Aid, Policy and Peace: Reducing the Risks of Civil Conflict

by

Paul Collier*
World Bank
1818 H Street, N.W.
MSN MC3-304
Washington, D.C. 20433
pcollier@worldbank.org

and

Anke Hoeffler
Centre for the Study of African Economies, Oxford University and
International Peace Research Institute Oslo
21 Winchester Road
Oxford OX2 6NA, U.K.
anke.hoeffler@economics.ox.ac.uk

(Revised 10 May 2002; in final form 20 May 2002)

running title: Aid, Policy and Peace

corresponding author: Paul Collier
Abstract

We analyze theoretically and empirically the effects of economic policy and the receipt of foreign aid on the risk of civil war. We find that aid and policy do not have direct effects upon conflict risk. However, both directly affect the growth rate and the extent of dependence upon primary commodity exports, and these in turn affect the risk of conflict. Simulating the effect of a package of policy reform and increased aid on the average aid recipient country, we find that after five years the risk of conflict is reduced by nearly 30%.

KEY WORDS: Civil wars; Foreign aid; Economic growth; Primary commodity exports; Zaire; Policy reform

JEL Code: D74, O11
INTRODUCTION

This paper analyses the effects of economic policy and the receipt of foreign aid on the risk of civil war. The question is of evident importance. Civil war is common in low-income countries and impedes global poverty reduction. It is also the most common form of large scale conflict: only two of the 25 major conflicts recorded by Stockholm International Peace Research Institute during 2000 were classified as international (Stockholm International Peace Research Institute 2001). Thus, both the governments of low-income countries and the international donor community need to give some priority to conflict prevention in policy formulation. This paper constitutes the first systematic empirical work on the question. Its foundations are the Collier-Dollar model of how policy and aid affect economic performance, (Collier and Dollar 2002), and the Collier-Hoeffler model of the determinants of civil war (Collier and Hoeffler 1998, 2001, 2002).

Collier and Dollar quantify economic performance in aid-recipient countries as a function of aid and policy, using global data for the period 1973-97. They predict performance during four-year periods from characteristics in the preceding period. They find that faster growth is associated with better policy, while the effect of aid depends upon the level of policy. Thus, aid and policy are complementary: aid amplifies the effects of policy, and policy amplifies the effects of aid. Collier and Hoeffler, (hereafter CH), build an econometric model of rebellion using global data for the period 1965-99. They predict the risk of conflict occurring during five year-periods, from characteristics in the preceding period. The average aid-recipient country had a risk of around 11.7%
that a conflict would be initiated during a five-year period and this serves as a useful benchmark for considering the effect of interventions aimed at risk-reduction. CH find that both economic performance and economic structure have powerful effects on the risk of conflict, so that potentially both aid and policy can be expected to affect risk. Consistent with concentration of civil conflict in low-income countries, they find that the higher is the level of per capita income, the lower is the risk of conflict. A second significant risk factor is the growth rate of per capita income: the slower is growth, the higher is the risk of conflict. Third, increased dependence upon primary commodity exports strongly raises the risk of conflict, unless dependence exceeds the rather high level of 35% of GDP, beyond which the risk begins to diminish. These economic effects on conflict are found while controlling for various geographic, social and historical characteristics. These controls are maintained in the present paper.

Economic policy and international aid potentially alter the risk of conflict both directly and by changing the economic variables. We assume that the other risk factors for which we control, the ethnic and religious composition of a society, and aspects of its geography and history, are invariant with respect to economic policy and aid. Knowledge of them can inform governments and donors as to the level of risk which countries face, but does not alter the effects of aid and policy on conflict risk. This assumption simply represents a limitation of the present analysis.¹ In Section 2 we review and augment the analytic modeling of how aid and policy affect the risk of rebellion. We distinguish direct and indirect routes by which aid and policy can affect the risk of conflict, but these are not consistently signed, and the net effects are \textit{a priori} ambiguous. Hence, the actual effects of aid and policy on conflict risk can only be determined empirically. In Section 3
we quantify these routes. We show that in conjunction, larger aid flows and improved policies sustained for five years could substantially reduce the incidence of conflict. Finally, we apply the analysis to a simulation of Zaire as of 1995. The CH model predicts that, as of 1995, Zaire (now the Democratic Republic of the Congo) was the country with the highest risk of civil war over the subsequent five years. Zaire indeed experienced two civil wars during this period. We use the model to simulate whether any feasible change in aid and policy might have substantially reduced this risk. The data used in the analysis are described in the Appendix.

AID AND POLICY IN THEORIES OF CONFLICT

The effects of aid and policy on the risk of civil conflict are a priori ambiguous. While the models are sometimes complex, the basic issues are straightforward. In respect of aid, on the one hand, the prospect of capturing control of it may increase the incentive to rebel. On the other hand, if aid strengthens the government and the economy, it may make rebellion more difficult. Better policy also strengthens the economy. However, it may also change the distribution of income, leading to resistance. For both aid and policy, the relative importance of these opposing effects can only be determined empirically.

Consider, first, the effects of aid. The model of Grossman (1992) explicitly considers the effect of aid on conflict risk and predicts that it will make conflict more likely. In his model the purpose of rebellion is the capture of the state for financial advantage. The larger is aid the more lucrative is such capture, and so the incentive for rebellion is increased. This result is superficially analogous to the theoretical and
empirical association between natural resources and the risk of conflict (Collier and Hoeffler 2002). However, there are reasons to be skeptical of aid as an incentive to rebellion. Unlike natural resources, aid is difficult for a rebel organization to capture during a conflict. During a conflict aid is usually reduced (Collier and Hoeffler 2002a) and in any case accrues either to the government budget or is spent on projects. The case study literature suggests that the only type of aid that rebels are able to capture during conflict is food aid, since they can threaten distribution channels. Hence, the incentive effect of aid for the rebel organization must rely predominantly upon the prospect of the control of aid subsequent to victory. However, only around 20% of rebellions end in rebel victory, and the typical duration of conflict is around seven years. Thus, the prospective gains to aid must be heavily discounted both by risk and time. In contrast, because natural resource revenues can be captured during conflict, they need not be discounted.

