Evaluating the conflict-reducing effect of UN peacekeeping operations*

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Abstract

During the past two decades there has been a dramatic increase in both funds spent and troops sent on peacekeeping operations (PKOs). At the same time, systematic research on the efficacy of PKOs to guide policy making is still scarce. We approach this question by simulating the effect of various possible UN peacekeeping policies. We base the analysis on a statistical model that estimates the efficacy of UN PKOs in preventing the onset, escalation, continuation, and recurrence of internal armed conflict in the world for the period 1960–2013 and simulate the impact of various policies for the 2001–13 period. Our results show that if the UN had been willing to issue PKOs with strong mandates and double its PKO budget, the propensity of major armed conflict in the world would have been reduced by up to two thirds relative to a scenario without PKOs. Considering the enormous costs of armed conflict, in terms of both human suffering and foregone economic development, our results suggest that UN peacekeeping is a cost-effective way of increasing global security.

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1 Introduction

The conflict in Syria has led to a devastating humanitarian situation with several hundred thousands of people killed and over four million refugees. What would have happened if the United Nations Security Council had managed to come to an agreement and deployed a peacekeeping operation early in the conflict? How much sooner would the conflict have ended? How would such a deployment have affected the security situation in the region in the future? For policymakers, such counterfactual questions are of critical importance when deciding on future routes for peacekeeping. The UN spends more money on peacekeeping today than ever before. This paper evaluates the effect of peacekeeping operations (henceforth PKOs) and their potential for reducing conflict by constructing and estimating the counterfactual global incidence of internal armed conflict under different peacekeeping policies.

This exercise is complicated, since PKOs affect conflict through several pathways. They may increase the duration of post-conflict peace; they may prevent contagion to neighboring countries; they may reduce the lethality of ongoing conflicts; and may even reduce the intensity of the conflict should it recur. The impact of a PKO is likely to last for a long time. Internal conflicts that break out typically last 5–10 years, and the risk of conflict recurrence is high for at least a decade after the war ends. Recurrent wars also tend to drag out for years. A successful conflict prevention, then, will benefit the country and its neighborhood for decades relative to the counterfactual.

Several studies have shown a beneficial effect of PKOs along *one* of the following pathways: Peacekeeping reduces the risk of conflict recurrence a few years after a war has ended (Doyle and Sambanis 2006*a*; Fortna 2004, 2008). It reduces the intensity of violence during conflict (Hultman, Kathman and Shannon 2014) and may increase the chances of conflict ending (Doyle and Sambanis 2000). PKOs also limit the onset of conflict in neighboring countries (Beardsley 2011). However, none of these studies assesses the total effect of PKOs along all pathways, and they are therefore likely to severely under-estimate the benefits of PKOs.

To assess the effect of different PKO policies along *all* these pathways over the 2001–2013 period, we use simulations based on a statistical model. With this model, we estimate the effect of PKO budgets and the robustness of their mandates using data for the 1960–2013 period. We specify five scenarios reflecting different potential policies regarding how much to spend on peacekeeping, what mandates to provide, and which countries to target. Our procedure allows us to compare our predictions with the actual occurrence of conflict, thus creating a counterfactual comparison of recent history. We are also able to compare the effect of our predicted PKO scenarios with the real PKO commitments during this period.

Our findings show that peacekeeping is much more effective than found in previous studies. In a scenario where the UN completely shuts down its peacekeeping from 2001 and onwards, we estimate that 3–4 more countries had been in major conflict in 2013 relative to what the world saw given the actual level of peacekeeping activity.[1] The effect of peacekeeping in the short run is to limit the amount of violence, but we also find clear evidence that less violent conflicts are easier to end conclusively a few years down the road. In a given year, this means that for each conflict that the UN manages to transform from a major conflict to a minor one, another conflict ends.

Even though we find that UN peacekeeping policies over the last 15 years have been effective, we also show that the UN could have done considerably better. The more the UN is willing to spend on peacekeeping, and the stronger the mandates provided, the greater is the conflict-reducing effect. In the most ambitious scenario we explore, in terms of budgets and mandates, we find that the UN could have transformed another 4–5 conflicts from the major type to the minor one in 2013. This represents a 70% reduction from the 6 major conflicts recorded in 2013 to only two or three. Over the 13-year period, the ambitious policy could have transformed 60 more country-years of major conflict into minor conflict than the observed policy and at least as many minor conflict years would have been turned into year of less than 25 deaths.[2]

This ambitious but effective scenario would not be exorbitantly expensive – according to

[1] We simulate roughly the same number of conflict countries given the observed policy as observed. Figures 3 and 4 below illustrates these results. Table A-7 reports the estimated proportion of countries in conflict.

[2] These figures compare scenarios S2 and S5 which are explained below.

our simulations, it would require maintaining a UN peacekeeping budget at about 17 billion USD every year, or twice the level of what it spent in 2012.[3] Accumulated over the 13-year period the simulated peacekeeping costs would have amounted to 205 billion USD compared to 59 billion in actual expenses over the 13 years. This is a substantial investment, but the required budget would decline in the future since the peacekeeping has brought the global future risk of conflicts down considerably.

The humanitarian gains alone would be worth the expenses. A typical major conflicts cause about 2,500 direct battle-related deaths per year. Over the 2001–2013 period, the 60 country years of minor and major conflict removed by the ambitious scenario would then have saved about 150,000 direct deaths. In addition, massive indirect deaths due to conflict violence would have been saved (Gates et al. 2012).

In fact, UN peacekeeping would have paid off even in economic terms. Armed conflicts typically cut 1–2% off countries' GDP growth (Collier 1999), depending on their severity (Gates et al. 2012). Accumulated over the 2001–2013 period, we estimate that the contribution of maximally effective peacekeeping to global GDP amounts to about 10%. This gain simply dwarfs the peacekeeping investment.

The article details how we reach these conclusions. We begin by providing a review of previous research on the conflict-reducing effect of PKOs. Subsequently, the methodology as well as the data used are presented. After that we present the results of the effect of our peacekeeping variables in the period 1960–2013, based on our statistical analysis. We then discuss and assess the determinants of PKO deployment in order to formulate a number of likely future PKO scenarios. Thereafter, the simulation results for the various scenarios for the period 2001–2013 are presented. The last section offers some conclusions. An (online) appendix provides more detail on the methodology and the data.

[3] The simulated budget figures are reported in Figure 6 and Table A-8.

2 The conflict-reducing efficacy of PKOs

The literature has identified three pathways through which PKOs may be effective. Firstly, PKOs prevent conflict from breaking out or recurring. The task of maintaining peace in a post-conflict situation was the original intention of peacekeeping, and remains the most studied effect of PKOs. Doyle and Sambanis (2000) was the first quantitative analysis of the effect of PKOs on the duration on post-conflict peace. The authors find a significant and substantial positive effect of peacekeepers on peace building, measured two, five, or ten years after the end of the conflict. This conclusion holds in several later studies. Fortna (2004, 2008) finds that the risk of repeat war drops 'by 75%–85% or more when peacekeepers are present' (Fortna 2008, 125).

Fortna (2004) identifies a marked difference between the effectiveness of PKOs during and after the cold war. She finds no significant effect of PKOs on peace duration for the full post-World War II period, but a substantial and significant effect of all types of PKOs after the cold war (Fortna 2004, 283). Similarly, Sambanis (2008) concludes from analyzing the short and long term effects of UN PKOs that 'the UN has actually become better at peacekeeping over time'. More generally, he finds that the effect of PKOs is strongest in the first few years, but in the long run only local economic recovery and institution building can ensure a lasting peace. The same conclusion is reached by Collier, Hoeffler and Söderbom (2008). They argue that economic recovery is the best way to achieve a stable peace, but that PKOs can make a substantial difference. Looking more broadly at third-party enforcement of peace settlements, Hartzell, Hoddie and Rothchild (2001, 200) find that five years after 'the signing of a peace agreement, the survivor rate among settlements with an external assurance is 68 percent compared with 32 percent for arrangements lacking such promise'.

A second pathway by which peacekeeping benefits peace is by enabling the cessation of fighting or by reducing the intensity of violence in an ongoing conflict. Hultman, Kathman and Shannon (2014) show that when peacekeepers are deployed in contentious situations, they are indeed effective in reducing fighting between the warring parties if deployed in larger numbers. According to Beardsley and Gleditsch (2015), peacekeepers also reduce the scope of violence by containing conflicts geographically. Likewise, Doyle and Sambanis (2000) show that UN PKOs can serve to end ongoing violent conflict, at least when provided with a strong enforcement mandate. PKOs with strong mandates or high capacity are also effective in managing violence against civilians in ongoing armed conflicts (Kreps and Wallace 2009; Hultman, Kathman and Shannon 2013) which may in turn have positive effects on the prospects of peace. The benefits of reducing violence have been debated though. Greig and Diehl (2005) question the positive long-term effects of reducing violence by arguing that there is sometimes a dilemma between peacekeeping and peacemaking; a focus on short-term goals of ending violence may reduce the parties' incentives for striking a peace agreement. While they do not find any strong empirical evidence for such a dilemma in intrastate conflicts, their discussion highlights an important problem: the ability to assess the comprehensive impact of peacekeeping is limited as long as we focus on one pathway at the time.

A third pathway through which peacekeeping works is by limiting the spatial and temporal contagion of conflict. Beardsley (2011) argues that the effect of peacekeeping goes beyond the mandated scope of the mission, and shows that PKOs are effective in reducing the likelihood of conflict in neighboring countries. By creating stability in one country, the risk of conflict contagion demonstrated by other studies (Gleditsch 2002; Kathman and Wood 2011) is thus strongly reduced.

One methodological challenge for studies of peacekeeping effects is the issue of selection bias – if the UN only sends missions to the easiest conflicts, the success rate of missions will be over-estimated. This seems not to be a major problem, however. Both Fortna (2008) and Gilligan and Stedman (2003) show that peacekeepers in fact tend to be deployed to the more difficult cases. Estimating the effect of peacekeeping, both Doyle and Sambanis (2006*a*) and Gilligan and Sergenti (2008) explicitly address the non-random way in which PKOs are deployed and utilize a matching model to guard against selection bias. Cases of countries in which PKOs were deployed are matched to similar cases in which PKOs were not. Both studies find a clear peace-prolonging effect of UN PKOs (Gilligan and Sergenti 2008;

Doyle and Sambanis 2006*a*).[4] According to Gilligan and Sergenti (2008), this effect is even stronger than in the non-matched dataset, meaning that previous research most probably have *underestimated* the effect of PKOs – at least on peace duration after war. Likewise, Vivalt (forthcoming) finds support for a peace prolonging effect by using an instrumental variable approach to account for non-random deployment, and Melander (2009) demonstrates that peacekeeping can also prevent genocidal violence breaking out by modelling a seemingly unrelated probit. In Section A.4 of the Appendix, we explore endogeneity problems in the context of our own analysis and concur with these studies that bias is limited.

From previous research we can conclude that peacekeeping in general has a conflict-reducing effect. However, all peacekeeping operations are not equally effective. The two characteristics that seem to be the most important are the operations' mandate and their size in terms of budget and troop strength. These are also the main aspects of PKOs that are politically established by the UN Security Council. Doyle and Sambanis (2000) find that traditional PKOs, characterized by unarmed or lightly armed troops with very limited mandates, do not have any effect on peace duration.[5] Multidimensional PKOs, on the other hand, 'are extremely significant and positively associated with' peace-building success (Doyle and Sambanis 2000, 791).[6] Similarly, Doyle and Sambanis (2006*a*) find that multidimensional and enforcement missions have a significant and substantial positive effect on peace-building success. Differentiating between a strict and a lenient definition of peace, they find that multidimensional PKOs 'works well with respect to both measures, [but] UN missions in general seem to have their greatest effect in preventing lower-level violence and enabling countries to democratize and rebuild institutions after civil war rather than prevent the resumption of full-scale war' (Doyle and Sambanis 2006*a*, 110).

