forces and because our goal is *not* to quantify the extent of corruption but to understand the consequences of civil conflict. Within the event study approach, the closest work to ours is the paper by Alberto Abadie and Javier Gardeazabal (2003). The authors compare the per capita GDP in the Basque region with that of a "synthetic" control region that had similar characteristics at the onset of the conflict, and find that the Basque region performed significantly worse after the start of the conflict. Furthermore, they find that the stocks of firms with significant business activities in the Basque region showed a positive response to the ceasefire announced by ETA in 1998. The main difference between Abadie and Gardeazabal's study and ours lies in the economic environment under consideration. An analysis of the Angolan war (and of many African conflicts, as a matter of fact) requires political economy considerations that may explain a *negative* stock price response to peace, rather than a positive one. We think it is important to call attention to this fact, as the existing empirical evidence on conflict and financial markets comes primarily from studies on industrialized regions. Most contemporary conflicts occur in poor regions, and the role played by uncertainty in rich, market-oriented economies is likely to differ from that played in poor, highly regulated countries.

The second branch of literature concerns the role of natural resources in civil wars. This literature, started by the work of Paul Collier and Anke Hoeffler (1998), investigates whether natural resource abundance increases the likelihood of conflict onset, as well as conflict duration.[1] Our paper has nothing to say about whether diamond wealth did or did not trigger civil war in Angola. Our focus is on the *effects* of war, rather than on its determinants. However, natural resources come into play because, as we argue, conflict and political instability in resource-abundant economies play a different role than it is generally assumed, due to the particular governance structure that such economies may develop. In an interesting case study of Angola, Philippe Le Billon (2001) argues that narrow and mostly foreign-dominated resource industries, such as the oil and the diamond sectors, generate huge economic rents that are appropriated by the political elite. We claim that this is an important element to consider when assessing how the Angolan war was perceived by investors, and we try to provide empirical evidence in support of this claim.

The remainder of the paper is organized as follows. In Section I we briefly sketch the key features of the Angolan civil conflict and the way in which the diamond industry is organized in Angola. Section II presents our estimation strategy and data. Section III contains our main empirical results, and Section IV offers additional findings and robustness checks. Section V concludes.

I. Civil War and the Diamond Industry in Angola

Following its independence from Portugal in 1974, Angola was plagued by a long and cruel civil war between the Movimento Popular de Libertaçao de Angola (MPLA) and the Uniao Nacional para a Independencia Total de Angola (UNITA). In September 1992, national elections were held and José Eduardo dos Santos, leader of the MPLA, won by a slight margin. This victory was never recognized by UNITA's leader, Jonas Savimbi, who initiated a civil war that was perceived by many as driven by his own desire of political power as much as by ideology. Throughout the war, UNITA's military strategy was aimed at occupying the areas of highest concentration of diamond mines and at using

[1] For a comprehensive review of these studies, see Michael L. Ross (2004). Edward Miguel, Shanker Satyanath, and Ernest Sergenti (2004) investigate the role of poverty as a determinant of conflict onset.

diamond sales to finance weapons purchases. The MPLA relied mostly on oil for financing its military operations through the Fuerzas Armadas de Angola (FAA), while also earning money from official diamond concessions. As part of the Lusaka Peace Protocol, in 1994, UNITA was given legal rights to mine and to form partnerships with foreign companies. The peace process collapsed in the summer of 1998, however, when the rebels returned to massive attacks against the military and civilians. The years between 1998 and February 2002 marked the last phase of the Angolan conflict and constitute the sample period on which our empirical analysis focuses. During these years, many commentators talked about a "military stalemate" between government and rebel forces. On February 22, however, Jonas Savimbi died in an ambush 100 kilometers from the Zambian border. Six weeks later, on April 4, the cease-fire was signed.

Since the beginning of the war, there was a close link between conflict and the diamond industry in Angola. Angolan diamonds have traditionally been mined in alluvial deposits, where capital investments take the form of light machinery and river diversions, and production was relatively easy to control by rebel forces. The key role of diamond sales in financing UNITA's operations has brought the problem of "conflict diamonds" to the attention of the public. To give an idea of the importance of the sector, Angola is the fourth largest diamond producer by value in the world, largely because most of its production is of gem quality. Angolan diamond sales in 2000 reached $1.1 billion, i.e., 15 percent of the world production of rough diamonds. This amount was almost equally split between official industrial production, official artisanal production, and illegal production. It is estimated that between 1992 and 1997, when UNITA controlled most deposits in the Cuango valley, the rebel movement supplied between 8 and 10 percent by value of the rough diamonds on the world market (Tony Hodges 2004, 174–77).

Diamond production and marketing in Angola have traditionally been controlled by the state-owned company Endiama through joint ventures. The diamond law passed in 1994 established that in order to obtain mining rights, foreign companies had to form a partnership with Endiama and with at least one other Angolan company, and get approval of the Ministry of Geology and Mines. This led to the proliferation of local mining companies owned by well-connected Angolans, who obtained concession rights for nominal fees and then sought lucrative partnerships with foreign companies.[2] Many army generals also benefited from the situation by establishing private security firms that were contracted by the mining company being awarded the concession, sometimes as an implicit part of the deal. These high hidden costs restricted participation in diamond mining in Angola to a relatively small number of industrial companies and a large number of artisanal miners (*garimpeiros*).

Between December 1999 and February 2000, the Angolan diamond industry underwent further restructuring. First, the government created a marketing monopoly in which all Angolan diamond production would be bought and resold by the Angola Selling Corporation (Ascorp). This was a joint venture between the state-owned Sodiam (51 percent) and two foreign companies with strong political connections, Welox and Tais. The creation of Ascorp was perceived as a serious blow to major international companies operating in Angola, primarily to De Beers. Another reform in early 2000 suspended all contracts that had been signed between Endiama and other mining companies and expropriated prospecting concessions exceeding 3,000 square kilometers. Needless to say, these reforms were not welcomed by existing companies, which saw their contracts unilaterally renegotiated. Since the end of the war, the situation has not changed significantly. Partnerships with local companies remain a cornerstone of the Angolan diamond industry, and the government has established a security body that has been seen by many as an attempt to centralize control of diamond production under domestic intelligence services.