While the Grossman model focuses upon the revenues to be captured by rebellion, that of Collier (2000) introduces costs of rebellion and develops a condition for financial viability. The condition captures theoretically three factors that are found empirically to be associated with a higher risk of conflict: a low level of income, slow growth, and high dependence upon exports of primary commodities. Although the model does not consider aid, it can readily be introduced into the viability condition. The model stresses viability because it is agnostic as to rebel objectives. Rebels may be revenue maximizers, or they may have non-economic goals for which military confrontation is seen as a necessary means. Rebellion is in this case conducted by a not-for-profit organization. The model assumes that the motivations of greed and grievance are sufficiently abundant globally that where a rebellion is viable it will occur.
The military viability of rebellion is modeled as dependent upon the size of rebel forces relative to government forces: rebel forces must be large enough to satisfy a survival constraint, and this imposes financing requirements. Societies differ in the opportunities they provide for rebel financing; hence, the core of the model is the relative abilities of the government and the rebels to finance an army.

Prior to rebellion, the government provides a level of defense effort, \( g \). The government cost function, \( C_g \), is the product of defense effort and the military wage rate per unit of effort, which is in turn assumed to be a linear function of the level of income, \( y \):

\[
C_g = g w_g = g \lambda y. \quad (1)
\]

The government sets its precautionary military expenditure as fraction, \( v \), of its revenue, which is assumed to be elastic in per capita income.\(^2\) Hence, prior to rebellion, government forces, \( g \), are:

\[
g = v(\delta^\theta y^{-1})/\lambda, \quad \theta > 1. \quad (2)
\]

Given this level of deterrence, the model then specifies the conditions for the financial viability of rebellion. The gross revenue function of the rebel organization, \( R_r \), has two components, the tribute from exporters which can be exacted conditional upon the credibility of the threat of military force, and a military contest function which determines that credibility. The tribute is assumed to be a function of the value of primary commodity exports, \( ny \), where \( n \) is the share of income constituted by primary commodity exports. The tribute increases in this base for predation, but at a diminishing rate. For the military contest function, the model adopts the specification of Konrad and
Skaperdas (1998), in which the degree of military success reflects the balance of opposing forces, rebel, $r$, and government, $g$. Hence:

$$R_r = (ny)^{\alpha} \frac{r}{r+g}; \quad 0 < \alpha < 1.$$ (3)

The rebel cost function, $C_r$, is its wage bill. As with the government, in recruiting its labor force the rebel organization is assumed to face costs that are related to per capita income in the society. Whereas the government army is in steady-state, the rebel organization needs to grow at least to the level of the survival constraint. This difference makes the recruitment costs of the rebel organization more sensitive to the current state of the labor market than are those of the government. Hence, the rebel wage is assumed to be a function not only of the level of income, $y$, but of the rate of growth of the economy:

$$C_r = r w_r = r(\varphi + k \dot{y}) y.$$ (4)

Finally, the model introduces a threshold size of rebel forces relative to government forces, below which predation of primary commodity exports is too dangerous to be viable. Thus,

$$r \geq \beta g.$$ (5)

The minimum size of a viable rebellion is that at which this survival constraint is binding.\(^3\) Substituting, and rearranging, the financial viability condition is:

$$\lambda n^{\alpha}(1 + \beta) \geq \nu \delta y^{\beta} (\varphi + k \dot{y}).$$ (6)

The risk of conflict is thus increasing in the probability that (6) is satisfied, so that risk is increasing in $n$ and decreasing in $y$ and $\dot{y}$.

We now introduce aid into the model. There are three potential routes by which aid can affect the risk of conflict. The most direct route is that aid augments the government budget. While most aid is linked to specific projects, many of these projects
would otherwise have been funded out of government revenue and so release that revenue for other government priorities, a phenomenon termed ‘fungibility’. A large empirical literature has established that fungibility is substantial (Feyzioglu, Swaroop and Zhu, 1998), and that a reasonable approximation is that aid simply relaxes the government budget constraint. This introduces a new term in the government revenue function, \( R_g \):

\[
R_g = A + \delta y^\theta, \quad \theta > 1.
\]  

(7)

In turn this tightens the financial viability constraint for rebellion and so reduces the risk of conflict.

The second route by which aid potentially affects the risk of conflict is through its effect on growth, and hence cumulatively upon the level of income. While there is an empirical dispute as to whether aid raises growth conditional upon, or irrespective of, policy, (Hansen and Tarp 2001, Burnside and Dollar 2000, Collier and Dollar 2002), as aid raises growth it will further tighten the viability constraint on rebellion.

The third route by which aid potentially affects the risk of conflict is through changing the structure of income. As per capita income grows, economies tend to diversify away from primary commodity dependence. Since primary commodity dependence is a risk factor in the model, this process of diversification reduces the risk of conflict. This effect is potentially reinforced by a Dutch disease effect (Corden 1984). Aid, being an increase in the supply of tradable goods to the economy, reduces their relative price. Hence, aid should reduce the share of primary commodity exports in economic activity. Again, this reduces the risk of conflict.
We now turn from aid to policy. In contrast to the effects of aid on conflict risk, there are no formal models that analyze the effects of policies. The measure of policy used in this paper is that of the World Bank, which currently rates client countries on twenty different aspects of policy, institutions and governance. Although these ratings give the potential for differentiating among policies, in practice they are sufficiently highly correlated that policy ‘improvement’ may best be interpreted as a change in policies across a wide range.