[4] While Doyle and Sambanis (2006*a*, 121-122) question the usefulness of a matching process with as few cases as they have, they find consistent support for the positive effect of peacekeeping on the subsequent peace using several different matching procedures.

[5] Interestingly, Fortna (2004, 238) finds that 'traditional peacekeeping missions and observer missions have been the most successful' while Doyle and Sambanis (2006*a*, 111) find that 'traditional peacekeeping does not work well, and may even have negative effects'.

[6] Discussing the problem of counterfactuals, King and Zeng (2007) argue that some of the Doyle and Sambanis (2000) findings are model dependent and unsupported by empirical evidence. Sambanis and Doyle (2007) dispute this claim.

Findings for the size of missions are mixed. Doyle and Sambanis (2006*a*) argue that the number of peacekeeping troops is a poor predictor of peace-building success – the number of 'boots on the ground' must be considered in relation to the PKO's mandate. The reason for this, they argue, is that a 'large troop deployment with a weak mandate is a sure sign of lack of commitment by the Security Council (...) This suggests a mismatch between the nature of the problem and the treatment assigned by the UN' (Doyle and Sambanis 2006*a*, 113). However, most studies indicate that the size is important. Hultman, Kathman and Shannon (2014) show that the more armed personnel that is deployed to UN missions, the better able they are in reducing violence between the combatants. Both Hultman, Kathman and Shannon (2013) and Kathman and Wood (Forthcoming) also show that larger missions are better at protecting civilians during and after conflict. Similarly, Ruggeri, Gizelis and Dorussen (2013) show that the mission size increases the level of co-operation by the conflict parties. Kreps (2010) also argues that the capacity of UN missions appears to explain the variation in their success, suggesting that military force is central for peacekeepers to succeed in conflict situations.[7] In addition, when estimating the determinants of post-conflict risk Collier, Hoeffler and Söderbom (2008) find that 'doubling [PKO] expenditure reduces the risk from 40% to 31%'. While some missions receive an annual budget of well over a billion USD, other budgets are limited to less than 50 millions. Since the budget sets clear limits to the number of troops that can be employed, it should influence the prospects for peace.

To summarize, PKOs are effective – and they are effective in generating peace through different pathways. While selection bias may lead scholars to underestimate the effect of peacekeeping, so does a focus on single pathways to peace. It is thus possible that PKOs are even more effective than previously suggested. The factors that have been emphasized as particularly important for enhancing the effectiveness of PKOs are the type of mandate provided by the Security Council, as well as the size of the mission.[8] Based on the theoretical

[7] This positive effect also seems to exist at the global level. Time trends presented by Heldt and Wallensteen (2006) suggest that an increase in the number of UN troops deployed in peace operations during the 1990s coincided with a decrease in the number of intrastate armed conflicts.

[8] These are often closely related, since a robust mandate requires a larger budget to be implemented, but not necessarily so, as argued by Doyle and Sambanis (2006*a*).

explanations proposed by previous research, we should thus expect PKOs with stronger and wider mandates as well as larger budgets to be more successful. But how much more successful can we expect them to be? In order to address that question in a comprehensive way, we use a simulation approach to make predictions about the effectiveness of various PKO policies in reducing armed conflict. Below we formulate different PKO scenarios in which we vary the crucial PKO components of mandate and budget. Before turning to these scenarios, we introduce the methodology we use to estimate and simulate the effectiveness of PKOs.

3 Methodology

Our methodology allows us to assess the effect of PKOs along all the pathways. We first estimate a model of the effect of PKO in the period 1960–2013. Using these results, we simulate over multiple years to evaluate the impact of a number of hypothetical peacekeeping scenarios for 2001–2013. These estimated effect of these policy scenarios are then compared to the actual incidence of armed conflict and the observed peacekeeping policy of the UN.

3.1 Statistical model and simulation procedure

Earlier studies of PKOs limit their attention to particular pathways of effects, and consequently restrict the analysis to a subset of the situations in which PKOs may affect the occurrence of conflict. Doyle and Sambanis (2000), for instance, only analyze post-conflict countries, and restrict attention temporally to the first ten years or until conflict reerupts, whichever comes first. Fortna (2004, 2008) has a similar setup, but includes post-conflict peace periods also after the first ten years (but also disregards countries if conflict reerupts). Beardsley (2011) utilizes the most extensive dataset, including all state-months at risk of armed conflict onset, but does not include information on conflict duration.

A PKO that succeeds in restraining a conflict to a few scores of annual deaths, may shorten the conflict, increase the post-conflict duration and even decrease the duration and intensity of any recurrence that occurs, as well as decreasing the risk and intensity of contagion to other countries. In principle, potential contagion has no limits. If the Afghan internal armed conflict could have been restrained in the mid-1970s, there might have been no attack on the World Trade Center in New York in 2001. To assess the total effect of PKOs along all the pathways, we must analyze all country years within the period we are studying, not only those where PKOs are deployed. We must also use available information on the intensity of armed conflict to see whether intensity of conflict is affected.

To simultaneously determine how PKOs (and other explanatory variables) have affected the probability of onset, escalation, deescalation and termination of armed conflict in the 1960–2013 period, we estimate a multinomial logit model with lagged dependent variables and interaction terms between explanatory variables and the lagged dependent variables.[9] We estimate the statistical relationship between the incidence of conflict and the presence of PKOs of various types and budget sizes, controlling for other factors that have been shown to affect the risk of conflict.[10] The models are estimated on data for all countries for the 1960–2013 period.[11]

Our statistical model is able to capture directly the effects of PKOs along all three pathways for *individual* years, but further analysis is required to assess the effects along all the pathways seen over *multiple* years. To this end, we make use of the simulation procedure presented in Hegre et al. (2013). It involves the following steps: (1) Specify and estimate the underlying statistical model; (2) Assume that the values for predictor variables are exogenous and use the observed ones for 2001–13; (3) Formulate a set of scenarios for future values of PKO variables (see Section 4); (4) Draw a realization of the coefficients of the multinomial logit model based on the estimated coefficients and the variance-covariance matrix for the estimates; (5) Calculate the probabilities of transition between levels for all countries for 2001, based on the realized coefficients and the predictor variables; (6) Randomly draw whether a country experiences conflict based on these; (7) Update the values for the variables measur-

[9]Such models are often referred to as 'dynamic' (Przeworski et al. 2000) or 'transition' models (Amemiya 1985).

[10]For a review of conflict risk variables, see Hegre and Sambanis (2006).

[11]In what follows, we treat the deployment of peacekeeping operations as an exogenous variable. In Appendix A.4, we discuss this issue and test formally that the assumption of exogeneity indeed holds.

ing historical experience of conflict in the country and neighborhood; (8) Repeat (4)–(7) for each year in the forecast period 2001–13, and record the simulated outcome; and (9) Repeat (4)–(8) a number of times to even out the impact of individual realizations of the multinomial logit coefficients and individual realizations of the probability distributions. See Appendix A.5 for a flowchart and Hegre et al. (2013) for further details.

This procedure allows us to estimate the impact of peacekeeping across all pathways. If a minor conflict breaks out in a hitherto peaceful country, this increases the estimated risk of conflict in that country in many years afterwards as well as the risk of conflict in neighboring countries. If our statistical model finds that a PKO prevents the onset (or recurrence or escalation) of such a conflict, that is reflected in several subsequent transitions, too. By comparing the global and regional incidence of conflict under these scenarios, we can aggregate the short-term effects identified by the statistical model up to a level that is much more useful for decision makers.

3.2 Description of data

3.2.1 Dependent Variable

We are interested in evaluating the efficacy of PKOs in ending armed conflicts as well as preventing escalation and future recurrences. Therefore, the dependent variable in this study is a three-category variable denoting whether there is a minor conflict (25–999 battle-related deaths), a major conflict (1000– battle-related deaths), or no conflict going on in a country in a given year. The data are from the 2014 update of the UCDP/PRIO armed conflict dataset (Themnér and Wallensteen 2014; Gleditsch et al. 2002).

3.2.2 PKO variables

We base our coding of PKOs on the categorization in Doyle and Sambanis (2006*a*, 11–18) (hereafter referred to as 'DS'). We code two types of mandates:

- **Traditional PKO**

  1. Observer missions – restricted to observing actions such as a truce, troop withdrawal, or a buffer zone. Always deployed with the consent of the parties to the conflict. Examples are the UNMOT and UNMOP missions in Tajikistan and Croatia.

  2. Traditional missions – also deployed with the consent of the parties, but with somewhat extended mandates such as policing a buffer zone and assisting in negotiating a peace agreement. Examples are the UNPRESEP mission in Macedonia 1995–99 and the UNIFIL mission in Lebanon.

- **Transformational PKO**

  1. Multidimensional missions – referred to as 'second-generation operations', the mandates, also consent-based, are extended with activities intended to go to the roots of the conflict, such as economic reconstruction, institutional transformation (reform of police, army, judicial system, elections). Examples are the ONUSAC mission in El Salvador 1991–95 and the UNMIT mission in Timor-Leste (2006–).

  2. Enforcement missions – 'third-generation operations' that do not require the consent of both parties, and therefore must draw on the authority of UN Charter articles 25, 42, and 43 to apply force to protect the activities of the operation. Examples are the UNPROFOR mission in former Yugoslavia 1992–95 and the UNMIS mission in Sudan (2005–).

The simplification of creating two categories out of the original four is based on the finding by DS that the latter two are significantly more effective than the two former types. Furthermore, many missions nowadays are more mixed, incorporating aspects of both enforcement and statebuilding. Therefore, it makes sense to estimate the effect of those more comprehensive mandates aimed at transforming the conflict in comparison to those missions with more limited goals such as preserving or observing a situation.[12]

The DS dataset does not cover all of the missions included in our study. Therefore, we have coded the mandate for all remaining missions on the basis of the definitions provided by DS, using UNSC resolutions and mandate information available at the DPKO website.[13] Moreover, since the DS dataset is not time-varying, we have coded changes in mandates based on the comments on adjustments to the mandate in Doyle and Sambanis (2006*b*). Appendix A.3 gives a list of all PKOs by mandate.

In order to capture the size of the PKO, we have coded the yearly expenditure for each mission, based on United Nations General Assembly published *appropriation* resolutions from 1946 to 2013. The variable gives the yearly amount allocated by the UN for each specific mission.

Additional PKO variables To measure the potential decrease in the risk of conflict contagion from one country to another we include a variable marking whether a PKO was deployed in any of the country's neighboring countries.

3.2.3 Other predictor variables

To predict the incidence of conflict under different PKO scenarios, we add predictor variables that are associated with the risk of conflict.

We model the *incidence* of conflict, i.e. whether the country is in a minor or major conflict in a given year. To model this appropriately, we include information on conflict status (no conflict, minor, or major conflict) at $t-1$, the year before the year of observation in the estimation phase in order to model the probability of transitions between each conflict level. The log of the number of years in peace up to $t-2$ is also included. We refer to this set of variables jointly as 'conflict history' variables. We also include the same information on conflicts in the country's neighborhood in order to model and simulate the spatial diffusion of

[12]While there may be essential differences between multidimensional and enforcement missions, they are not important for our results. In out-of-sample tests we show that our categorization performs as well as or better than a model including dummy variables for the different mandate types.