II. Empirical Strategy and Data

A. *Methodology*

In our event study, we follow the standard methodology presented by, among others, John Y. Campbell, Andrew W. Lo, and Craig A. MacKinlay

[2] Hodges (2004) cites the example of one contract under which "the foreign partner is responsible for all mining

(1997). We take as a benchmark an augmented market model,

$$(1) \qquad r_t = \alpha + \beta r_t^M + \theta S_t + e_t,$$

where r_t is the daily rate of return on a stock, r_t^M is the return on the market portfolio, S_t is a set of dummies for company-specific events unrelated to our Angolan political events, and e_t is an unexplained residual called the *abnormal return*. The inclusion of S_t in the market model ensures that our abnormal returns do not reflect concurrent information released by our companies on earnings, mergers, dividends, etc.[3] Our objective is to study the relationship between the estimated abnormal return e_t and salient political events. For each event, we use several *event windows* (i.e., intervals around the event date over which markets are likely to have incorporated changing expectations) and *estimation windows* (i.e., pre-event days during which model (1) can be estimated). In what follows, we shall report results for symmetric and asymmetric event windows of 0 to 3 days around the date and for an *estimation window* of 24 trading days. The relatively short estimation window is due to the high frequency of salient political events in Angola during the period under consideration. Results with longer estimation windows were very similar (see Guidolin and La Ferrara 2004). From the estimated residuals in (1) we generate the series of *cumulative abnormal returns* $\{CAR_t\}$ as $CAR_t = \sum_{j=t_0}^{t} e_j$, where t_0 is the first day of the event window.

We aggregate the cumulative returns for the various companies by constructing two portfolios: an "Angolan" portfolio constituted by diamond mining companies holding concessions in Angola, and a "control" portfolio of diamond mining companies that do *not* have interests in Angola. We use the control portfolio to make sure that the effects we find for Angolan companies are not due to shocks in the market where they trade (and not captured by the market index r_t^M), nor to events affecting the diamond industry as a whole. The weights assigned to companies in the control are chosen endogenously so that the resulting portfolio matches as closely as possible three natural properties of the Angolan portfolio in the period January 2, 1998–January 31, 2002, i.e., before Savimbi's death. Specifically, our weights minimize the Euclidean distance between two vectors containing: (a) the mean of abnormal returns; (b) the variance of abnormal returns; and (c) the OLS beta of a world market portfolio model that regresses daily control returns on world market index returns.[4] As for the estimated coefficients in (1), the mean (median) beta for the Angolan companies is 0.49 (0.43) and for control companies the corresponding figures are 0.45 (0.46). For the Angolan companies, all the estimated betas are positive and 86 percent are significant at the 5 percent level. For the control group, 95 percent of the betas are positive and 51 percent are significant at the 5 percent level.

We then assess whether a political event has any cumulative impact on our portfolios in two ways. We do this first through visual inspection, i.e., plotting CAR_t over the event window. A downward (upward) sloping *CAR* indicates that the event had a negative (positive) impact on stock abnormal returns. Second, we formally test the null that the event has no impact on CAR_t through nonparametric rank and sign tests. We could report statistics based on standard t-tests (as in Guidolin and La Ferrara 2004) and results would not change much, but nonparametric tests are much less influenced by departures from normality that characterize high-frequency data and have better small sample properties.[5]

activities and, after deduction of costs and fiscal obligations, shares the rest of the production with the Angolan concessionaires on a 50-50 basis" (193).

[3] For each company, we retrieved company-specific events contained in S_t through the Bloomberg database selecting the following Corporate Action Types: "Corporate Events," "Capital Change," and "Distributions."

[4] A detailed description of our methodology, which is similar to that of Abadie and Gardeazabal (2003), is provided in a Technical Appendix posted on the *AER* Web site (http://www.e-aer.org/data/dec07/20040820_app.zip). The same Appendix contains a figure showing the tracking between the two portfolios.

[5] Charles J. Corrado (1989) shows that even for cross-sectional dimensions below ten, securities nonparametric rank tests have an approximate Gaussian distribution, while classical parametric tests are significantly leptokurtic and display positive skewness. The power properties are far superior to standard tests. Cynthia J. Campbell and Charles E. Wasley (1993) report simulation experiments in which rank tests have excellent power in medium-sized samples, even with fewer than ten cross-sectional units. The Web Technical Appendix provides further details.

Finally, to compare the effects of different types of events on firm value, we perform an OLS regression using the full sample daily observations for the period January 2, 1998–June 28, 2002. We calculate the abnormal returns e_t^i for each of the Angolan companies and regress them on a set of dummies that take value zero in days when nothing occurs and one when a given type of event occurs (see Section IVD for an operational definition). We use the pooled sample with company fixed effects, clustering the residuals at the company level. We perform a similar exercise on the pooled sample of companies belonging to our control portfolio, weighting the individual observations with the (square root of the) estimated control weights described above.

B. *Data*

We conduct our analysis over the last phase of the conflict between UNITA and the MPLA government, namely the days from January 1, 1998, to June 28, 2002. For this period we collected financial data from Datastream and Bloomberg and indicators of political conflict from Lexis-Nexis and from several Web sources.[6] To construct our Angolan and control portfolios we proceeded in the following way.

For the Angolan portfolio, we started from the most comprehensive set of diamond mining companies holding concessions in Angola that we could assemble, combining information from the Angolan Ministry of Mining and Geology, Jakkie Cilliers and Christian Dietrich (2000), and Global Witness (1998). Considering that a large number of companies are not publicly traded, the final set for which we have price data over the entire sample period consists of seven companies.[7] Our Angolan portfolio is an equally weighted average of these companies. We work with equally weighted returns because the companies under consideration have substantially different sizes, and a more traditional value-weighted approach would essentially limit the analysis to De Beers, or to one or two additional companies at most. On the contrary, we are interested in detecting effects that are likely to have affected stock prices of all mining companies operating in Angola, presumably in homogeneous directions. Nonetheless, given the atypical position of De Beers compared to other players, we have replicated our results excluding De Beers from the Angolan portfolio, without noticing substantial qualitative changes.