Radical critiques of ‘structural adjustment’ policies, such as the move to market exchange rates and privatization, commonly portray them as sacrificing equity for growth and efficiency. If this were the case, then ‘better’ policy as measured by the World Bank (both in cross-section and inter-temporally), might potentially be associated with a higher risk of conflict. Even if ‘better’ policy is not associated with greater inequality, a change in policy will inevitably redistribute income, and this redistribution may be resisted. Hence, both the level of policy and the change in policy may potentially have adverse effects on conflict risk. However, policy improvement is also associated with better governance. Liberalization tends to reduce rents and increase the transparency of government and this is presumably associated with reduced grievance against the political elite.

Policy will also affect the growth and structure of the economy. An ‘improvement’ in policy as defined by the World Bank is normally intended to raise the growth rate. The consequences of policy improvement for the risk of conflict then follow from the discussion above. Faster growth reduces the risk of conflict through three routes: a direct effect, an effect via the cumulative increase in the level of income, and an effect
via the effect of the level of income on the composition of economic activity. In addition to its effect on the growth rate, policy improvement may have some direct effect on the composition of economic activity, although the direction of change is a priori uncertain. Development is usually associated with declining dependence upon primary commodity exports, and the process can be presumed to be accelerated by policy improvement. Since primary commodities typically earn higher rents than manufacturing and services, their production is likely to be less sensitive to poor policy. Hence, policy improvement might reduce primary commodity dependence. However, some critiques of poor economic policy in developing countries have focused on over-taxation of primary commodity exports (notably Bates 1981). Improvement of these policies would raise the share of primary commodity exports in economic activity. Thus, the sign of the effect cannot be determined a priori.

To summarize, aid and policy can each affect the risk of conflict directly, and indirectly through the growth and composition of economic activity. Neither the direct effects nor the net effects can be signed a priori. However, each of them is potentially quantifiable and this task is the subject of Section 3.

QUANTIFYING THE EFFECTS OF AID AND POLICY

In the subsequent analysis we consider variations in aid and policy relative to a baseline case. The baseline is a hypothetical country with characteristics set at the mean of all the aid-recipient in the CH sample. These characteristics are shown in the first column of Table 1. The second column of Table 1 reports the coefficients on these variables from the CH logit regression on conflict risk. The implications for conflict risk
are shown in the third column, this being the product of the two previous columns. Prior to any change in aid or policy the hypothetical country faces a risk of conflict of 11.7%. From this baseline we now investigate the effects of changes in aid and policy.

**The Effects of Policy Improvement**

In order to quantify the effects of policy on the risk of conflict, we need to be able to measure policy over a long period on a comparable basis for many countries. Since 1977 the World Bank has measured economic policy, country-by-country, on a six-point ordinal scale. We use this index, known as the Country Policy and Institutional Assessment (CPIA), which is the most comprehensive attempt to measure economic policy. Although subjective, the scoring is based upon a set of specified criteria, and the country-specialist Bank staff who make the assessments are supervised with a view to imposing these common standards. Despite the limitations inherent in a subjective index, the CPIA has the advantage of including many policies which would simply be omitted were we to confine our analysis to those policies which are objectively quantifiable. In our first simulations we consider the effect of an improvement in the CPIA score by one point, sustained for a five year period, on the risk of conflict. Such a policy improvement is roughly equivalent to the difference in policy between the average ratings for sub-Saharan Africa and that for China as of 1995.

We first investigate whether, in addition to any indirect effect of policy improvement on the risk of conflict via the variables in the model, there is also a direct effect. A change in policy is likely to alter the pattern of grievances in society. ‘Bad’ or deteriorating policies most obviously might intensify grievance, but even good, or improving policies, by limiting the opportunities of powerful groups to extract rents,
might heighten some grievances. Recall that although the model does not incorporate such effects, and so predicts that changes in grievances have no effect on the risk of conflict. To investigate this potential route we add the CPIA to the CH specification of conflict risk, thus controlling for both the growth rate and the other risk factors. Because the CPIA is only available since 1977, and even then only for countries that borrow from the World Bank, there is a severe reduction in sample size. Whereas CH base their results upon 750 episodes, the inclusion of the CPIA reduces the sample to between 285 and 298 episodes depending upon specification.

In the first column of Table 2 we report our baseline model of conflict risk (CH 2001, 2002). We then add to this baseline model a measure of the change in policy during the five years prior to the episode being considered. For example, in estimating the risk of conflict in Kenya for the episode 1985-89, we include the change in policy between 1980 and 1984. The variable is insignificant, suggesting that other than via its effect on economic growth and structure, policy improvement does not have an effect on conflict risk. Because the CPIA is only available from 1977, the introduction of a lagged change in policy drastically reduces the sample to the period 1985-99, so that many other variables lose significance. Although policy change is not significant, this is only weak evidence that it does not have a direct effect. However, the sign on the coefficient is negative, indicating that if anything, policy improvement directly reduces conflict risk. In the third column of Table 2 we replace the change in policy with its average level during the five years prior to the episode being considered. Again the coefficient is insignificant and negative.
To summarize, none of these results suggest that either good policies or policy improvement, as defined by the World Bank, directly increase the risk of conflict. We find no significant direct effect, but to the extent that we find effects at all, they are that good, and improving policies both directly tend to reduce risk. In the subsequent analysis we ignore any such favorable effect. Since policy change has economic effects which indeed reduce risk, it is more important for us to establish that there is no evidence for an offsetting direct effect than that there is any reinforcing direct effect. Since neither the level of the CPIA, nor its change, increase the risk of conflict, there is indeed no evidence for an offsetting effect: policy improvement does not appear directly to increase the risk of conflict. By ignoring any reinforcing effect whereby policy improvement might directly reduce the risk, we create a lower-bound estimate of the effect of policy improvement on risk reduction in which any effect of policy works through the other variables in the CH regression.