[13]See http://www.un.org/en/peacekeeping.

conflicts. To take into account the potential that neighboring conflict might increase the risk of both the onset or escalation of conflict, we include interaction terms between the conflict status in the country, and in neighboring countries.[14]

Socio-economic development has been shown to have a strong and robust relationship with the risk of conflict and we include as a measure of development GDP per capita (Collier and Hoeffler 2004; Fearon and Laitin 2003; Hegre et al. 2001). To take into account the deleterious effect of conflict on GDP (Gates et al. 2012), we augment the observed GDP levels with a model that takes the effect of a forecasted conflict on GDP levels into account – thus partly endogenizing GDP per capita. The conflict-to-GDP model is explained in more detail in Appendix section A.8.

Countries with larger populations have more conflict (Hegre and Sambanis 2006). We therefore include a variable measuring the country's total population. The demographic variables originate from the World Population Prospects 2006 (United Nations 2007). We also add a variable reflecting the country's age structure. Cincotta, Engelman and Anastasion (2003) and Urdal (2006) report increasing risks of minor armed conflict onset associated with youth bulges. An emerging consensus is that youth bulges appear to matter for low-intensity conflict, but not for high-intensity civil war. The data are from United Nations (2007).

We also control for the log of the number of years the country has been independent. This measure captures aspects of state consolidation not measures by socio-economic development. We fit a 'random-effects' model and include two parameters that measure, respectively, the propensity of minor and major conflict for each individual country.[15]

Our control variables may not have the same effect on the probability of conflict onset as on conflict termination. To model this 'dynamic' model, we include multiplicative interaction

[14] We define neighbors as pairs of countries that share a common border. Islands are defined as their own neighborhood. Data from Weidmann, Dorussen and Gleditsch (2010).

[15] Ideally we would have fit a fixed-effects model that would take into account non-observed time-constant country characteristics. Given the nature of our data that, however, is not feasible (Beck and Katz 1995, 2001). For technical reasons, the random effects are estimated in two separate random-effects logistic regression model estimations, one for minor and one for major conflict compared to no conflict, and entered as covariates in the simulation model.

terms between the control variables and the conflict history variables.[16]

4 Description and motivation of scenarios

Given that the UN has gone through a qualitative and quantitative change during the last two decades, it is difficult to predict exactly what the future of UN peacekeeping will look like. According to a recent report by the UN which reflects on the future of peacekeeping, resources are already stretched to its limits (United Nations 2009). With the recent global economic downturn, potential resources are also shrinking. At the same time, the demand for peacekeeping might become more intense (United Nations 2009).

4.1 PKO deployment rules for simulations

In our simulations, future conflicts occur randomly albeit with probability distributions according to the results in Table 5. Since we do not know where conflicts will occur, we cannot know where PKOs will be needed. We therefore have to specify rules for where our simulations will deploy PKOs. These rules are based on empirical analyses in previous research and our own observations of where and when the UN is more likely to intervene in internal conflicts.

Gilligan and Stedman (2003, 38) argue that since 'the UN acts in ways that corroborate its humanitarian and security missions (...) one of the best predictors of UN intervention is the number of deaths in a conflict'. In our analysis of where PKOs are deployed (reported and discussed in Appendix A.1), we confirm that PKOs indeed are more frequently deployed to major conflict than to minor ones in our dataset. Given limited resources, the UN prioritizes the most intense conflict areas which constitute the greatest threats to regional stability. Reflecting this trend, our first rule is accordingly:

[16]The sizeable number of interaction terms entails some loss of efficiency, but also improves the predictive performance of the model (Hegre et al. 2013). Since we assess the total impact of our variables by means of simulations, the high number of parameters do not give rise to interpretational or collinearity problems.

Rule 1 *PKOs are initiated if the conflict is major (more than 1,000 battle deaths in the previous year).*

The second rule specifies the duration of PKOs. The exact number of years chosen is somewhat arbitrary, but is supported by the estimates in Appendix A.1 (Table A-1).

Rule 2 *PKOs remain for five years after last year with conflict activity (more than 25 battle-related deaths within a calendar year). This rule also applies to all PKOs active at the start of the simulation.*

The third and fourth rules restrict PKOs from being deployed in certain countries. Mullenbach (2005) argues that international-level factors are more important than state-level factors in determining where third parties intervene. Controlling for state- and conflict-level factors, he finds that third-party interventions are significantly less likely when the target state is a major power (Mullenbach 2005, 549–52). Major powers are reluctant to welcome international involvement in their internal affairs, and as permanent members of the Security Council (P5) they have authority to veto such decisions.

Rule 3 *PKOs are never deployed in permanent UNSC members.*

Moreover, the UN is also highly unlikely to establish a PKO in states with very large populations. (Gilligan and Stedman 2003, and our analysis in Table A-1). The largest country ever to attract a PKO is Sudan, with a population of 37 millions in 2005. Therefore, in all scenarios except S7, our simulations adhere to a final rule:[17]

Rule 4 *For most scenarios, PKOs are deployed only in countries that have smaller populations than 100 millions in 2000.*

[17]This precludes PKOs in Bangladesh, Brazil, India, Indonesia, Japan, Mexico, Nigeria, and Pakistan in addition to the permanent UNSC members.

Table 1: Overview of PKO policy scenarios

Scenario	Description
1	PKO deployment ceases
2	PKO deployment as observed
3	PKO, traditional mandate, 100 million USD/year, no large countries
4	PKO, transformational mandate, 800 million USD/year, no large countries
5	PKO, transformational mandate, 800 million USD/year, all countries

4.2 Specifying PKO scenarios

To evaluate the effectiveness of PKOs on the global, regional, and country-level incidence of conflict we specify five scenarios reflecting various general UN policies, summarized in Table 1. We then simulate conflict trajectories for 2001–13 under these five policy scenarios. The first scenario is a comparison scenario where the UN is assumed to terminate all PKO activity in 2001. Here, the only policy rule is no deployment of PKOs. For the second 'scenario' we use the observed UN PKO deployments for the entire simulation period as the operationalization of the policy.

In addition to these two we specify three scenarios were we use various rules for what kind of mandate a PKO receives and the size of the annual budget, two factors that substantially affect the effectiveness of the mission. When it comes to mandates, this is an area in which UN PKOs have recently undergone a major change. While observer missions and traditional peacekeeping mandates used to dominate the actions of the UN, recent operations have seen more multidimensional and enforcement mandates.

Figure 1: Number and total budget of UN PKO missions by mandate type, 1970–2014

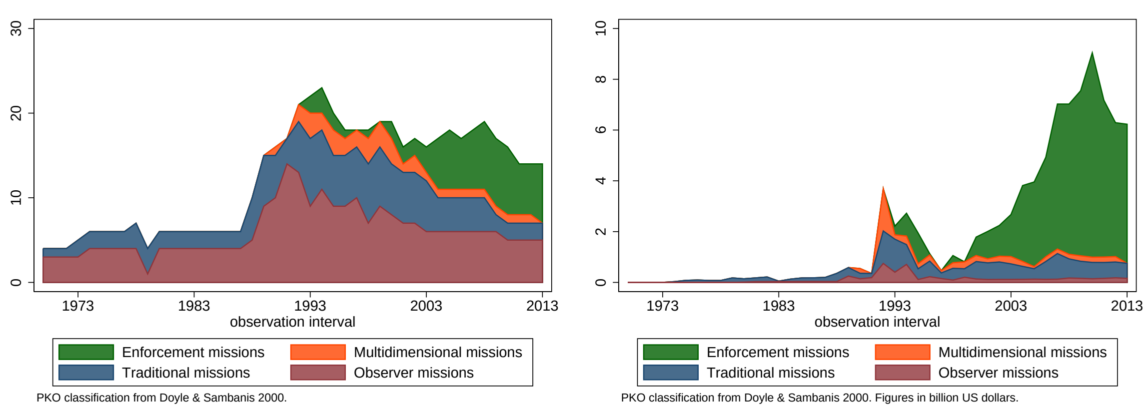


Figure 1 depicts the number of and total budgets of UN PKO missions in our dataset by mandate type. Multi-dimensional and enforcement missions were inventions of the early 1990s. Complex situations in for example the Balkans, Somalia, and Rwanda led to a surge of PKOs with more robust mandates, but the perceived failures of several such missions led to a slight decrease in UN peacekeeping initiatives (Durch and Berkman 2006). At the turn of the century, the Brahimi Report (United Nations 2000) set the agenda for the future of UN peacekeeping, and the UN again initiated a number of enforcement missions in conflict situations.

Several facts are readily apparent from Figure 1: First, both the frequency and types of PKOs changed after the end of the Cold War – in terms of frequency (left panel), the traditional and observer missions were supplemented by multidimensional and enforcement missions. The right panel clearly shows that enforcement missions account for an increasing share of the total UN PKO budget. Missions with more robust mandates are more complex and require larger budgets. In 2000, the Brahimi report emphasized the need for more robust mandates and an increase in resources (United Nations 2000). This marked a shift in both the nature of and the resources spent on peacekeeping.[18] Consequently, Figure 1shows that the increase in the number of peace enforcement missions since 2000 has been accompanied by a dramatic increase in the total UN peacekeeping budget.

In scenario 3 the UN deploys only limited PKOs – all major conflicts, except those that occur in large countries and in permanent UNSC member states, receive a traditional mandate PKO with a budget of 100 million USD/year (S4). Scenarios 4–5 are more expansive. They both involve the UN deploying PKOs with a transformational mandate and a budget of 800 million USD/year. Scenario 5 differs in that we drop rule 4 and let the UN deploy also to large countries with more than 100 million inhabitants. These scenarios reflect the empirical correlation between the type of mandate and the budget. In the appendix, we also report results for two additional scenarios where we vary the budget for each of the two mandate types. Those results demonstrate that the predictions are much less affected by changes in

[18]The strong correlation between mandate types and budget is shown in Figure A-1.

the budget level than by changes in the mandate.

5 Estimation results, 1970–2013

Table 2: Estimation results, sim, model 1, simulation set PKOsimv9

	(1)			
	conflict			
	1		2	
Minor conflict$_{t-1}$ (c1)	-3.082***	(-3.50)	-0.992	(-0.65)
Major conflict$_{t-1}$ (c2)	-0.793	(-0.50)	2.715	(1.43)
log(time in peace)$_{t-2}$ (lts)	-0.432***	(-4.24)	-0.405	(-1.85)
Neigh. conflict$_{t-1}$ (nc)	-1.383***	(-6.63)	-2.485***	(-5.33)
nc * c1$_{t-1}$	2.254***	(10.22)	2.889***	(6.01)
nc * c2$_{t-1}$	2.417***	(6.45)	5.344***	(9.95)
log(time in neigh. peace)$_{t-2}$	0.0262	(0.51)	0.0432	(0.57)
nc * lts$_{t-1}$	-0.635***	(-6.40)	-0.910***	(-3.72)
log(population)$_{t-1}$	0.269***	(6.36)	0.351***	(5.25)
log(GDP per capita)$_{t-1}$	-0.406***	(-5.18)	-0.463**	(-2.97)
GDP * c1$_{t-1}$	0.567***	(4.87)	0.268	(1.32)
GDP * c2$_{t-1}$	0.312	(1.49)	-0.0436	(-0.17)
GDP * lts$_{t-1}$	0.0211*	(2.07)	0.0123	(0.69)
Time independent$_{t-1}$	0.179**	(3.10)	0.0308	(0.35)
PKO traditional$_{t-1}$	-0.0456	(-0.11)	-0.384	(-0.64)
PKO transformational$_{t-1}$	-0.495	(-0.72)	-1.619	(-1.68)
log(PKO budget)$_{t-1}$	0.0617	(0.56)	0.0943	(0.62)
PKO neighbor$_{t-1}$	-0.0158	(-0.08)	-0.752*	(-2.35)
Random effect$_{minor}$	1.147***	(10.36)	0.681***	(3.92)
Random effect$_{major}$	-0.145	(-1.40)	1.074***	(6.35)
Constant	-1.407*	(-2.16)	-2.194	(-1.76)
N	7591			
AIC	3732.5			
ll	-1824.3			

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5 shows the results of estimating a multinomial logistic regression model including the log of annual PKO expenditures, dummy variables marking traditional and transformational mandates, a variable capturing PKOs deployed to a country's neighbors, as well as our control and interaction variables.[19]

[19] In Appendix section A.4 we report the results of an instrumental-variable regression to explore potential

The estimates in Table 5 indicate that increasing PKO expenditures does not affect the probability that a country is in minor conflict in a given year, but clearly reduces the probability of major conflict. Note that because of high collinearity between the PKO budget and mandate variables caution should be exercised when interpreting the regression output. Our simulation algorithm is not sensitive to this problem, since it produces estimated probabilities taking all parameter estimates and the correlation between these into account simultaneously (along the same logic as Clarify Tomz, Wittenberg and King 2003).