Our control portfolio is a weighted average of diamond mining companies that satisfy all the following criteria during our sample period: (a) listed in one of the markets where the Angolan companies are traded (i.e., Sydney, Johannesburg, Toronto); (b) continuously traded over the sample period; and (c) not holding exploration or mining concessions in Angola. Criterion (a) is intended to lend plausibility to the assumption that the difference between the abnormal returns of Angolan and control companies may indeed be related to political events in Angola. To this purpose, our residuals are estimated conditioning on the same underlying common factors, chiefly the corresponding national stock market indices. Criterion (b) limits the analysis to a sample in which bankruptcy or listing events have no influence. As for criterion (c), it simply qualifies a company as belonging to the control sample. These three criteria leave us with a subset of 42 companies. The list of companies and their weights in the control portfolio are reported in the Web Appendix.

[6] In Lexis-Nexis we performed a search in the category "World News" from the news source "Middle-East and Africa," using the following keywords: UNITA, FAA, Savimbi, rebels, and diamond(s). We also did a focused search on the same database including the term Angola together with (alternatively): deaths, dead, killed, wounded, injured, attack(s), victims, strike(s). We then complemented the search with Web sources, including the Angola Peace Monitor by Action for Southern Africa (http://www.actsa.org/Angola/apm/), the Integrated Regional Information Networks Africa (http://www.irinnews.org), the UN Office for the Coordination of Humanitarian Affairs (http://www.reliefweb.int), and War News (http://www.warnews.it/ita/angola.html).

[7] These are: American Mineral Fields Inc (TSX), Ashton Mining Ltd (ASX), Caledonia Mining Corporation (TSX), De Beers Consolidated Mines Ltd (JSE), Diamondworks Ltd (TSX), SouthernEra Resources Ltd (TSX), and Trans Hex Group Ltd (JSE), where TSX, ASX, and JSE stand for —respectively—Toronto, Australia, and Johannesburg Stock Exchange. Two of these companies changed denomination during our sample period: Ashton Mining (Rio Tinto Plc) and De Beers Consolidated Mines (Anglo American). We dummied out these events and used the new series afterward.

III. Results

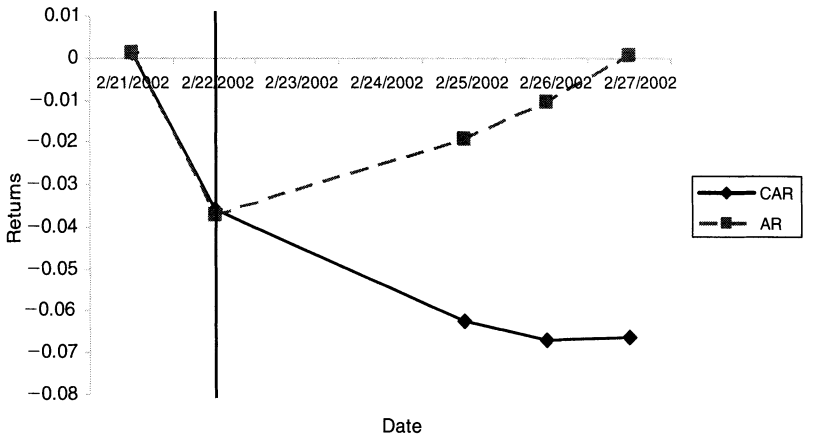
A. *Savimbi's Death*

The natural starting point for our event study is the end of the conflict, as marked by Jonas Savimbi's death on February 22, 2002. While one can identify several other conflict episodes (e.g., particularly severe attacks by the government or by the rebels), on a priori grounds it would be difficult to know whether a given episode was perceived as an increase or a decrease in the likelihood of conflict resolution, and by how much. On the contrary, both the sign and the magnitude of the impact of Savimbi's death on the probability that the war would end are known with certainty. In fact, the rebel leader's death was unanimously perceived as the ending point of the conflict because Savimbi, with his military and political acumen and ambition for power, was seen as the key obstacle to the peace process.[8] Indeed, one and a half months after Savimbi's death, a formal cease-fire had already been signed putting an end to the Angolan conflict.

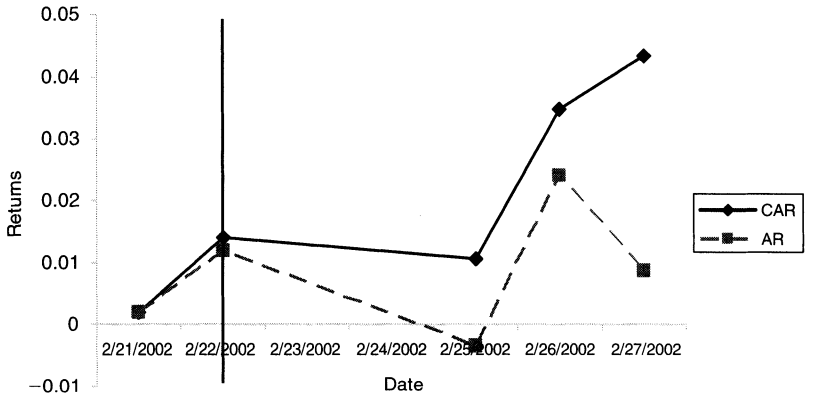
Figure 1 and Table 1 contain our main result. Figure 1 shows the evolution over time of the abnormal return (*AR*) and of the cumulative abnormal return (*CAR*) for the Angolan portfolio (top panel) and for the control portfolio (bottom panel) during the four trading days around Savimbi's death. The event date is indicated by a vertical line. Quite strikingly, for "Angolan" companies on average we do *not* observe an increase in cumulative abnormal returns, but rather a sizeable *decrease* leading to negative values. On February 22, our Angolan portfolio lost 4 percentage points. The evolution of the abnormal returns shows that the shock was gradually absorbed over the following three trading days. It is noteworthy, though, that the abnormal returns remained consistently negative during that period. As a result, three days after Savimbi's death, the *CAR* of the "Angolan" portfolio had declined by 7 percentage points in excess of what was justified by the underlying market dynamics. On the contrary, in the bottom panel of Figure 1, we see that the abnormal return of the control portfolio was +1.4 percentage points on the event date and subsequently became negative, and then positive again. The overall effect on the *CAR* of the control portfolio after three days was an increase of over 4 percentage points. Notice that if the negative effect on the Angolan portfolio were the result of an extraneous event affecting the diamond industry or the stock markets where the companies are traded, we should have observed a similar trend in the *CAR* of the control portfolio, which is not the case. If we interpret the opposite sign in the trend of the *CAR* of the control portfolio as the result of unobserved factors that (positively) affect the whole diamond industry, the magnitude of our effect actually increases: on the event date, the difference between the *CAR* of the Angolan portfolio and of its counterfactual is −5 percent. Alternatively, the increase in the abnormal returns of the control portfolio may be caused by the Angolan event if investors switched out of "Angolan" stocks in favor of (similar) competing stocks. In either case, our main finding is that *investors perceived Savimbi's death as "bad news" for the companies holding mining concessions in Angola, and as "no news" or "good news" for otherwise similar companies not operating in the country.*