The most evident indirect route by which policy will affect the risk of conflict in the model is via its effect on the rate of growth. CH find that controlling for other variables economic growth significantly reduces the underlying risk of conflict. Collier and Dollar (2002) investigate the relationship between economic policy as measured by the World Bank and the rate of growth. They find that policies significantly affect growth, partly direct and partly conditional upon aid receipts. Specifically, they find that:

\[ \hat{y}_i = k_i + 0.64\text{Policy}_i + 0.185\text{Policy}_i \cdot \text{Aid}_i - 0.036\text{Aid}_i^2. \]  
(8)

The effect of policy improvement on the growth rate thus depends upon the level of aid. Here, as noted, we simulate the effect at the level of aid receipts and initial policy
of the mean aid-recipient. A one point improvement in the CPIA raises the growth rate for such a country by 1.25 percentage points.

Within the model, not only does growth have a direct effect on the risk of conflict, it also has a secondary effect through raising the level of income. Sustained over a five year period, as assumed above, the better policy permanently raises income by around 7%. In turn, this contributes to risk reduction because higher income makes a society safer.

Both directly, and through the higher level of income generated by the five years of sustained growth, policy reform has further potential effects on risk through changing economic structure. In the model the structure of income effects the risk of conflict. Recall that a priori, it is ambiguous how an ‘improvement’ in the CPIA might directly affect primary commodity dependence. The effect of policy upon primary commodity dependence is difficult to establish empirically because causality also runs in the other direction: there is a weak long-term tendency for policy to be worse in societies that are dependent upon primary commodities (Collier 2002). To control for this we investigate the effect of policy and the level of income in a panel of countries, including country fixed effects. The dependent variable is the log of the share of primary commodity exports in GDP during a five-year period, and this is explained on the CPIA score, the level of income, and the level of aid, all measured as averages during the preceding five year period. Testing the specification of the model confirms the need to include these country fixed effects. The results are as follows:7

\[
\ln (\text{primary commodities})_{it} = 3.696 - 0.90 \text{Policy}_{i,t-1} - 0.012 \text{Aid}_{i,t-1} - 0.737 \ln GDP_{i,t-1} \\
(3.81) \quad (2.02) \quad (2.43) \quad (5.64)
\]
Thus, we find that both the level of income and policy have significant and reasonably substantial effects. A 1% increase in the level of income, controlling for policy and aid, reduces primary commodity dependence by 0.7%. The direct effect of a one point improvement in policy on economic structure, controlling for the level of income and aid, is smaller, around 0.1%. Between the income effect and the direct effect, a one point improvement in policy sustained for five years would therefore reduce primary commodity dependence by around 0.8%.

In summary, economic policy improvement is effective in reducing risk via its effect on economic structure and its effects on growth. In turn, growth has both a direct effect on risk reduction and indirect effects via the level of income and the structure of the economy. The fourth column of Table 1 collates these effects of a one point policy improvement and aggregates them into an effect on the risk of conflict. It can be directly compared with the third column which presents the baseline risk, built up from its component parts. For example, the contribution of faster growth is shown in the second row, which is the product of the higher growth rate and the coefficient on growth given in column 2. Similarly, the contribution of faster growth to higher income is shown in the first row. After five years, the higher income is about half as important as the direct effect of faster growth. Since the effect of primary commodity dependence upon the risk of conflict is substantial, the effect of policy improvement on risk via this route is quite large, again being shown in the fourth column of Table 1 (rows 3 and 4). Because both primary commodity dependence and its square enter the logit regression, the net effect of reduced dependence is the net effect of the change in these two variables. Thus, the effect is about as large as the direct contribution of faster growth. The combined effect of a one
unit improvement in the CPIA score on the risk of conflict for the mean aid-recipient, is shown at the bottom of the fourth column. Such a policy improvement would reduce the risk of conflict from 11.7% to 9.1%. Thus, sustained for five years, the policy improvement would reduce the risk of conflict by around one fifth.

The Effects of Aid

We now turn from the role of government in conflict prevention to the role of donors. We consider the effect of an increase in aid of one dollar per capita, sustained for a five-year period. We do not investigate changes in the composition of aid. Potentially, an increase in aid may induce policy improvement and so reduce the risk of conflict through the routes considered above. However, since we have already investigated the effect of policy improvement explicitly, we now take policy as given. Moreover, evidence suggests that the effect of aid on policy is on average modest. Dollar and Svensson (2001) investigate 220 aid programs and fail to find a statistically significant effect of aid volumes on policy. We again consider the effects for a country with the characteristics of the mean aid-recipient.

We first consider whether aid might have a direct effect on conflict risk, controlling for the variables in the CH model. Recall that a priori the sign of the effect varies depending on the model. We test for the direct effect of aid by including aid/GDP in the CH model. Since the opposing effects may be differentially strong at different levels of aid, we include a variant in which both aid and its square are explanatory variables. Clearly, there is a potential endogeneity problem: donors are likely to reduce non-military aid in conflict situations. If this is not allowed for, then aid will appear to reduce the risk of conflict when in fact causation is in the other direction. We allow for
this by lagging aid flows: we measure aid receipts averaged over the five-year period prior to the period of prediction. The results are reported in Table 3. The coefficient on aid/GDP is insignificant and negative. As with policy, this suggests that there is no direct effect of aid on conflict risk, but that should there be such an effect it is more likely to be benign. Recall that in the Grossman model aid raises the risk of conflict by being a lure for capture, whereas in the Collier model it reduces the risk of conflict by raising government deterrence expenditures. Either both of these postulates are wrong, or they are both right but offset each other. Were one right and the other wrong we should have found a significant net effect.