As the model includes variables for both the PKO mandate and budget variables, Table 5 does not provide direct information about the relative importance of budget and mandate.[20] The effect of the budget variable is positive, but since that variable can only be non-zero when either of the mandate variables are non-zero, the effect of budget must be interpreted conditional on the effect of the mandate variables. Figure 2 shows the relative risk of major conflict vs. no conflict as a function of budget (for a country with a transformational PKO mandate). As is clear from the figure the effect is negative even at the highest budget levels. The estimates do imply, however, that there is a falling marginal utility of the size of the PKO budget, conditional on the PKO having a transformational mandate. The simulation results discussed below also show this.

I don't understand how this figure is calculated.

Because we include both mandate and budget these results can not be directly compared to effects presented from models that include only one of these. The combined effect of mandate and budget is somewhat stronger than that found by Collier, Hoeffler and Söderbom (2008).

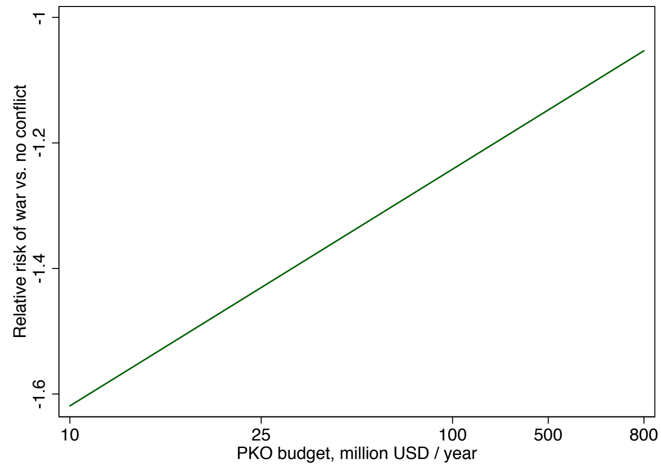
When represented in terms of their mandates, transformational PKOs directly affect the risk of major conflict only. The estimate for the transformational PKO is large and negative. It implies that a transformational PKO reduces the risk of major conflict relative to no conflict. The estimate for traditional PKOs is negative but substantially smaller.[21]

selection effects in where PKOs are deployed, and conclude that such selection may be safely ignored.

[20] We have also estimated models with a squared log expenditure variable to investigate whether the relationship between log PKO expenditure and the risk of conflict might be curvilinear. The squared variable did not improve the goodness-of-fit of the model.

[21] Although the categorizations are different, these findings are slightly different from Fortna (2008) who

Figure 2: Estimated effect of budget



The fact that we do not find any direct or short-term effects of peacekeeping operations on minor conflict does not mean that PKOs only reduce the intensity of conflicts. The probability of no conflict in a year is 0.182 after a minor conflict, but only 0.077 after a major conflict. The probability of minor conflict in a year after major conflict is 0.264.[22] Given that PKOs increase the probability of transitions from major to minor conflict in year t, they will also increase indirectly the probability of no conflict at $t+1$.

The estimates for the conflict history variables in Table 5 shows that this holds more generally. The probability of minor conflict is much higher if there was a minor or major conflict the year before.[23] Moreover, the estimates for the 'log time in status c0' terms show that the probability of conflict is much lower if the country has been at peace for several years.

Effective prevention of major conflict, then, may reduce the incidence also of minor conflicts since minor conflicts in general more easily come to an end. The best way to assess the combined effects of these estimates is by looking into the simulated results.

finds that consent-based missions are in general more successful than enforcement missions. However, this discrepancy is likely to be a result of different designs, since she only measures the duration of peace given a cease-fire agreement, which leads to a particular selection of cases. Our results show the general ability of peacekeeping to reduce the likelihood of conflict along all pathways, and in that context it is not surprising that more extensive mandates are more successful; see e.g. Doyle and Sambanis (2000).

[22]See the transition probability matrix in Table A-6 for all transition probabilities.

[23]This inference is based on the multiple interaction terms involving conflict at $t-1$.

5.1 Out of sample estimation results

To evaluate the extent to which the PKO variables add to the predictive power of the model we perform out of sample analysis. We estimate two models, one identical to the one in Table 5 and one that has the same set of variables except for the four PKO terms (two mandate terms, budget, and neighboring PKOs). Estimation results for this model is reported in the Appendix (results/pko00sv8/PKOoos1.tex). For the out of sample analysis, we estimate on data from 1970 to 2001 and predict from 2001 to 2014. We can then compare simulated to observed conflict levels across the two models. To evaluate the degree to which we predict correctly we use the area under the Receiver Operator Curve (AUC). The AUC plots the true positive rate against the false positive rate. A perfect model would get an AUC of 1. We find that in terms of predicting peace or minor conflict the two models perform relatively similar. For peace the AUC are .930 and .929 for, respectively, the models without and with PKO terms, and for minor conflict the corresponding figures are .936 and .937. For major conflict, in contrast, the model with PKO terms does much better. The model with PKO terms scores an AUC of .821 vs. an AUC of .799 for the model without PKO terms.

6 The simulated effect of PKOs

Figure 3 shows the simulated and observed proportion of countries in conflict under the different PKO scenarios for the period 1990 to 2013. The two solid black lines report the observed proportion of countries in conflict – the top line shows countries in either minor or major conflict while the bottom line shows only major conflict. In 2001, about 17% of all countries in the world had a conflict. In 6% there was a major conflict. The black dashed line (partly covered by the green dotted line) shows the simulated proportion of countries in conflict given the actual UN peacekeeping policy (S2). Here, we use the observed data for UN budgets and mandates, but simulate the conflicts in order to obtain a baseline. The simulated proportion for S2 is somewhat higher than the observed proportion, indicating that we are under-estimating the effect of PKOs or other risk-reducing factors.

The blue line shows the simulated proportions in conflict given S1. As for observed conflict, the upper set of lines refer to 'either minor or major conflict', and the lower lines to 'major conflict' only. The complete and abrupt termination of UN peacekeeping in 2001 in S1 would have increased the conflict proportion considerably. By 2013, the excess relative to S2 would have amounted to 1.7% of all countries, or about 3 conflicts.[24] The difference is about the same for major conflict, implying that the all of these extra 3 conflicts would have been major ones, and the global number of minor conflicts would have been roughly the same. Without UN peacekeeping, our results indicate that we would have seen more considerably more deadly conflicts in the world.

The dotted line in green represents scenario S3 with traditional mandates and a 100 million USD budget per mandate year. The dashed line in red represent S4 – a transformational mandate scenario with a budget of 800M USD per year. The orange dashed line shows the most expansive scenario (S5) where a PKO with the same budget is deployed to every major conflict, including in large countries.regional figures below show the simulations without associated uncertainty. Clearly the uncertainty would overlap between some of the scenarios, but presenting this full uncertainty here would make the figure impossible to read. Accordingly, we present the simulation uncertainty below when we discuss excess predicted conflict.

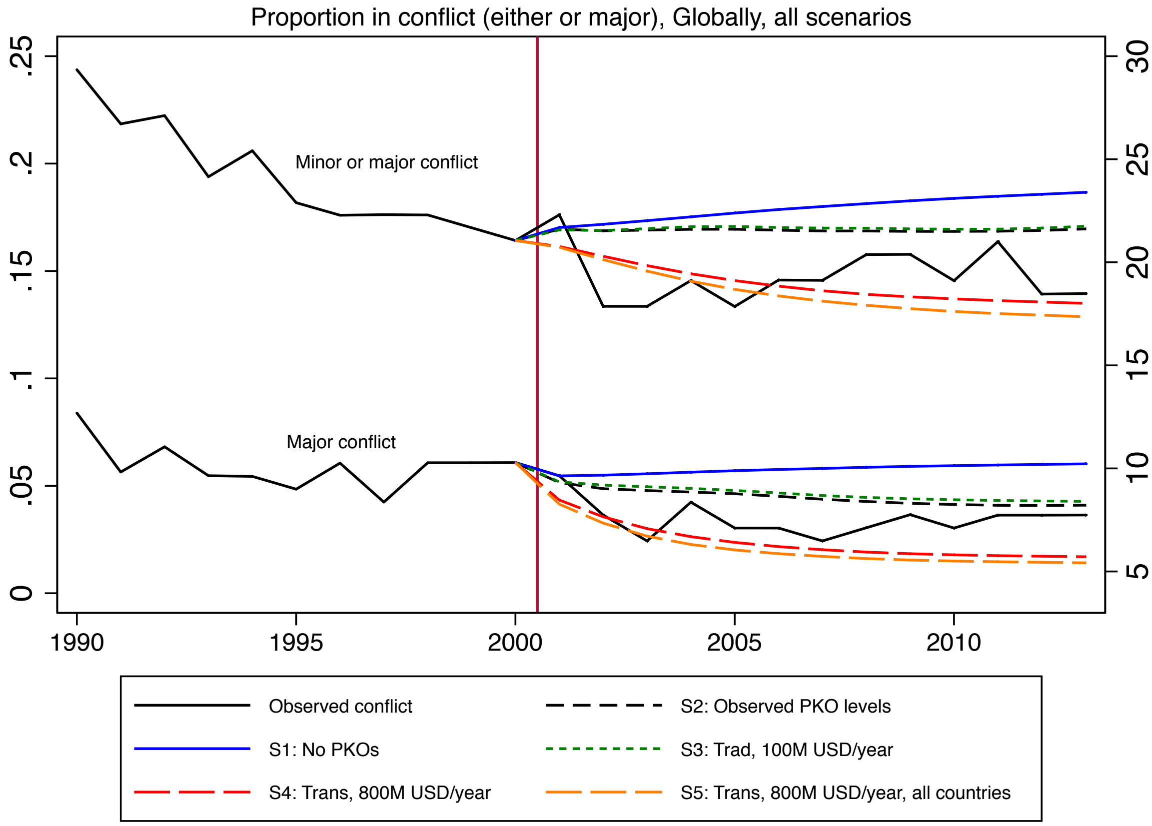
The traditional-mandate scenario (S3) implies a reduction in the incidence of conflict compared to S1, the no-PKO scenario. The simulated proportion under S3 is very close to that of the S2 baseline. Compared to the observed UN policy, S3 stipulates a larger number of missions, but with less ambitious mandates.

The transformational-mandate scenarios yields conflict levels considerably lower than S2 based on observed PKO deployment patterns. Under S4 and S5, the incidence of conflict is clearly lower than under the baseline scenario. Seen as a proportional reduction in the incidence of conflict, this is particularly true for major conflict.

Looking at the effect of traditional mandates, the simulated reduction from S2 to S3 in the ???

[24] The numbers underlying Figure 3 are reported in Appendix Table **??**. In 2013, the simulated proportion unde S2 is 0.169, and that under S1 is 0.186. Multiplied by the 171 countries in our dataset in 2013, the difference of 0.017 amounts to 2.9 countries.