In Table 1, we formally test whether the effects displayed in the graphs are statistically significant. Specifically, the table reports the results of the nonparametric tests of the null that the *CAR* of the Angolan (control) portfolio is zero in correspondence to the event, against the alternative that it is different from zero. In the last two columns of the table, we test the null that the difference between the *CAR* of the control portfolio and that of the Angolan one is zero against the alternative that it is positive. In the top part of the table, we construct our test statistics using abnormal returns, while in the bottom part we employ raw returns to show that our effects are not driven by movements in the market index. Each row in the table corresponds to a different event window, and we report results for a short asymmetric window (−0, +1)

[8] To quote one source among many, "[Savimbi] embarked on a 27-year long quest for power which eventually took on the character of an obsession.... UNITA's military power was progressively weakened....For a brilliant tactician, there was no way out. The only option left was peace on the government's terms and a role for himself as a private citizen. It was not one he was prepared to consider" (Economist Intelligence Unit Country Report, May 2002, 13–14).



(A) Angolan portfolio



(B) Control portfolio

FIGURE 1. SAVIMBI'S DEATH

and for a longer symmetric one (−3, +3). For the Angolan portfolio, the rank and sign test statistics are always negative, consistent with the pattern of negative abnormal returns experienced by the Angolan portfolio in correspondence to the event. Out of eight tests, in seven cases the test statistics exceed two and we reject the null at the 5 percent level. In one case, i.e., the sign test for the (0, +1) event window, the two-tailed p-value is 0.16. For the control portfolio, on the other hand, the test statistics are always positive, but the results indicate an effect that is not statistically different from zero (with the exception of the sign test using raw returns for the window (0, +1), where the effect is positive and significant). In any event, for all windows and all types of returns, the difference between the control and the Angolan portfolio is positive and statistically significant at the 5 percent level, indicating a significant negative reaction of Angolan companies relative to the comparison group.

To corroborate our finding, we look inside the Angolan portfolio to see if companies with greater involvement in Angola were particularly hit by the event. For this purpose, we collected a breakdown of each company's assets and we constructed the variable *AssetShare*, equal to the ratio of assets *located in Angola* over total company assets at the time of Savimbi's death. If we

TABLE 1—TESTING THE IMPACT OF SAVIMBI'S DEATH

Event window	ANGOLAN portfolio Rank statistic	p-value two-tailed	Sign statistic	p-value two-tailed	CONTROL portfolio Rank statistic	p-value two-tailed	Sign statistic	p-value two-tailed	Difference[a] rank test p-value one-tailed
Abnormal returns									
(−0, +1)	−3.065	0.002	−1.414	0.157	0.506	0.613	0.000	1.000	0.043
(−3, +3)	−2.430	0.015	−6.584	0.000	0.299	0.765	1.000	0.317	0.000
Raw returns									
(−0, +1)	−2.020	0.043	−2.554	0.011	0.592	0.554	3.000	0.003	0.041
(−3, +3)	−2.711	0.007	−2.000	0.046	0.409	0.682	1.000	0.317	0.021

[a] Test of the null that the "Control" mean minus the "Angolan" mean is zero, against the alternative that it is positive.

compute the abnormal return of individual companies, AR_i, on February 22 and regress it on the asset share variable, we obtain the following:

$$AR_i = \underset{(0.015)}{-0.01} \quad \underset{(0.088)}{-0.24^{**}} \; AssetShare_i,$$

where numbers in parentheses are standard errors and the adjusted R^2 is 0.52. To check for the possibility that this may be a spurious relationship, we conducted a "placebo" experiment by randomly selecting 50 *nonevent* days and running the same regression.[9] None of the coefficients of the *AssetShare* variable was significant at the 5 percent level. Although these estimates should be viewed with caution due to the small number of observations, they do suggest that the reaction of stock prices to Savimbi's death had to do with the companies' involvement in Angola.

B. *Can War Be Good for Incumbent Companies?*

How can we explain the apparently paradoxical reaction of investors to the end of the conflict? Our interpretation is that the positive effects of the resolution of uncertainty were counterbalanced by the expectation that the newly acquired stability of the government would shrink the profit margins of the companies already holding concessions. This could occur for several reasons.