Now consider the effect of aid on conflict risk via the growth rate. A corollary of (8) is that, conditional upon policy, aid raises growth. Whereas previously (8) was differentiated with respect to policy, now it is differentiated with respect to aid. For the mean aid recipient, an additional one dollar per capita would raise the growth rate by around 0.25%. Recall that this directly reduces conflict risk and additionally has two indirect effects. Sustained over a five year period growth would raise the level of income by around 1.25% and this would in turn reduce risk. Further, as discussed above, the higher level of income would reduce primary commodity dependence by around 1% which would also reduce conflict risk.

In addition to its effect on growth, aid is postulated to alter the structure of the economy, as a result of ‘Dutch disease’. We investigate the relationship between primary commodity dependence and aid through including it in the regression for primary commodity dependence (equation (9)). There is indeed a significant Dutch disease effect: aid reduces primary commodity exports as a share of GDP.
The overall effect of the increase in aid on the risk of conflict is shown in the fifth column of Table 1 which again collates these individual effects. The risk of conflict is reduced from the baseline case of 11.7% to 11.5%. In the last column of Table 1 we simulate the effect of policy improvement and increased aid in combination. Because aid and policy are complements, the increased aid now has a greater effect on risk reduction. Despite the fact that with policy improvement the risk is already reduced to 9.1%, the aid achieves a larger absolute reduction in risk (and, \textit{a fortiori}, a larger proportionate reduction) to 8.4%. Hence, this combination of policy improvement and aid reduce conflict risk by around 28% over a period of five years.

\textbf{Zaire: a Simulation}

The above simulations have concerned a hypothetical country at the mean of aid-recipient characteristics and shown that aid and policy can have a substantial impact on the conflict risk for such a country. However, globally, the incidence of civil war is accounted for predominantly by a relatively small group of countries with atypically unfavorable characteristics. We now investigate the potential for policy improvement and aid to reduce conflict in one of these high-risk countries by simulating their effects Zaire.

The CH model can be used to assess country-specific risks. For the most recent period predicted by the model, 1995-99, Zaire had the highest predicted risk of conflict of the 116 countries in the sample, with a risk of 82%. Zaire indeed suffered two outbreaks of civil war during the ensuing period. We now investigate, within the framework of the model, whether any combinations of policy reform and aid might have substantially reduced the risk of conflict. Specifically, we construct an iso-risk locus in policy-aid
space, with the risk level reduced from 82% to 28%. The underlying simulations are reported in Table 4, and the resulting locus is plotted in Figure 1.

Clearly, such a simulation has to be regarded with considerable caution. It is treating as linear over a wide range relationships that are likely to be linear only locally. Further, it is applying results that are partly derived from cross-section relationships, as if they held over time. It is better regarded, not as a providing insight into policy design, but merely as a concrete and exaggerated illustration of how the analysis of this paper might be applied in practice. The model predicts that had the government of Zaire implemented radical policy reform, (approximately of the magnitude undertaken by Uganda between 1986 and 1992), and if donors had tripled their aid contributions, then civil war would have become unlikely. It also predicts a trade-off: tripling aid would have reduced the required degree of policy reform from a massive 2.1 points to a more manageable 1.2 points. This is approximately equivalent to what Uganda achieved between 1986 and 1988 instead of what it achieved between 1986 and 1992.

CONCLUSION

In this paper we have investigated both analytically and statistically the effects of aid and economic policy on the risk of civil conflict. The subject has not previously been investigated statistically. Previous analytic studies of the effect of aid on the risk of civil conflict (Grossman, 1992, and Azam, 1995) concluded that it would increase the risk by making the capture of the state more attractive, but we have shown that alternative analytic models can easily reverse this result.
The core of the paper is a quantification of the various routes by which aid and policy affect conflict risk. We draw upon the results of Collier and Dollar (2002) on how aid and policy affect economic performance. Controlling for a range of economic, social, geographic and historical variables, we found that neither aid nor policy had a direct effect upon the risk of conflict. However, through their indirect effects upon the growth and structure of income, both increased aid and policy improvement substantially reduce the risk of conflict.
Appendix: Data Sources

The data source for most of the variables used in this paper is Collier and Hoeffler (2002b). These data provide a panel data set for 161 countries and eight time periods, 1960-64, 1965-70, ..., 1995-99. Thus, it provides 1288 potential observations.

War starts

The war start variable takes a value of one if a civil war started during the period and zero if the country is at peace throughout the period. If a war started in period t and continues in t+1 we record the value of the war started value as missing. A civil war is defined as an internal conflict in which at least 1000 battle related deaths (civilian and military) occurred per year. We use mainly the data collected by Small and Singer (1982) and Singer and Small (1994) and according to their definitions we use updates to extend the data to cover 1992-99.8

GDP per capita

We measure income as real PPP adjusted GDP per capita. The primary data set is the Penn World Tables 5.6 (Summers and Heston 1991). Since the data is only available from 1960-92 we used the growth rates of real PPP adjusted GDP per capita data from the World Bank’s World Development Indicators 1998 in order to obtain income data for 1995. Income data is measured at the beginning of each sub-period, 1965, 1970, ..., 1995. (GDP growth)_{t-1}

We used the log differences of GDP per capita over the previous five years (1960-64, 1965-69, ..., 1990-94) to approximate the growth rate.
Primary commodity exports/GDP

The ratio of primary commodity exports to GDP proxies the abundance of natural resources. The data on primary commodity exports as well as GDP was obtained from the World Bank. Export and GDP data are measured in current US dollars. The data is measured at the beginning of each sub-period, 1965, 1970, ..., 1995.

Population

Population measures the total population, the data source is the World Bank’s World Development Indicators 1999. Again, we measure population a the beginning of each sub-period.