Figure 3: Global observed and simulated incidence of conflict, 1990–2013, all scenarios



incidence of both levels of conflict is about 3%, and the reduction in the incidence of major conflict is about the same. This means that the most extensive scenario reduces the risk of major conflict in 2013 with a little more than two thirds relative to the no-PKO scenario – from 6% to 2%.

Turning to the effect of transformational mandates, comparing S1 and S4, we find that the incidence of minor conflict is reduced considerably, although less than for major conflicts in relative terms (cf. the difference between top and bottom set of lines in Figure 3). However, it is not so that PKOs merely reduce the intensity of conflict without increasing the chance of peace. If that was the case, the simulated reduction would have been restricted to major conflict, as implied by only studying Table 5. Our simulations imply that for every successful transition from major to minor conflict due to the presence of a PKO, there is one transition from minor conflict to no conflict. In sum, these results imply that UN PKO policy matters significantly, and that the UNSC has the power to substantively enhance global security.

Our model allows for capturing long-term and spatial effects of conflict. The estimates for the 'log time in status' variables indicate that the probability of no conflict increase strongly with several consecutive years of peace, and decrease with several consecutive years of conflict. Likewise, conflicts in neighboring countries increase the risk that conflicts erupt. Given that we find that PKOs have a clear short-term effect, we might expect the difference between scenarios to increase over time. Our results show a strong, indirect effect of ambitous PKO policies. The direct short-term effect of a change in policies is the difference seen in the first 2–3 years in Figure 3. The difference for the overall incidence of conflict between the no-PKO and PKO scenarios in Figure 3 widen considerably from these first years of simulation up to 2013. The indirect effect over time and space is the main reason for the strengthened response over time to the various scenarios.[25]

6.1 Regional effects

According to Gilligan and Stedman (2003) there is a regional bias in where PKOs are deployed. The risk of armed conflict also varies across regions. We therefore move to a regional analysis of the effects of UN PKOs. We define 8 regions as listed in Table 3. The list is a condensed version of the UN region definition.[26] In Figure 4 we show simulated and observed incidence of conflict in six of these regions, across the same scenarios as in Figure 3.

Not surprisingly, the set of regional graphs show the largest impact of PKOs in regions that saw considerable amounts of conflict in the 2001 – 2013 period. Given that there are only a handful of conflicts within each region, individual conflicts are discernible in the plots. In West Africa (top right panel), for instance, there were no major conflicts from 1995 to 1997, and one conflict in 1998–99. In the 1995–2004 period the total number of conflicts fluctuated between 2 and 4.

[25]The gradual widening of the difference between PKO and no-PKO scenarios is also due to a gradual readjustment to a new steady-state equilibrium for the incidence of conflict in a probabilistic model, so it is not straightforward to quantify the long-term effect of PKOs in this manner.

[26]The UN list is found at http://www.un.org/depts/dhl/maplib/worldregions.htm.

Table 3: List of regions

Number	Region Name
1	South America, Central America, and the Caribbean
2	Western and Southern Europe, North America, and Oceania
3	Eastern Europe
4	Western Asia and North Africa
5	Western Africa
6	East, Central, and Southern Africa
7	South and Central Asia
8	Eastern and South-East Asia

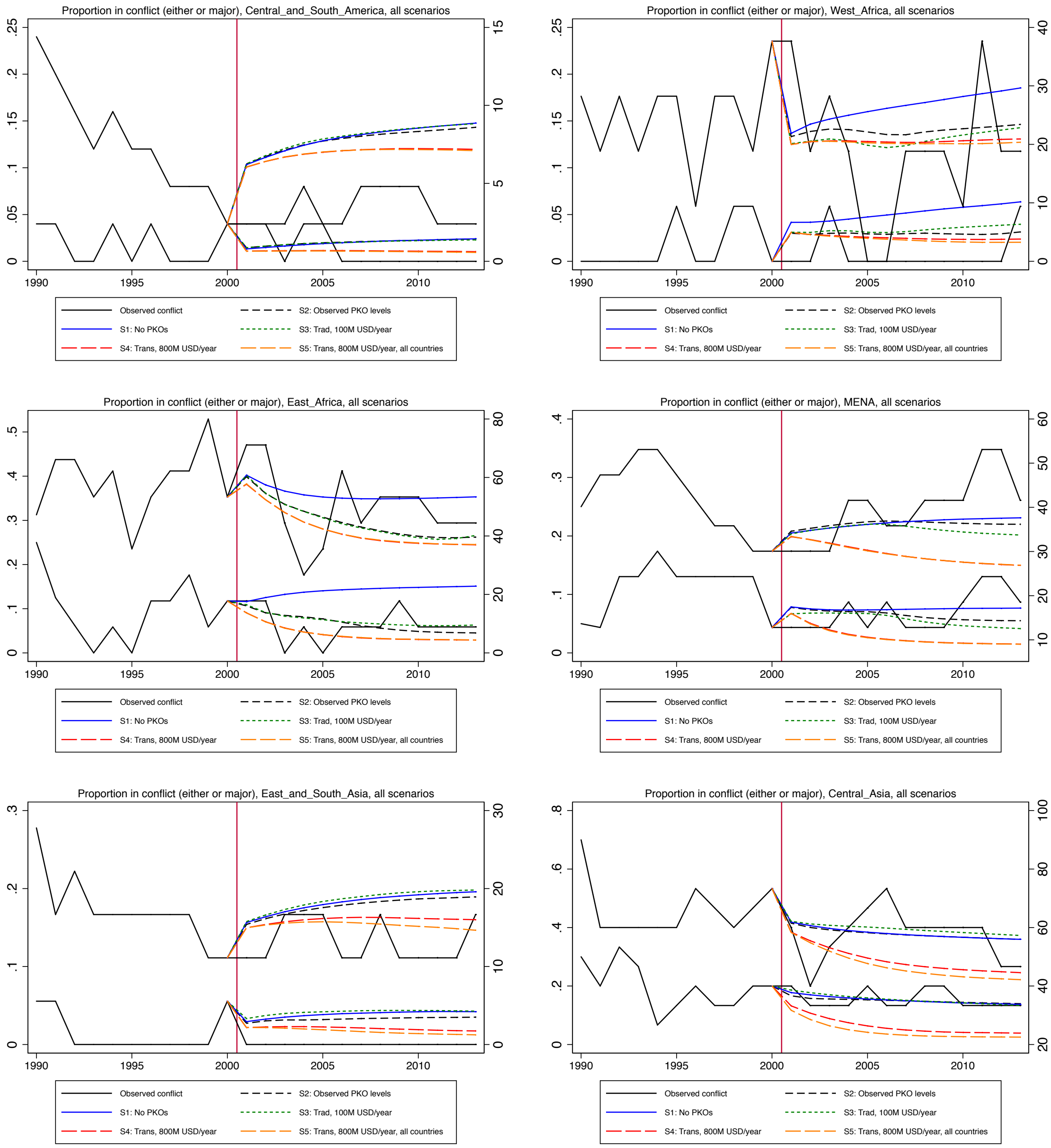
The simulated proportion in conflict in that region is about 13% for S1 and somewhat lower for S3–5. This corresponds to a little over 2 conflicts every year. In the no-PKO scenario (S1), in contrast, we simulate around 18 % of countries in conflict in 2013 – or about 50% more. The expected annual number of major conflicts (more than 1,000 battle-related deaths) is less than about 1 for this region under the no-PKO scenario, but less than 0.5 for the various PKO scenarios.

In all regions, PKOs have a clear conflict-dampening effect, and strong-mandate PKOs do best everywhere. In many regions, there were few major conflicts in the post-Cold war period, so the model predicts a continued low incidence of these conflicts. Since PKOs in our scenarios are initiated only in major conflicts, we consequently predict fewer deployments in these regions, and they therefore only marginally affect the regional incidence of conflict. Our PKO scenarios applied uniformly would have the strongest impact in the 'MENA', 'East Africa' and 'Central Asia' regions (4, 6, and 7). In the 'MENA – West Asia and North Africa' region, we predict a clear decline in the incidence of conflict because of the relatively high levels of socio-economic development in the region. Particularly in the first 5 years of the simulation, PKOs with strong mandates would according to our model reinforce this declining trend. Since there are few large countries in the region, there is little difference between S4 and S5 for this region.[27]

In addition to the African regions, 'East and South Asia' and 'Central Asia' regions are

[27]Our model fails to predict the Arab Spring conflicts. The failure to deploy ambitious PKOs until 2008, however, may be a partial reason for the poor forecasts.

Figure 4: Regional observed and simulated incidence of conflict, 1990–2013, all scenarios



the ones with the highest observed and simulated incidence of conflict in the post-Cold War period. In these regions, the extensive mandate scenarios reduce the predicted incidence of major conflict from about 5% of the countries to about 2%, corresponding to going from more than two conflicts every year to less than one. In ‘Central Asia’, the predicted incidence of conflict is about 40% in 2001 and slowly decreasing under the no-PKO scenario. The most extensive scenario with transformational mandates for all conflicts in smaller countries, reduces the predicted incidence in this region to about 20%. If Gilligan and Stedman (2003) are correct that the UN is less inclined to intervene in Asian conflicts, the UNSC has strong reasons to reconsider this policy. The potential effect of PKOs is strong in this area, and a policy shift would substantially decrease the incidence of armed conflict.

6.2 Country-specific simulations

Figure 5: Excess conflict relative to no PKO scenario, scenarios 3 and 5.

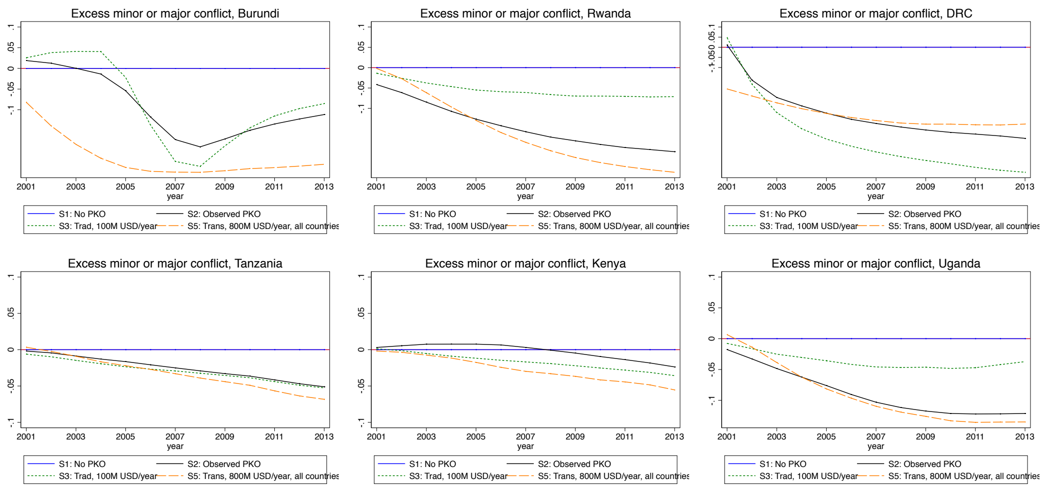


Figure 5 reports the difference in predicted levels of conflict between the no-PKO scenario (S1) and scenario S2 with observed PKO deployment levels (solid black line), S3 (green line), and S5 (orange line) for a set of countries – Burundi, Rwanda, the Democratic Republic of Congo (DRC), Tanzania, Kenya, and Uganda. Of these countries, Kenya and Tanzania have not seen any armed conflict since 1982. The simulation model predicts continued low risks of conflict in these countries and the effectiveness ofsimulated PKOs here is therefore very limited. The largest effects are seen in the DRC and Burundi. Both of these countries have recent or on-going armed conflict, and both countries have seen PKOs deployed. For Burundi the PKO that was deployed from 2004 to 2007 (S2) reduced the (counterfactual) risk of conflict by close to one fifth at its peak deployment. As the solid black line shows the effect also persisted after the PKO left. The simulation shows that had the UN opted for a large PKO, which in this case would have entailed a budget increase from 300 to 800M USD but no change in mandate, the risk of conflict could have been reduced by an additional 10 percentage points.