The first, and most obvious, is an increase in the *competition* faced by incumbent firms due to the potential entry of new firms. The presence of a civil war limits participation in the private sector to firms that can work in high-risk environments. This involves a number of aspects, including the willingness/ability to contract private security firms and strike deals with local armed forces, as well as the capability to sustain increased production costs due to the fact that road transportation becomes insecure and supplies may have to be brought in by air. One could therefore conceive that after the end of the war many more companies could afford or be willing to enter the Angolan mining sector, and this would limit the prospects for incumbents in acquiring new concessions. Judging from what happened ex post, this may not have been the sole explanation. Industry sources suggest that between February 2002 and today most incumbents reinforced, if anything, their position in the Angolan mining sector.[10] Even if there was no turnover in those holding concessions, however, the *potential* entry of other firms is likely to have shrunk the profit margins of

[9] These 50 dates were randomly drawn from the full sample after excluding days in which salient events related to the conflict or to diamond mining in Angola occurred. In particular, the dates excluded are the same used for the construction of event-type dummies in Section IVD below.

[10] During 2002, Endiama established a joint venture with SouthernEra (in our portfolio) and the Israeli-owned Welox to develop the Camafuca kimberlite pipe. As for later years, according to a Mining Annual Review 2004 article by Paul Crankshaw, the three projects in which new production was to be expected were in Fucauma-Luarica, Alto Cuilo, and on the Chicapa River. The foreign partners in these projects were, respectively, TransHex, Petra Diamonds, and Alrosa, and all three were already present in Angola throughout our sample period. Overall, the largest player in the market was and remains an Israeli diamantaire, Lev Leviev, who in 2000 had already acquired the right to market the entire Angolan production through Ascorp.

incumbents. Note that the role of war as a barrier to entry is not specific to Angola nor to the diamond sector.[11]

A second explanation has to do with the extent of *government control* over the mining sector, and its effect on regulation and rent-seeking behavior. The concession of mining rights has traditionally been one of the chief forms of patronage for the Angolan government, as described in Section I. The conflict with UNITA effectively thwarted the monopoly of the government over mining rights, as rebel forces controlled part of the diamond-rich territory. In the mid-1990s the UNITA company Sociedade General Mineiro (SGM) had legal mining rights and could form partnerships with foreign companies, auctioning its own licenses. In the last phase of the conflict, mining by UNITA had been declared illegal, but underground activities were still known to occur. As late as October 2001, a United Nations expert panel wrote that "many of the diamond companies have a previous history of working with UNITA and the Mechanism has information that some companies continue to do so. However, direct proof of working with UNITA is extremely difficult to find" (UN Monitoring Mechanism report, October 2001, § 186). Once the "competitive force" of armed conflict disappeared, the management of the diamond industry became more centralized and fears of increased rent extraction likely prevailed in the mind of investors. It should be recalled that right after the signing of the Lusaka Peace Protocol in 1994 the government, expecting a bust in foreign investment, had tightened regulation in the diamond sector. An explicit quote along these lines comes from the Economist Intelligence Unit: "The end of the war will undoubtedly open up new areas to exploitation by foreign and Angolan mining companies. However, most foreign companies are wary of conditions in Angola following years of contract-breaking by the Angolan authorities" (EUI Country Report, May 2002, 27). A concise quote from a local source is possibly more explicit: "The end of the war in Angola means that right now the main institution in the country is corruption."[12] Again, the relationship between conflict, lack of government monopoly over natural resources, and regulation is not unique to the Angolan case.

Related to the argument above is a third explanation: a *price war* between the government and UNITA over the concession of mining rights. The length of the conflict, and the withdrawal of the external funding that had helped both sides during the Cold War, put increasing pressure on the two parties to obtain immediate revenue. This is likely to have shifted bargaining power in favor of firms and allowed them to strike better deals. This was particularly true in the case of UNITA after the imposition of UN sanctions that rendered dealing with rebel forces illegal and forced them to do business on terms very favorable to the buyers. Indeed, industry sources suggest that working under UNITA protection was a particularly cheap way to extract diamonds: "According to one former *garimpeiro* who worked in the twilight zone between UNITA and government control, foreign dealers paid $250 to UNITA for prospecting rights" (Justin Pearce 2004, 4). The end of the war would dramatically decrease the demand for weapons (and for immediate revenue) by the two parties and thus increase firms' licensing costs. Through this channel, company profits would have decreased after Savimbi's death even if the extent of regulation and rent extraction by the government had not changed.

Finally, during the war, the lack of *transparency* in the management of the resource sector allowed public officials and well-connected companies to collude in extracting surplus at the expense of the citizens. Despite repeated attempts to denounce this system, the delay in reforming the country's institutions was typically blamed on the state of emergency created by the ongoing conflict. Investors may thus have expected that, after the end of the war, the government would have faced increasing pressure to make the licensing system more transparent,

[11] To quote one reference on Congo, "Mining companies are condemned to operating wherever they find minerals. They can consequently find themselves in the middle of conflicts that have erupted around them. In some instances they also deliberately enter conflict zones as part of a high risk–high profit strategy to exploit areas lacking competitors, or to gain a toehold before competitors arrive." (Oxford Analytica, *Congo-Kinshasa: Resource sector brings political risks*, 20 July 2005).

[12] Quote by Rafael Marques, a dissident journalist from Luanda. Reported by Tim Butcher in "As guerrilla war ends, corruption now bleeds Angola to death," www.telegraph.co.uk, 30 July 2002.

and this could have turned to the disadvantage of some incumbent firms. Indeed, after the end of the war, the Angolan government endorsed the Extractive Industry Transparency Initiative and is currently considering its implementation.

Overall, the explanations above are all consistent with our findings, and certainly should not be considered mutually exclusive. Unfortunately, it is impossible to quantify the contribution of each channel to the estimated effect due to the intrinsic nonverifiability of UNITA's dealings with individual companies and to the lack of disclosure of licensing fees on both sides. In what follows, we provide further empirical results to test the robustness of our findings and to rule out some alternative interpretations.

IV. Robustness

A. *Involvement in Conflict Zones*

Given that the explanations above hinge on the peculiar nature of production activities in "conflict economies," further insights can be obtained by considering the involvement of the different companies in *other* conflict zones. Together with Angola, Sierra Leone and—to a lesser extent—the Democratic Republic of Congo (DRC) are the countries in which illicit diamond mining has most contributed to financing civil war. Contemporaneous presence in at least two of these countries could then be interpreted as a signal that a company has a "comparative advantage" in a conflict environment. This feature would have two opposite effects in our event study: on the one hand, companies that specialize in conflict areas should have been the ones most negatively affected by Savimbi's death. On the other hand, presence in Sierra Leone or the DRC might have allowed the same companies to diversify into similar environments and thus better cushion the effects of the Angolan event.