Social fractionalization

We proxy social fractionalization in a combined measure of ethnic and religious fractionalization. Ethnic fractionalization is measured by the ethno-linguistic fractionalization index. It measures the probability that two randomly drawn individuals from a given country do not speak the same language. Data is only available for 1960. In the economics literature this measure was first used by Mauro (1995). Using data from Barrett (1982) on religious affiliations we constructed an analogous religious fractionalization index. Following Barro (1997) we aggregated the various religious affiliations into nine categories: Catholic, Protestant, Muslim, Jew, Hindu, Buddhist, Eastern Religions (other than Buddhist), Indigenous Religions and no religious affiliation. Data is available for 1970 and 1980 and the values are very similar. For 1960, 1965 and 1970 we used the 1970 data and for 1980, 1985, 1990 and 1995 we use the 1980 data. For 1975 we use the average of the 1970 and 1980 data.
The fractionalization indices range from zero to 100. A value of zero indicates that the society is completely homogenous whereas a value of 100 would characterize a completely heterogeneous society. We calculated our social fractionalization index as the product of the ethno-linguistic fractionalization and the religious fractionalization index plus the ethno-linguistic or the religious fractionalization index, whichever is the greater. By adding either index we avoid classifying a country as homogenous (a value of zero) if the country is ethnically homogenous but religiously divers, or vice versa. In Collier and Hoeffler (2000b), Table 8, we show that this aggregation rule is superior to variants.

Ethnic dominance (45-90%)

Using the ethno-linguistic data from the original data source, Atlas Narodov Mira (Department of Geodesy and Cartography of the State Geological Committee of the USSR 1964) we calculated an indicator of ethnic dominance. This variable takes the value of one if one single ethno-linguistic group makes up 45 to 90 percent of the total population and zero otherwise.

Geographic Dispersion

We constructed a dispersion index of the population on a country by country basis. Based on population data for 400km$^2$ cells we generated a Gini coefficient of population dispersion for each country. A value of 0 indicates that the population is evenly distributed across the country and a value of 1 indicates that the total population is concentrated in one area. Data is available for 1990 and 1995. For years prior to 1990 we used the 1990 data.
Peace Duration

This variable measures the length of the peace period since the end of the previous civil war. For countries which never experienced a civil war we measure the peace period since the end of World War II until 1962 (172 months) and add 60 peace months in each consecutive five year period.

Aid

We measure aid as the percentage of official overseas development assistance and official aid in GDP. Aid and GDP are measured in current US dollars and we use the average percentage over the preceding five years in our analysis. Data source: World Development Indicators 1999 (World Bank 1999).

Policy

The Country Policy and Institutional Assessment (CPIA) measure of policy has 20 equally weighted components divided into four categories as follows: (1) Macroeconomic Management and Sustainability of Reforms (General Macroeconomic Performance, Fiscal Policy, Management of External Debt, Macroeconomic Management Capacity, Sustainability of Structural Reforms); (2) Structural Policies for Sustainable and Equitable Growth (Trade Policy, Foreign Exchange Regime, Financial Stability and Depth, Banking Sector Efficiency and Resource Mobilization, Property Rights and Rule-based Governance, Competitive Environment for the Private Sector, Factor and Product Markets, Environmental Policies and Regulations); (3) Policies for Social Inclusion (Poverty Monitoring and Analysis, Pro-poor Targeting and Programs, Safety Nets); and (4) Public Sector Management (Quality of Budget and Public Investment Process,
Efficiency and Equity of Revenue Mobilization, Efficiency and Equity of Public Expenditures, Accountability of the Public Service). Data source: World Bank.
Footnotes

* The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the World Bank, its Executive Directors, or the countries they represent. Anke Hoeffler's research for this paper was partially funded by the Research Council of Norway (NFR).

1. The assumption is particularly limiting with respect to the history of previous conflict. We are unable to establish distinctive effects of policy and aid in situations of recent post-conflict. This is because the studies of conflict prevention and of post-conflict risks require very different information. The CH study of conflict prevention is based on explaining why, out of 1167 five year episodes covering 161 countries, civil war was initiated in 78 cases. Although data limitations reduce their effective sample to 52 conflicts out of 750 episodes, this is sufficient for statistical inference. By contrast, an analysis of post-conflict experience must explain why, within this group of 52 conflicts, some gave rise to further conflict whereas others did not. Such a small population can support only limited statistical analysis, the results of which are reported in Bigombe, Collier and Sambanis (2000). They interact a post-conflict dummy variable with the underlying risk factors described above, to determine whether any of them affect risks differently in pre- and post-conflict situations. They find that the only differences which are statistically significant are so small as to be unimportant. This suggests that the policies for conflict prevention which we discuss in this paper also have some bearing on post-conflict situations. Specifically, they are effective for reducing that part of the post-conflict risk which is inherited from the pre-conflict period, rather than for the pure post-conflict risk. Typically, in post-conflict situations, the underlying risks in aggregate, and
the pure post-conflict risk, are of about equal magnitude, so that our analysis covers approximately half of the overall post-conflict risk. Specifically, during the first five years after conflict on average there is a 53% risk of a relapse into conflict, of which around 25% is due to underlying factors and 28% due to post-conflict risk. For this study we investigated whether our measures of policy and aid affected risk directly and distinctly in post-conflict situations over-and-above their effects on the underlying risks. Although we could find no significant effect, this presumably reflects the limitations of the size of our sample of post-conflict countries. Hence, our paper should be understood as applying to conflict prevention, with some partial further applicability to post-conflict situations.

2. Here we present a slightly simplified version of the model, abstracting from differences in population.

3. If the rebellion is financially viable at this size, the rebel leader may choose to expand it further. However, since there are diminishing marginal returns to rebel labor, the rebellion will only be financially viable beyond the size imposed by the survival constraint if it is also financially viable at that size. Hence, financial viability at the size which just satisfies the survival constraint is the condition for the initiation of a rebellion.