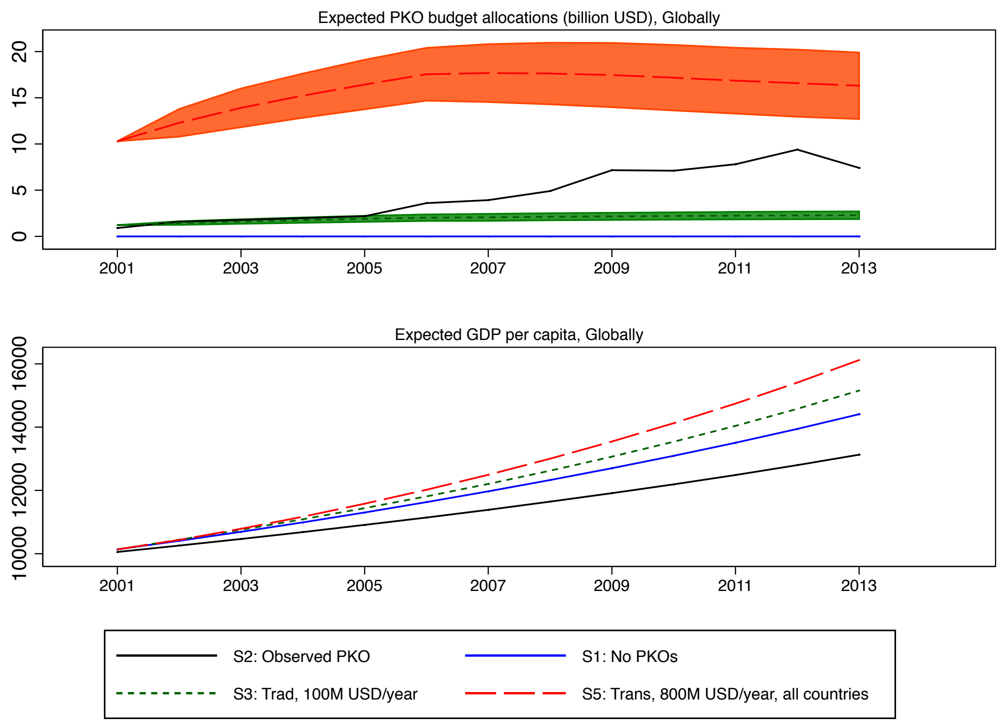
The DRC presently has the largest PKO in history deployed. Since 2005 the yearly budget of the MONUSCO operation was more than 2000M USD. Naturally, for this country our more limited scenario is less effective in reducing the risk of conflict than the observed mission. The observed mission, however, has decreased the risk of conflict in the DRC by more than 40 %.

For Rwanda and Uganda, two countries with ample recent conflict history, we again find that PKO deployment substantially decreases the risk of renewed conflict – just above 10 % in Uganda and just below in Tanzania. For both countries there is no difference between the observed and the 800M USD scenario. Given that neither of these two countries had a PKO deployed in the period 2001 to 2014 this may seem strange. Both countries, however, had PKOs deployed in neighboring countries throughout the simulation period. In Table 5 we report a negative effect of PKOs in neighboring countries on the country's own conflict propensity. Given that rebel groups in both Rwanda and Uganda has routinely taken shelter across borders, it is not surprising that we find a strong dampening effect of neighboring PKOs on these two countries in particular.

6.3 Costs and benefits of PKO deployment

We find that ambitious PKO policies can reduce the risk of major conflict with about two thirds relative to a no-PKO scenario. Compared to the actual UN PKO policy for 2001–13, the reduction of the most ambitious policy is about 45%. Such conflict reduction has enormous potential to decrease human suffering. Nevertheless, the high-commitment scenarios are costly. We are therefore interested in assessing how much the UN budget would increase in our various scenarios. The upper part of Figure 6 shows the average simulated total budgets for UN PKOs under the same scenarios as above and with the same line and color characteristics. The low-budget scenario (100M USD) would imply a strong reduction in UN peacekeeping expenditures compared to the actuals for 2001–13, whereas the more extensive 800M USD scenarios represent an increase in total annual expenditures of 50–75% compared to what the UN spent in reality. The initial increase in PKO expenditure will not persist indefinitely, but will decrease as the proportion of countries in conflict in the world starts to decrease. In the most extensive scenario in our simulation, the peak in UN PKO spending happens after about 6-7 years, and then the costs gradually recede.

Figure 6: Expected budget allocation and endogenized GDP growth



These are significant increases in expenditures, especially since the UN is already struggling to get the funds and the troop commitments required to carry out the current missions.[28] Nevertheless, it is misleading to consider only the direct costs of peacekeeping. Would the member states of the UN be willing to increase their support for PKOs, there is much to be gained – not only in terms of global security, but also in terms of development and economic growth. According to Gates et al. (2012), a major armed conflict with 2500 battle deaths – i.e. those conflicts that PKOs are particularly good at reducing – increases undernourishment

[28]All of these costs do not have to be borne by the UN. As was pointed out in United Nations (2009), the UN needs to strengthen partnership with e.g. the African Union and the European Union. Parts of the budget could thus be borne by these partners in joint operations as the one in Darfur.

by 3.3 percent and infant mortality by 10 percent. De Groot, Bozzoli and Brück (2012) find that the world would have seen a 16 percent larger global GDP in the absence of war in the last five decades. They particularly emphasize the economic gains to be made by ending wars earlier, which is what PKOs are well designed to do according to our analysis. The lower part of Figure 6 shows the predicted global GDP growth for our scenarios. The GDP growth is much larger in S5 compared to a no-PKO scenario. Since more expensive missions reduce conflict more, there are substantial economic gains from a most robust peacekeeping agenda.

We can also consider other development gains. Gates et al. (2012) estimate the consequence of conflict across all of the UN Millennium Development Goals (MDG). They find, for instance, that a conflict of average intensity (2500 battle deaths over 5 years) in a medium size country of 10 million inhabitants increases the proportion of the country that is undernourished by about 300,000 people (Gates et al. 2012, 1717). Using the estimates from Gates et al. (2012) we can calculate what a two thirds reduction in major conflict would translate into in benefits as measured by the MDGs. Presently there are 7 active major conflicts, a two thirds reduction would therefore mean **4.6 fewer conflicts**. If we assume, for simplicity, that all of these would be average conflicts in median-sized countries we can start to calculate the benefits of deploying PKOs. Based on the figures reported by Gates et al. (2012), doubling the PKO budget would mean 57,500 fewer infant deaths, 900,000 fewer people without adequate access to potable water, and 1,380,000 fewer undernourished people. An average conflict also cuts 1 year from a populations life expectancy, and 15 % from a country's GDP, costs that could be prevented by deploying PKOs. We would argue that considering the enormous negative externalities of armed conflict, an increase in the UN PKO budget by 75 percent may be a relatively cheap way of investing in future global security and development.

Check all these figures

We also break down these costs and benefits by region. Figures 7 and 8 show the cost of the PKO (top panel) and expected GDP (bottom panel) as a function of, among other variables, conflict incidence across the set of regions and countries discussed above.[29] The

[29] Expected GDP is dynamically simulated as a function of, among other factors, conflict. See Appendix section A.8 for details.

figures show UN PKO budget and GDP per capita across scenarios 1 (black line), 2 (blue line), 3 (green line), and 5 (orange line). The shaded regions around the lines show 1 standard deviation simulation uncertainty.[30] The regional results in Figure 7 all exhibit the same general tendency – UN PKO budget spending in the most extensive scenario increases rapidly in the first few years, in most cases overtaking observed PKO spending, reaches a peak and then starts a gradual slow decline as the investment in PKOs results in fewer armed conflicts.[31]

This initial investment in PKO spending does not only translate into lower incidence of conflict. In each region dampening conflict also leads to higher expected GDP per capita rates, shown in the bottom panel of each regional figure. This benefit is seen most clearly in the regions where we expect the highest incidence of conflict. In East Africa, for example, expected GDP per capita in 2013 is at least 20% higher in the most extensive PKO deployment scenario compared to if the UN were to follow observed deployment patterns. For West Africa, which in the last 10 years has been relatively peaceful, GDP per capita is expected to have been around 8% higher today under the extensive policy. The line for the observed PKO deployment scenario is initially parallel with the no-PKO scenario. In 2006, however, there seems to be a break point and GDP increases more rapidly under this scenario. 2006 is the year the combined effect of the PKOs in Liberia and the Ivory Coast is felt on the region.[32] Both these missions have transformational mandates and relatively large budgets (respectively around 500M USD and 600M USD in 2013). After 2006 therefore the observed deployment scenario resembles our more extensive scenarios and the expected GDP per capita levels consequently converge.

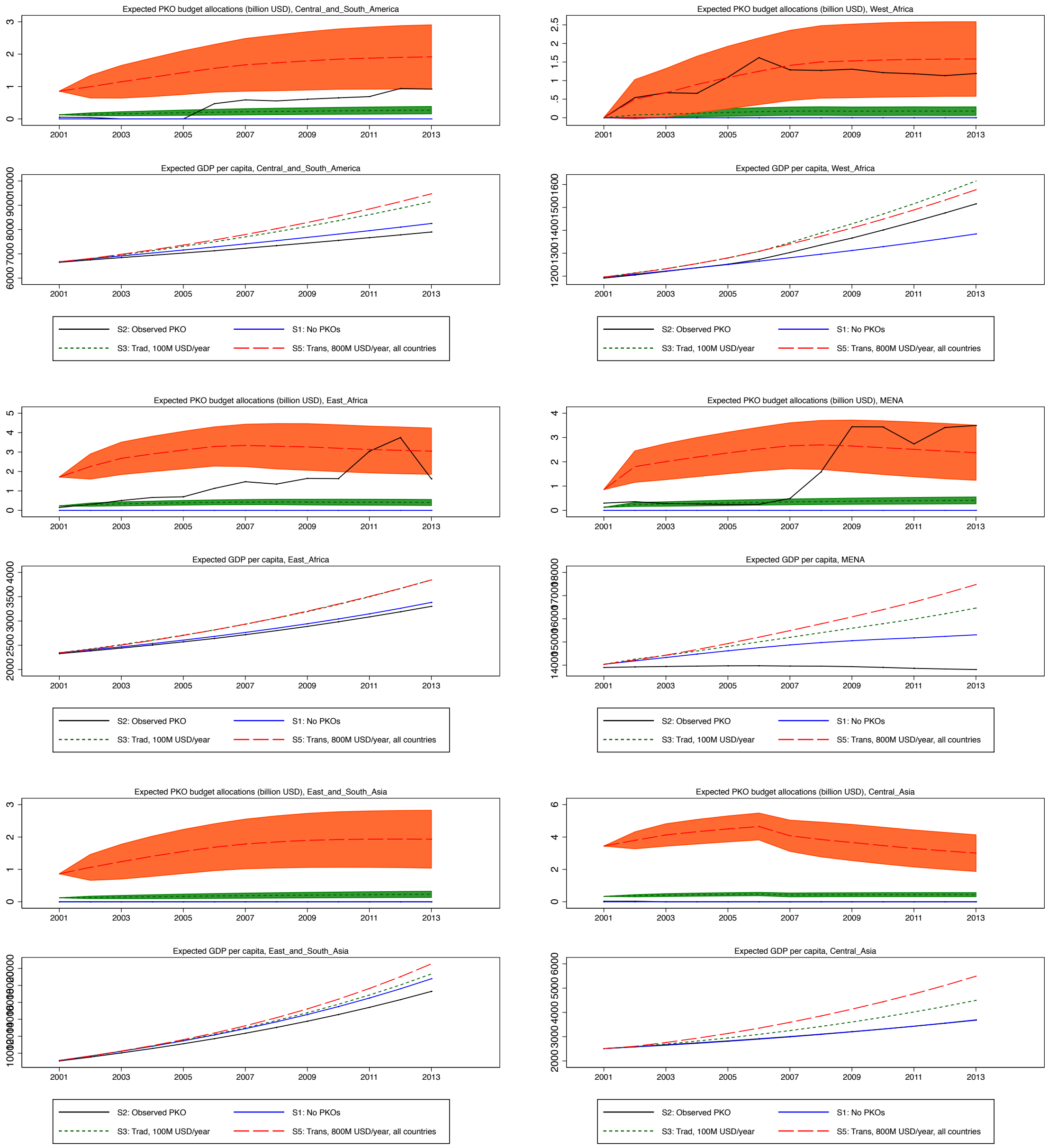
Figure 8 shows the same information for the set of countries discussed above. Overall findings are largely in line with the results at the regional level and we find that more extensive UN deployment patterns result in markedly higher expected GDP per capita levels. For some

[30] We follow Brandt and Freeman (2006, 5) and Sims and Zha (1999) and use 1 standard deviation instead of the more common 95 % confidence intervals since 'the former are much more indicative of the relevant range of uncertainty than the latter, which are indicative of pretesting and data mining'.