Luckily for us, the conflict in Sierra Leone ended one month before Savimbi's death, as disarmament was declared officially complete on January 17, 2002. The DRC, however, was still a theater of widespread conflict at the time of Savimbi's death. We can therefore create smaller portfolios of Angolan companies and perform two exercises in which we have unambiguous predictions on the relative size of the effect. The first is a comparison among companies active in Angola and Sierra Leone but not in the DRC (two companies in our sample) and the remaining five companies. We expect the former to be the ones taking the biggest hit in response to the news. In fact, with the situation in Sierra Leone evolving toward normality, the end of the war in Angola meant further reductions in the gains from "conflict operations" and no ongoing activity in other conflict environments. The second exercise is a comparison between a portfolio of two companies working in Angola and the DRC and one containing the remaining five companies. In this case, we have no prior on the relative magnitude of the effect because of the two contrasting forces mentioned above. Note that none of the companies in our sample was active in all three countries at the same time.

The results of these exercises were as follows. On the day of Savimbi's death, the abnormal return for the portfolio holding concessions in Angola and Sierra Leone was −4.9 percentage points, while for the remaining portfolio it was −3.2 percentage points.[13] Thus, our conjecture finds support in the data: the end of the Angolan conflict was bad news for both portfolios, but more so for the companies that also had concessions in what no longer was a conflict zone. On the other hand, on the same day, the average abnormal return for the two companies operating in Angola and the DRC was −1.9 percentage points, compared to −4.4 for the remaining portfolio, suggesting that—if joint presence in more conflict areas was a signal of comparative advantage—holding concessions in areas where conflict was not yet over might have allowed companies to diversify their operations.

B. *Corruption*

Evidence that the management of government licenses was not perceived as particularly beneficial to foreign diamond mining companies can be obtained by looking at an earlier event: the

[13] Similarly, the standardized rank of a portfolio that invests in companies involved in both Sierra Leone and Angola is −2.33, versus −1.01 for a portfolio of companies operating in Angola only. We also apply a nonparametric rank test to the cumulative abnormal returns of a portfolio that invests (with equal weights) a dollar in Angolan companies not involved in Sierra Leone, plus the proceedings

unexpected suspension of Endiama's managing director, Jose Dias, on allegations of corruption mandated by the vice-minister of geology and mines on January 26, 1999. On this day, the abnormal returns of Angolan stocks were positive, 2 percent, while those of the control portfolio were −1 percent. In other words, this anticorruption episode was perceived as good news for the mining companies with direct interest in this episode, but not for other companies.

C. *Alternative Interpretations*

A possible interpretation of our main result is that Savimbi's death might have *increased* the uncertainty over the end of the conflict, rather than decreased it, for example, because there was no clear successor to UNITA's leadership. To rule out this interpretation, we conducted an event study corresponding to the "official" end of the war, namely, the signing of a cease-fire agreement between the FAA and UNITA on April 4, 2002. The results were very similar to those obtained for Savimbi's death. On the day of the cease-fire, the abnormal return on the Angolan portfolio was −4 percent. If we take March 30—the day in which the cease-fire memorandum was presented—as the starting date of our event window, the cumulative abnormal return on April 4 was −9 percent. On the contrary, the control portfolio displayed a weakly positive reaction to the signing of the cease-fire. Nonparametric tests (unreported) indicate that the effect was negative and significant for the Angolan portfolio and insignificant for the control one. We can therefore conclude that the *unambiguous* end of the war was still bad news for diamond mining companies working in Angola.

Another interpretation is that peace might have damaged mining firms by causing a *fall in diamond prices* if Angola had decided to boost its production and flood the international market. We can rule out this explanation on three grounds. First, being a generalized effect on diamond prices, this should have affected firms in the control portfolio too. Second, if one looks at the evolution of diamond prices through 2003, they did not respond to the changed situation in Angola. Finally, the company that was threatened the most by the potential price effect was De Beers. However, when we exclude De Beers from the Angolan portfolio and reestimate the weights for the control portfolio, the results remain virtually unchanged: the only difference is a slight increase in the size of the effect.[14]

D. *How Different Types of Events Affect Firm Value*

In addition to the results above on the end of the war, we conducted a more systematic analysis to take into account other conflict-related events and episodes of tightening in industry regulation. The relevant events were selected through the Lexis-Nexis search described in Section III. On the basis of the number of casualties and/or of the relevance given to each episode by the media, we selected 19 events that we grouped under six categories: end of conflict, government victories over UNITA, UNITA attacks on civilians, UNITA attacks on industrial diamond mines, UNITA attacks on *garimpeiros* (artisanal miners), and tightened industry regulation. A detailed list of events can be found in Guidolin and La Ferrara (2004). We then regressed the daily abnormal returns of our "Angolan" and control companies on six dummies corresponding to the categories of events above. The results are reported in Table 2.

The first and most notable result is that, in connection with the "end of the conflict," the abnormal returns of "Angolan" companies decreased by 3 percentage points, and this effect was statistically significant at the 1 percent level. This estimate is fairly close to the 4 percentage point decrease that we obtained in our event study (Section IIIA), the difference being due to the fact that the residual $e_{i,t}$ was estimated on the full sample here, and on a shorter pre-event window before. The coefficient for the companies in our control portfolio, on the other hand, is not significantly different from zero. The hypothesis

from shorting (for another dollar) the portfolio composed of companies also active in Sierra Leone, for a total net investment of one dollar. The corresponding rank statistic is 1.44 for the $(0, +1)$ event window, implying a rejection of the null of symmetric effect with a one-tailed p-value of 0.074.

[14] Detailed tests concerning these alternative interpretations are reported in the working paper version, Guidolin and La Ferrara (2004).