4. A further reason for using the CPIA is that its ranking of policies, both across countries and over time by definition indicates the normative judgment of the World Bank as to which policy environments were best-suited to development. Through its advice and negotiated conditionality, the Bank was attempting to promote policy change towards higher CPIA scores. By investigating the effect of the CPIA scores on the risk of
conflict, we determine both how policy might effect conflict, and how the Bank’s policy priorities affected conflict.

5. The growth rate is lagged by one five-year period. Since one route by which policy affects risk is via growth, by controlling for growth in the risk regression the remaining route is the direct one. Because growth is endogenous to policy there is a case for instrumenting for the growth rate, leaving an effect of aid which combines the direct effect plus that via growth, although in practice there are so many other effects on growth that growth and policy are only weakly correlated. When growth is instrumented, the results are consistent with the results presented in the paper: aid has a larger beneficial effect. The instrumented results are available from the authors on request.

6. t-ratios in parentheses.

7. T-ratios in parentheses. N=345, F-test for the joint significance country specific effects: F(104, 237), p=0.00.

8. We would like to thank Nicholas Sambanis for updating the data set for us.

9. We would like to thank Robert Barro for the use of his data set (Barro 1997).

For some countries which were not listed in his data set we used the data from the original source (Barrett 1982).
References


Figure 1. Zaire: A Simulation of Conflict Risk

Policy index (CPIA)

Aid as a percent of GDP

Risk=82%

Risk=28%

1995
Table 1: Aid, Policy and the Risk of Conflict: a Simulation

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Means</td>
<td>Coefficient at the Mean</td>
<td>Improved Policy</td>
<td>Increased Aid</td>
<td>Improved Policy and Increased Aid</td>
<td></td>
</tr>
<tr>
<td>ln GDP per capita</td>
<td>7.805</td>
<td>-0.950</td>
<td>-7.418</td>
<td>-7.476</td>
<td>-7.430</td>
<td>-7.497</td>
</tr>
<tr>
<td>(GDP growth) ( t-1 )</td>
<td>1.122</td>
<td>-0.098</td>
<td>-0.110</td>
<td>-0.232</td>
<td>-0.135</td>
<td>-0.275</td>
</tr>
<tr>
<td>Primary commodity exports/GDP</td>
<td>0.179</td>
<td>16.773</td>
<td>3.009</td>
<td>2.802</td>
<td>2.975</td>
<td>2.762</td>
</tr>
<tr>
<td>(primary commodity exports/GDP)(^2)</td>
<td>0.322</td>
<td>-23.800</td>
<td>-0.766</td>
<td>-0.663</td>
<td>-0.749</td>
<td>-0.645</td>
</tr>
<tr>
<td>ln population</td>
<td>17.190</td>
<td>0.510</td>
<td>8.773</td>
<td>8.773</td>
<td>8.773</td>
<td>8.773</td>
</tr>
<tr>
<td>Social fractionalization</td>
<td>2119</td>
<td>-0.0002</td>
<td>-0.424</td>
<td>-0.424</td>
<td>-0.424</td>
<td>-0.424</td>
</tr>
<tr>
<td>Ethnic dominance (45-90%)</td>
<td>0.454</td>
<td>0.480</td>
<td>0.218</td>
<td>0.218</td>
<td>0.218</td>
<td>0.218</td>
</tr>
<tr>
<td>Geographic dispersion</td>
<td>0.593</td>
<td>-0.992</td>
<td>-0.588</td>
<td>-0.588</td>
<td>-0.588</td>
<td>-0.588</td>
</tr>
<tr>
<td>peace duration</td>
<td>336.602</td>
<td>-0.0038</td>
<td>-1.279</td>
<td>-1.279</td>
<td>-1.279</td>
<td>-1.279</td>
</tr>
<tr>
<td>( X \hat{\beta} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>conflict risk</td>
<td>0.117</td>
<td>0.091</td>
<td>0.112</td>
<td>0.084</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Calculations are based on an average policy score of 2.857 and an average aid/GDP ratio of 6.503.
**Table 2: Does Policy Directly Effect the Risk of Conflict?**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln GDP per capita</td>
<td>-0.950 (0.245)***</td>
<td>-1.032 (0.424)**</td>
<td>-0.990 (0.426)**</td>
</tr>
<tr>
<td>(GDP growth) t-1</td>
<td>-0.098 (0.041)**</td>
<td>-0.026 (0.078)</td>
<td>-0.034 (0.076)</td>
</tr>
<tr>
<td>primary commodity exports/GDP</td>
<td>16.773 (5.206)***</td>
<td>9.128 (7.605)</td>
<td>8.604 (7.006)</td>
</tr>
<tr>
<td>(primary commodity exports/GDP)^2</td>
<td>-23.800 (10.040)**</td>
<td>-12.395 (14.986)</td>
<td>-9.944 (12.916)</td>
</tr>
<tr>
<td>ln population</td>
<td>0.510 (0.128)***</td>
<td>0.279 (0.194)</td>
<td>0.314 (0.190)*</td>
</tr>
<tr>
<td>social fractionalization</td>
<td>-0.0002 (0.0001)***</td>
<td>-0.0002 (0.0001)</td>
<td>-0.0002 (0.0001)*</td>
</tr>
<tr>
<td>ethnic dominance (45-90%)</td>
<td>0.480 (0.328)</td>
<td>0.173 (0.510)</td>
<td>0.097 (0.507)</td>
</tr>
<tr>
<td>geographic dispersion</td>
<td>-0.992 (0.909)</td>
<td>-0.073 (1.424)</td>
<td>-0.207 (1.400)</td>
</tr>
<tr>
<td>peace duration</td>
<td>-0.0038 (0.001)***</td>
<td>-0.004 (0.001)***</td>
<td>-0.004 (0.001)***</td>
</tr>
<tr>
<td>(Change in CPIA) t-1</td>
<td>-0.411 (0.337)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy t-1</td>
<td></td>
<td>-0.243 (0.453)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>750</td>
<td>285</td>
<td>298</td>
</tr>
<tr>
<td>no of wars</td>
<td>52</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>pseudo R^2</td>
<td>0.22</td>
<td>0.18</td>
<td>0.19</td>
</tr>
<tr>
<td>log likelihood</td>
<td>-146.84</td>
<td>-65.75</td>
<td>-67.92</td>
</tr>
</tbody>
</table>