[31] Note that the y-axes differ across the regions. This is because the number of countries and mean GDP per capita in each region are very different.

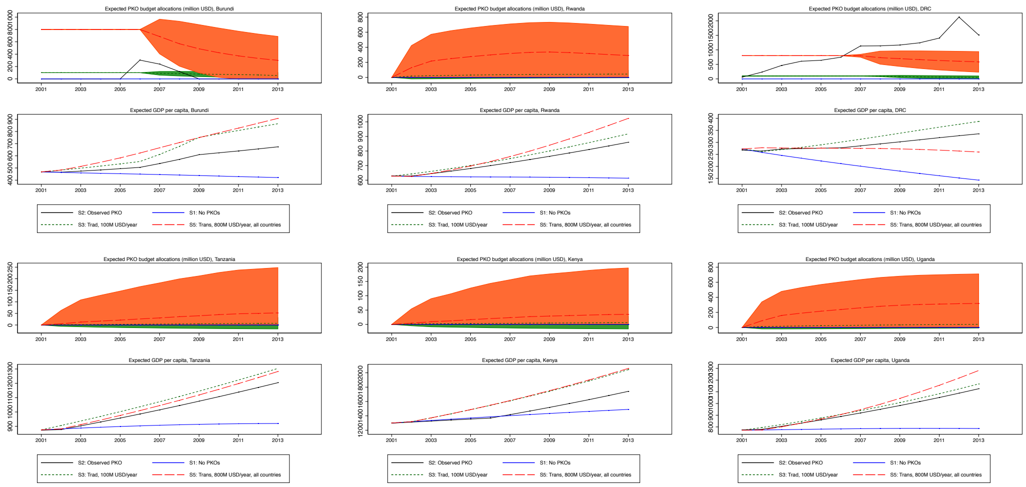
[32] West Africa now has one additional deployed PKO in Mali.

Figure 7: Expected budget allocation and endogenized GDP growth



countries, however, what on a regional or at the global level is the most extensive scenario, scenario 5, is less ambitious than the observed PKO deployments in the country in the period 2001 to 2013. In the DRC the currently deployed PKO has a budget more than twice as much as 800M USD, and expected GDP is therefore higher under this scenario than under the 800M USD scenario. For every country, though, PKO deployment at any level results in an expected GDP much higher than what could have been achieved, according to our simulations, without PKO deployment. The difference between the no-PKO and the most extensive PKO scenarios typically translated into around 50% higher GDP per capita levels.

Figure 8: Expected budget allocation and endogenized GDP growth



7 Conclusion

In this paper we have evaluated the prospects of PKOs in reducing conflict in the future. By simulating different scenarios, we have estimated the effect on the future incidence of conflict of different types of missions and of varying the money spent on PKOs. The results show that PKOs have a clear conflict-reducing effect. The effect of PKOs is largely limited to preventing major armed conflicts. However, there is a discernible indirect effect since the reduction of conflict intensity also tends to increase the chances of peace in following years. There are also some interesting regional differences. PKOs have the strongest effect in three regions: West Asia and North Africa; East, Central, and Southern Africa; South and Central Asia. This reflects that these regions have had more major conflicts compared to other regions.

These findings have clear policy implications, since they illustrate the effect of different PKO policies. In one of the most extensive scenarios, in which major armed conflicts are met with a PKO with an annual budget of 800 million USD, total UN peacekeeping budget is estimated to increase by 50–70 percent. However, in this scenario, the risk of major armed conflict is reduced by half relative to a scenario without any PKO. This indicates that a large UN peacekeeping budget is money well spent. Moreover, the total PKO budget would increase for about ten years, and then start decreasing again as a result of a reduced number of conflicts in the world. In another scenario, which specifies that major conflicts get a PKO with a transformational mandate in the first year, the risk of conflict is reduced by two-thirds in 2035 compared to a scenario without any PKO. If the UN is serious about maintaining international peace and security, it is important to consider the impact of different policies regarding mandates and budgets, as well as the reaction-time from a conflict outbreak to the deployment of a mission.

The methodology used here opens up for new interesting questions and possible extensions to the research presented. One pertinent question is whether the quality of PKOs may not be equally important for its efficiency as the mandate and the budget. Troop-contributing countries have varying levels of military training and a large number of countries contributing troops to a single mission may introduce coordination problems. Another relevant issue is the impact of regional security actors. In this paper we have evaluated the effect of UN PKOs, but the UN is not the only actor doing peacekeeping. For example, the African Union and NATO have been involved in several conflict and post-conflict situations. Therefore it would be interesting to assess whether these actors differ in their peacekeeping efficacy, and subsequently simulate a future scenario that takes into account the increasing involvement of regional actors in peacekeeping. The simulation procedure used here offers a useful tool for evaluating the practical relevance of theoretical insights as well as assessing the impact of different policies.

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A Appendix

A.1 Where do peacekeepers go?

Table A-1: Where do they go: Determinants of peace-keeping operations, 1990–2009

	(1) Onset		(2) Incidence	
	Traditional	Transformational	Traditional	Transformational
Traditional operation t–1	0	4.733***	6.168***	4.676***
	(.)	(6.90)	(13.77)	(7.59)
Transformational operation t–1	3.028***	0	2.726**	6.878***
	(3.30)	(.)	(3.17)	(11.79)
Major conflict t	1.882*	1.600*	1.232	1.932**
	(2.38)	(2.00)	(1.78)	(2.85)
Minor conflict t–1	0.286	1.080	0.0936	-0.700
	(0.38)	(1.43)	(0.14)	(-1.05)
Major conflict t–1	-0.0883	-0.547	-0.610	-1.536
	(-0.09)	(-0.47)	(-0.65)	(-1.65)
Post-conflict year 1–3	0.509	0.182	0.0138	-0.739
	(0.56)	(0.19)	(0.02)	(-0.99)
Post-conflict year 4–6			-0.293	-1.898*
			(-0.37)	(-2.36)
Post-conflict year 7–10			-0.326	-3.741**
			(-0.43)	(-2.75)
Log population	-0.387	-0.494	-0.295	-0.391
	(-1.81)	(-1.92)	(-1.70)	(-1.83)
Log infant mortality rate	0.0611	0.515	-0.126	0.250
	(0.17)	(1.38)	(-0.52)	(0.96)
1990s	21.56***	-0.819	0.982*	-0.754
	(9.08)	(-1.35)	(2.25)	(-1.69)
_cons	-22.49	-2.531	-1.693	-1.031
	(.)	(-0.89)	(-0.86)	(-0.45)
N	1002		1152	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Unit of observation: Country years at conflict or in post-conflict state (less than 10 years after end of conflict).

Table A-1 shows the results from estimating a multinomial regression model with a simplified version of the categorical Doyle-Sambanis mandate variable as the dependent variable. As explained in Section 3, we have merged the 'observer' and 'traditional' categories into a new 'traditional operation' category, and the 'multidimensional' and 'enforcement' categories into 'transformational operations'. The model is estimated only for the post-1989 period, and only for country years where the country is either in conflict or has had a conflict within the last 10 years. We have excluded the permanent members of the UNSC from the data set used here, since these countries are very likely to veto PKOs in own internal conflicts.

Model 1 – onset – is restricted to PKO onsets, i.e. conflict/post-conflict country years where a peace-keeping operation continued from the previous with the same mandate have ben removed from the data set. Model 2 – incidence – includes all conflict/post-conflict country years for the 1990–2009 period.

As noted by previous studies, it is difficult to identify circumstances in which conflict countries will receive PKOs, but Model 1 give some indications. First, both traditional and transformational PKOs are about six times more likely to be initiated in countries with major conflict (more than 1,000 battle deaths) than in conflicts that are less intense or just have ended. The UN occasionally starts up PKOs in countries that have had up to three years after conflict, but almost never after that.[33] There is some indication that conflicts that have lasted a year or more have a larger probability of attracting PKOs.

Secondly, PKOs are less frequent in large countries. This is particularly true for transformational operations. The odds of PKO initiation in a country with 10 million inhabitants is more than three times higher than in a country with 100 million inhabitants. This is also evident from the list of all PKOs (Table A-2).

Thirdly, transformational PKOs are more likely in under-developed countries, but the relationship is not very strong. A conflict country with an infant mortality rate at 100 (per 1,000 live births) is about twice as likely to receive PKOs as one with 20.

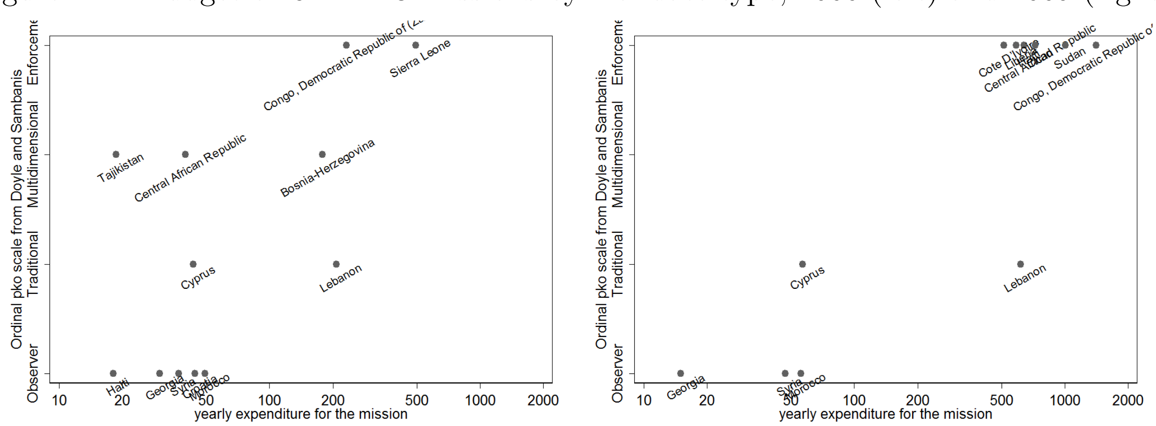
Finally, traditional operations often initiate after transformational ones, and vice versa. Moreover, as evident from Figure 1, traditional PKOs were more frequent in the 1990s than in the 2000s, whereas transformational operations became more numerous in the most recent decade.

Model 2 – incidence – complements this picture by showing that PKOs also tend to continue if the conflict remains at the major conflict level. The probability of continuation decreases quickly over the post-conflict period.