TABLE 2—ABNORMAL RETURNS AND DIFFERENT TYPES OF EVENTS

	Angolan β_A	Control β_C	Test $\beta_A - \beta_C = 0$ (p-value)
End of conflict	−0.03**	0.004	0.001
	(0.009)	(0.003)	
Government victories	0.014	0.042**	0.1
	(0.012)	(0.012)	
UNITA attacks civilians	0.019	−0.0001	0.28
	(0.017)	(0.004)	
UNITA attacks mines	−0.028	0.013**	0.03
	(0.017)	(0.005)	
UNITA attacks *garimpeiros*	−0.014	0.009	0.15
	(0.014)	(0.005)	
Industry regulation	−0.01**	−0.013	0.82
	(0.004)	(0.010)	
Company fixed effects	Yes	Yes	

Notes: Table reports estimated OLS coefficients. Standard errors in parentheses are corrected for heteroskedasticity and clustering of the residuals at the company level. Last column reports p-value of the test for the difference of the coefficients against two-sided alternative. N = 55,155, of which 8,079 for Angolan companies and 47,076 for control ones. There are 1,171 trading days between January 1, 1998, and June 28, 2002. N = (7 + 42)*1,171 minus the company/days with missing price data.

* Denotes significance at the 5 percent level, ** at the 1 percent level.

that the difference between the two coefficients is zero is rejected at the 1 percent level. When we turn to attacks and military victories that occurred during the course of the conflict ("government victories" and "UNITA attacks on civilians") we do not find statistically significant differences between the two sets of coefficients, possibly because the protracted nature of these episodes is not well captured by one-day dummies, or because identifying the most salient episodes over the course of four years of intense fighting is not an uncontroversial task. UNITA attacks on industrial mines have, instead, a negative impact on Angolan companies and a positive effect on control companies, the difference being significant at the 5 percent level. The positive effect on our control portfolio can be due either to unobserved events affecting the whole diamond industry, or to the resulting competitive advantage of "non-Angolan" companies. In fact, following an attack on an industrial mine, rational investors may want to switch out of Angolan stocks that have become rebel targets in favor of similar non-Angolan companies. Attacks on unorganized *garimpeiros* had no impact on either group of companies. Finally, the dummy "industry regulation" identifies episodes in which the Angolan government tightened its control on the diamond sector by centralizing the marketing process and imposing stricter regulation on joint ventures. These interventions had a negative and significant impact on the abnormal returns of our "Angolan" companies, corroborating the argument that investors did not perceive the management of the diamond industry by the Angolan government as particularly favorable to foreign companies. The effect on companies belonging to the control portfolio is not statistically significant, nor is the difference among the coefficients.

E. *Matched Pairs*

A typical control design in the event study literature consists of matching each of the "target" companies to one control company, and investigating whether the event under consideration has a significantly different impact on their abnormal returns. To explore the robustness of our results to this alternative way of constructing the control group, we proceed in the following way. For each of the seven Angolan companies, we select out of the available 42 companies a matched control using two criteria: (a) the control has to

TABLE 3—MATCHED PAIRS RESULTS FOR SAVIMBI'S DEATH

Event window	(−0, +1)		(−3, +3)	
	Rank statistic[a]	p-value One-tailed[a]	Rank statistic[a]	p-value One-tailed[a]
Pair 1 (Listing: JSE)	1.418	0.078	0.878	0.190
Pair 2 (Listing: TSX)	2.440	0.007	−0.697	0.243
Pair 3 (Listing: ASX)	2.503	0.006	2.741	0.003
Pair 4 (Listing: TSX)	1.815	0.035	1.123	0.131
Pair 5 (Listing: JSE)	−0.725	0.234	0.305	0.380
Pair 6 (Listing: TSX)	1.181	0.119	2.514	0.006
Pair 7 (Listing: TSX)	1.727	0.042	1.454	0.073

[a] Test of the null that the "control" mean minus the "Angolan" mean is zero, against the alternative that it is positive.

be listed in the same stock exchange (this to net out the effect of the market index factor and of other common macroeconomic influences); and (b) the control has to be of the closest possible size, as measured by total assets in US dollars, versus the Angolan company. We thus formed seven pairs and proceeded to apply Wilcoxon signed-rank tests of the null that the mean abnormal return for the control company exceeds the mean of the matched Angolan one.[15] The results are reported in Table 3.

Focusing on the (−0, +1) event window, in five cases out of seven we find that the differences in means are positive and significant, i.e., that abnormal returns are lower for Angolan companies than for the matched control (with p-values below 0.10; the p-values are actually below 0.05 in four cases). Of the remaining two pairs that are not significantly different, one has a test statistic of 1.18, and the other has a negative signed-rank statistic. If we consider the (−3, +3) event window, only in three cases is the difference between the control and the matched Angolan company positive and significant (with p-values 0.003, 0.006, 0.073); in three other cases it is positive but not significant (with p-values between 0.13 and 0.38); and in one case is it negative and insignificant (p-value 0.24). Overall, these results are broadly consistent with our previous approach, which relies on portfolios, especially if we focus on the sharper definition of the event, that is, the narrower (−0, +1) event window.

[15] The pairs are as follows: American Mineral Fields–Tahera; Ashton–BHP Billiton; Caledonia–REX Diamond Mining; De Beers–African Gems Resources; Diamondworks–Golden Star Resources; Southernera–Etruscan Resources; Transhex–Thabex Exploration.

F. *Statistical Issues*

We also performed a number of robustness checks to make sure that our results continue to hold under different statistical methodologies. First, our findings do not depend on the choice of the underlying model for *expected* returns. Together with the results from the market model, in Table 1 we also present results based on raw returns—i.e., when, for simplicity, expected returns are set to zero and we prevent the choice of the expected return model to affect our results—and we show that results are essentially unchanged. As an additional robustness check, we estimated abnormal returns from a multifactor model that included a world market index among the regressors (specifically, the MSCI total value-weighted World Index). Our results were again confirmed. For the (−0, +1) event window, the rank and sign statistics for the Angolan portfolio were, respectively, −4.37 and −2.6; the corresponding values for the (−3, +3) window were −2.27 and −5.28. For the control portfolio, the rank and sign statistics were always positive or zero, but never significant. The Wilcoxon rank test for the difference in means indicated that the *CAR* of the control portfolio was significantly higher than that of the Angolan one, with p-values of 0.08 and 0.00, respectively, for the (−0, +1) and (−3, +3) windows.