Notes: All regressions include a constant. Standard errors in parentheses. ***, **, * indicate significance at the 1, 5 and 10 percent level, respectively.
Table 3: Does Aid Affect the Risk of Conflict Directly?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln GDP per capita</td>
<td>-0.0810</td>
<td>-0.929</td>
</tr>
<tr>
<td></td>
<td>(0.337)**</td>
<td>(0.371)***</td>
</tr>
<tr>
<td>(GDP growth)_{t-1}</td>
<td>-0.115</td>
<td>-0.114</td>
</tr>
<tr>
<td></td>
<td>(0.046)***</td>
<td>(0.047)***</td>
</tr>
<tr>
<td>primary commodity exports/GDP</td>
<td>15.593</td>
<td>15.627</td>
</tr>
<tr>
<td></td>
<td>(5.980)***</td>
<td>(5.983)***</td>
</tr>
<tr>
<td>(primary commodity exports/GDP)^2</td>
<td>-24.156</td>
<td>-24.093</td>
</tr>
<tr>
<td></td>
<td>(11.599)**</td>
<td>(11.601)**</td>
</tr>
<tr>
<td>ln population</td>
<td>0.418</td>
<td>0.396</td>
</tr>
<tr>
<td></td>
<td>(0.151)***</td>
<td>(0.153)***</td>
</tr>
<tr>
<td>social fractionalization</td>
<td>-0.0002</td>
<td>-0.0003</td>
</tr>
<tr>
<td></td>
<td>(0.0001)**</td>
<td>(0.0001)**</td>
</tr>
<tr>
<td>Ethnic dominance (45-90%)</td>
<td>0.202</td>
<td>0.205</td>
</tr>
<tr>
<td></td>
<td>(0.368)</td>
<td>(0.368)</td>
</tr>
<tr>
<td>geographic dispersion</td>
<td>-0.709</td>
<td>-0.698</td>
</tr>
<tr>
<td></td>
<td>(1.009)</td>
<td>(1.016)</td>
</tr>
<tr>
<td>peace duration</td>
<td>-0.004</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(0.001)***</td>
<td>(0.001)***</td>
</tr>
<tr>
<td>(Average aid)_{t-1}</td>
<td>-0.011</td>
<td>-0.050</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>(Average aid)^2_{t-1}</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.001)</td>
</tr>
<tr>
<td>N</td>
<td>521</td>
<td>521</td>
</tr>
<tr>
<td>no of wars</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>pseudo R^2</td>
<td>0.17</td>
<td>0.17</td>
</tr>
<tr>
<td>log likelihood</td>
<td>-119.8</td>
<td>-119.5</td>
</tr>
</tbody>
</table>

Notes: All regressions include a constant. Standard errors in parentheses. ***, **, * indicate significance at the 1, 5 and 10 percent level, respectively.
Table 4: Donor-Government Partnership for Conflict Prevention in Zaire, as of 1995

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient 1995 values</td>
<td>column 1 * Improved Policy (=2.1)</td>
<td>Aid Tripled (1.2)</td>
<td>Improved Policy (=2.1) and Tripled Aid</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ln GDP per capita</strong></td>
<td>-0.950</td>
<td>5.403</td>
<td>-5.134</td>
<td>-7.476</td>
<td>-7.430</td>
<td>-7.497</td>
</tr>
<tr>
<td>(GDP growth) t-1</td>
<td>-0.098</td>
<td>-10.485</td>
<td>1.028</td>
<td>-0.232</td>
<td>-0.135</td>
<td>-0.275</td>
</tr>
<tr>
<td><strong>primary commodity exports/GDP</strong></td>
<td>16.773</td>
<td>0.141</td>
<td>2.365</td>
<td>2.802</td>
<td>2.975</td>
<td>2.762</td>
</tr>
<tr>
<td>(primary commodity exports/GDP)^2</td>
<td>-23.800</td>
<td>0.020</td>
<td>-0.473</td>
<td>-0.663</td>
<td>-0.749</td>
<td>-0.645</td>
</tr>
<tr>
<td><strong>ln population</strong></td>
<td>0.510</td>
<td>17.595</td>
<td>8.982</td>
<td>8.982</td>
<td>8.982</td>
<td>8.982</td>
</tr>
<tr>
<td><strong>social fractionalization</strong></td>
<td>-0.0002</td>
<td>5850</td>
<td>-1.17</td>
<td>-1.17</td>
<td>-1.17</td>
<td>-1.17</td>
</tr>
<tr>
<td><strong>ethnic dominance (45-90%)</strong></td>
<td>0.480</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>geographic dispersion</strong></td>
<td>-0.992</td>
<td>0.630</td>
<td>-0.625</td>
<td>-0.625</td>
<td>-0.625</td>
<td>-0.625</td>
</tr>
<tr>
<td><strong>peace duration</strong></td>
<td>-0.0038</td>
<td>9</td>
<td>-0.0342</td>
<td>-0.0342</td>
<td>-0.0342</td>
<td>-0.0342</td>
</tr>
<tr>
<td><strong>X · ˆβ</strong></td>
<td>1.500</td>
<td>-0.900</td>
<td>0.943</td>
<td>-0.954</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>conflict risk</strong></td>
<td>0.818</td>
<td>0.290</td>
<td>0.720</td>
<td>0.278</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>