Second, in constructing the control portfolio, we experimented with alternative weighting matrices to aggregate means, variances, and

betas that are measured in different units. In addition to the weighting matrix proposed by Abadie and Gardeazabal (2003), which we employed for the results reported in this paper, we also used a diagonal matrix containing the inverse of the (asymptotic) standard deviations of the maximum likelihood estimators of the mean, the variance, and the market model beta. The results were similar and can be found in Guidolin and La Ferrara (2004).

Third, we performed afresh our nonparametric rank and sign tests concerning the stock price reaction to Savimbi's death for estimation windows of 63 days and for a variety of symmetric and asymmetric event windows, such as $(-1, +1)$, $(-0, +3)$, and $(-1, +3)$. The Wilcoxon rank statistic for the difference between the control and the Angolan portfolio was always positive, yielding p-values below 0.10 for all three event windows when the estimation window was set at 24 trading days. When the estimation window was 63 days, the results for the event window $(-0, +3)$ were significant (p-value 0.05), while those for the remaining two windows were not.

Fourth, one may be concerned that—because a majority of the companies in our samples are small capitalization firms listed in stock exchanges outside the United States—our event study results might be plagued by *thin trading*-induced biases. As first recognized by Robert Heinkel and Alan Kraus (1988), thin trading—in the form of a high proportion of days with no change in closing prices and therefore artificially zero (raw) returns—may bias test statistics in favor of rejecting the null of no event-related impact by artificially reducing the standard deviations of returns and related statistics. The worst possible case would correspond to the existence of a structural difference between the impact of thin trading for our Angolan versus control samples, in the sense of a stronger effect on the former portfolio. This is *not* the case in our data: over the entire sample, the incidence of days with zero raw returns is 19 percent for companies in the Angolan portfolio versus 39 percent for our controls. If we use the 20 percent threshold employed by, among others, Elizabeth Maynes and John Rumsey (1993), i.e., stocks with less than 20 percent incidence of zero raw returns are "thickly" traded, our Angolan sample is (borderline) free of strong thin trading issues, and the problem seems to mostly concern the average control company. Therefore, if anything, our tests on the differences between means would be biased *against* rejecting the null.[16]

Having said this, we rerun our event study of Savimbi's death, adjusting daily returns to formally take into account the presence of thin trading, as suggested in the literature. In particular, instead of "lumping" returns in correspondence to dates in which a price change is recorded, we proceed to either "splice" realized returns over periods between successive tradings, or to compute trade-to-trade returns and drop all dates in which no trading activity is recorded.[17] In the former case (uniform returns), with reference to abnormal returns on the Angolan portfolio, we find rank statistics of -2.30 and -1.63 for windows of $(-0, +1)$ and $(-3, +3)$, respectively. The sign tests take, instead, values of -2.38 and -4.86. In the latter case, when trade-to-trade returns are employed, the rank statistics are -2.02 and -1.60 and the sign statistics are -2.01 and -3.02. Clearly all of these statistics imply (one-sided) p-values of 0.05 or less. Similarly, nonparametric tests of a significant difference in mean returns between the Angolan and control portfolios yield p-values of 0.05 or less.

V. Concluding Remarks

This paper has examined the relationship between civil war and the value of firms in a poor, resource-abundant economy. We focus on the diamond sector in Angola and estimate stock returns for a sample of mining companies holding concessions in the country, and for a

[16] If we limit our attention to the periods from which the daily returns used in our event studies are drawn (estimation windows), instead of the full sample, the corresponding statistics are basically unchanged: 20 and 39 percent for Angolan and control companies, respectively. To obtain these incidence statistics, we averaged individual company data, applying equal weights in the case of Angolan companies, and the same weights of the control portfolio for the other companies. Equivalently, these statistics correspond to an average number of days between trades of 1.3 and 1.6, respectively.

[17] In the case of tests based on trade-to-trade returns, a longer estimation window of 63 days was employed, as computation of trade-to-trade returns implies loss of observations. The Web Technical Appendix provides details on the two methods.

control portfolio of otherwise similar companies not operating in Angola. Using an event study approach, we find that the end of the conflict, as represented by the death of the rebel leader and by the official cease-fire, *decreased* rather than increased the abnormal returns of the "Angolan" portfolio. This effect is sizeable and statistically significant, and is not likely to arise from unmeasured shocks to the diamond industry occurring at the same time, as the "counterfactual" constituted by our control portfolio shows no significant reaction. In related research using a *continuous* indicator of tension, we show that moderate levels of conflict can be beneficial to private firms, while extremely low or high levels of tension reduce their abnormal returns (see Guidolin and La Ferrara 2004).

We interpret our results in the light of the benefits that some incumbent firms may derive from a conflict environment in resource-dependent economies such as Angola. The occupation of parts of the territory by the rebels and the instability created by civil war may constitute a barrier to entry, reduce the government's bargaining power, and facilitate nontransparent licensing schemes. A cynical reader of our results may consider the popular street saying during the 1992 presidential elections in Angola—"The MPLA steals, UNITA kills"—and say that our findings cast doubt on whether private investors perceived killing to be worse than stealing. We understand that our findings are based on a small sample of firms and that they may be specific to the African context, though not solely to Angola. In this sense, they should not be viewed as in opposition to previous studies that found conflict to negatively affect firm value in industrialized countries. This paper does suggest, however, that in the debate on whether or how growth of the mining industry in Africa can bring widespread benefits to its population, one should acknowledge a simple fact: to the extent that some incumbent firms may benefit from civil war, this may affect their incentives to exert political and economic pressure to prevent or stop ongoing conflicts.

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