A.2 Mandate types and budget allocations

Figure A-1 shows the budgets of all PKOs active in 2000 (left figure) and 2009 (left figure) plotted against mandate type. The correlation between robust mandates and large budgets is evident in 2000 and even stronger in 2009.

Figure A-1: Budget of UN PKO missions by mandate type, 2000 (left) and 2009 (right)



[33]Estimates for the coefficients for 'Post-conflict year 4–6/7–10' are typically smaller than –30, reflecting the almost perfect absence of such cases. Given the estimation problems associated with such relationships we opted not to present these results.

A.3 List of peacekeeping operations

Since the DS dataset is not time-varying, we have coded changes in mandate based on the comments on adjustments to the mandate in Doyle and Sambanis (2006*b*). Our list of PKOs is given below.

In some unclear cases, Fortna (2008)'s version of the DS data was consulted (which is time-varying but not annual). The DS data are coded up to 1999. For the years 2000–2009, we have coded the mandate on the basis of the definitions provided by DS, using UNSC resolutions and mandate information available at the DPKO website.[34] Appendix A.3 gives a list of all PKOs by mandate.

In order to capture the size of the PKO, we have coded the yearly expenditure for each mission, based on United Nations General Assembly published *appropriation* resolutions from 1946 to the present. The variable gives the yearly amount allocated by the UN for each specific mission. UN PKOs are mostly funded outside the ordinary UN budget, and appropriation resolutions were therefore quite straightforward to collect and code. A small number of missions, e.g. the United Nations Truce Supervision Organization (UNTSO), are funded directly through the UN's operating budget, and yearly expenditure data are harder to single out from other budget items. These missions, however, are all small and limited. For PKO years without expenditure data we use the average for the mission type as our best guess.

We have removed international PKOs such as the UNIKOM mission monitoring the Iraq-Kuwait conflict 1991–2003 – i.e. UN PKOs that are deployed in more than one country simultaneously under the same mandate. There are only four such missions and they are listed below.

[34] http://www.un.org/en/peacekeeping

Table A-2: List of United Nations peace-keeping operations, 1970–2009

Acronym	Mission name	Start date	Closing date	Countries
Observer missions				
UNDOF	United Nations Disengagement Observer Force	Jun-74	Present	Syria
UNAVEM I	United Nations Angola Verification Mission I	Jan-89	Jun-91	Angola
ONUCA	United Nations Observer Group in Central America	Nov-89	Jan-92	Costa Rica, El Salvador, Guatemala, Honduras
MINURSO	United Nations Mission for the Referendum in Western Sahara	Apr-91	present	Morocco (Western Sahara)
UNAMIC	United Nations Advance Mission in Cambodia	Oct-91	Mar-92	Cambodia
UNOMUR	United Nations Observer Mission Uganda-Rwanda	Jun-93	Sep-94	Rwanda, Uganda
UNOMIG	United Nations Observer Mission in Georgia	Aug-93	Jun-09	Georgia
UNOMIL	United Nations Observer Mission in Liberia	Sep-93	Sep-97	Liberia
UNASOG	United Nations Aouzou Strip Observer Group	May-94	Jun-94	Chad
UNMOT	United Nations Mission of Observers in Tajikistan	Dec-94	May-00	Tajikistan
UNMOP	United Nations Mission of Observers in Prevlaka	Jan-96	Dec-02	Croatia, Federal Republic of Yugoslavia
MIPONUH	United Nations Civilian Police Mission in Haiti	Dec-97	Mar-00	Haiti
UNPSG	UN Civilian Police Support Group	Jan-98	Oct-98	Croatia
Traditional missions				
UNFICYP	United Nations Peacekeeping Force in Cyprus	Mar-64	Present	Cyprus
UNIFIL	United Nations Interim Force in Lebanon	Mar-78	Present	Lebanon
UNGOMAP[35]	United Nations Good Offices Mission in Afghanistan and Pakistan	May-88	Mar-90	Afghanistan, Pakistan
UNAVEM II	United Nations Angola Verification Mission II	Jun-91	Feb-95	Angola
UNOSOM I	United Nations Operation in Somalia I	Apr-92	Mar-93	Somalia
UNAMIR	United Nations Assistance Mission for Rwanda	Oct-93	Mar-96	Rwanda
UNAVEM III	United Nations Angola Verification Mission III	Feb-95	Jun-97	Angola
UNPREDEP	United Nations Preventive Deployment Force	Mar-95	Feb-99	Macedonia
UNCRO	United Nations Confidence Restoration Operation in Croatia	May-95	Jan-96	Croatia
UNSMIH	United Nations Support Mission in Haiti	Jul-96	Jul-97	Haiti
MINUGUA	United Nations Verification Mission in Guatemala	Jan-97	May-97	Guatemala
MONUA	United Nations Observer Mission in Angola	Jun-97	Feb-99	Angola
UNTMIH	United Nations Transition Mission in Haiti	Aug-97	Dec-97	Haiti
UNOMSIL	United Nations Observer Mission in Sierra Leone	Jul-98	Oct-99	Sierra Leone
Multi-dimensional missions				
UNTAG	United Nations Transition Assistance Group	Apr-89	Mar-90	Namibia

[35] UNGOMAP is coded as active only in Afghanistan

ONUSAL	United Nations Observer Mission in El Salvador	Jul-91	Apr-95	El Salvador
UNTAC	United Nations Transitional Authority in Cambodia	Mar-92	Sep-93	Cambodia
ONUMOZ	United Nations Operation in Mozambique	Dec-92	Dec-94	Mozambique
UNMIBH	United Nations Mission in Bosnia and Herzegovina	Dec-95	Dec-02	Bosnia & Herzegovina
MINURCA	United Nations Mission in the Central African Republic	Apr-98	Feb-00	Central African Republic
UNMISET	United Nations Mission of Support in East Timor	May-02	May-05	Timor-Leste
UNMIT	United Nations Integrated Mission in Timor-Leste	Aug-06	Present	Timor-Leste
Enforcement missions				
UNPROFOR	United Nations Protection Force	Feb-92	Mar-95	Croatia, Bosnia & Herzegovina, Macedonia
UNOSOM II	United Nations Operation in Somalia II	Mar-93	Mar-95	Somalia
UNMIH	United Nations Mission in Haiti	Sep-93	Jun-96	Haiti
UNTAES	United Nations Transitional Administration for Eastern Slavonia, Baranja and Western Sirmium	Jan-96	Jan-98	Croatia
UNMIK	United Nations Interim Administration Mission in Kosovo	Jun-99	Present	Kosovo
UNTAET	United Nations Transitional Administration in East Timor	Oct-99	May-02	Timor-Leste
UNAMSIL	United Nations Mission in Sierra Leone	Oct-99	Dec-05	Sierra Leone
MONUC	United Nations Organization Mission in the Democratic Republic of the Congo	Nov-99	Present	Democratic Republic of Congo
UNMIL	United Nations Mission in Liberia	Sep-03	Present	Liberia
UNOCI	United Nations Operation in Côte d'Ivoire	Apr-04	Present	Cote d'Ivoire
MINUSTAH	United Nations Stabilization Mission in Haiti	Jun-04	Present	Haiti
ONUB	United Nations Operation in Burundi	Jun-04	Dec-06	Burundi
UNMIS	United Nations Mission in the Sudan	Mar-05	Present	Sudan
UNAMID	African Union-United Nations Hybrid Operation in Darfur	Jul-07	Present	Sudan
MINURCAT	United Nations Mission in the Central African Republic and Chad	Sep-07	Present	Central African Republic, Chad
Missions associated with international conflicts that are excluded from our analysis				
UNEF II	Second United Nations Emergency Force	Oct-73	Jul-79	Egypt
UNIIMOG	United Nations Iran-Iraq Military Observer Group	Aug-88	Feb-91	Iran, Iraq
UNIKOM	United Nations Iraq-Kuwait Observation Mission	Apr-91	Oct-03	Iraq, Kuwait
UNMEE	United Nations Mission in Ethiopia and Eritrea	Jul-00	Jul-08	Ethiopia, Eritrea

In this data PKOs stay in the country on average 4.8 years after the conflict has ended.

A.4 When do they go? Exploring potential endogeneity

Several studies have looked at whether PKOs are subject to a selection effect such that they are sent to the 'easy' conflicts. So far there is little or no evidence that would support such a claim (Fortna 2004; Gilligan and Sergenti 2008; Gilligan and Stedman 2003). Being sent to particularly intense conflicts would, however, not be the only way a selection effect could influence the estimated efficiency of PKOs. Another possible mechanism would be one were peacekeepers are sent to conflicts after the conflicts have passed their intensity peak. PKOs would then be deployed only when the 'moment is ripe' (Zartman 2001) and conflicts would nevertheless have deescalated without the intervention. If so, it is untenable to attribute any causal effect of the PKO – it would simply signal the beginning of the end.

Table A-3: Onset of PKOs across 'conflict trajectory', 1970–2009

	ds_onstri							
conflicttrajectory	No PKO		Traditional		Transformational		Total	
	No.	%	No.	%	No.	%	No.	%
-5	3	75.0%	1	25.0%	0	0.0%	4	100.0%
-4	18	100.0%	0	0.0%	0	0.0%	18	100.0%
-3	22	88.0%	1	4.0%	2	8.0%	25	100.0%
-2	83	97.6%	1	1.2%	1	1.2%	85	100.0%
-1	101	96.2%	1	1.0%	3	2.9%	105	100.0%
0	712	97.9%	11	1.5%	4	0.6%	727	100.0%
1	84	96.6%	2	2.3%	1	1.1%	87	100.0%
2	75	96.2%	1	1.3%	2	2.6%	78	100.0%
3	13	100.0%	0	0.0%	0	0.0%	13	100.0%
4	22	100.0%	0	0.0%	0	0.0%	22	100.0%
5	4	100.0%	0	0.0%	0	0.0%	4	100.0%
Total	1,137	97.3%	18	1.5%	13	1.1%	1,168	100.0%

We investigate this claim in two ways and find little evidence in its favor. First we construct a five-category conflict variable that distinguishes between five levels of battle deaths incurred in a given year.[36] From this, we create an 11-category 'conflict trajectory' variable. This variable tracks the escalatory process of conflicts by comparing the conflict level at t with the level at $t-1$. A conflict which stays at the same level scores 0 on this variable. A conflict which escalates gets a positive score, and a conflict which de-escalates a negative score. Table A-3 tabulates conflict trajectory against onset of PKOs for all country years in conflict or within three years after the end of a conflict. The column to the right shows the total number of conflict years. These have an approximately normal distribution across the trajectory categories. The second and third columns reports the distribution of PKO onsets across the conflict trajectory categories. There is only slight evidence for the hypothesis that PKOs are deployed as the conflict is winding down. Half of the 31 PKO onsets were deployed in years where the intensity level was the same as the preceding years, and 27 of the deployments happened in years when the conflict trajectory was between –2

[36]The five categories are: 0–99, 100–499, 500–999, 1000–9999, 10,000–max. Data on annual battle deaths come from the UCDP Battle Deaths Dataset (UCDP 2012).

and 2. Only four cases break this symmetric patterns: The operations in Cambodia (1992), El Salvador (1993), Lebanon (1978), and Morocco (1991) were initiated following a noticeable decrease in conflict intensity.

Next, we conduct an instrumental variable analysis. In this, we follow Vivalt (forthcoming) and use rotating membership on the UN Security Council as an instrument for PKO deployment. Five countries a year are elected to serve on the Security Council for a two-year period. To ensure geographical representation the five different regional groups in the UN, i.e. Africa, Asia-Pacific, Eastern Europe, Latin-America and the Caribbean, and Western Europe, have security council membership quotas. The Security Council members are de facto elected in a two-stage process. First the different regional groups elect their set of candidates, and then the full General Assembly votes for which candidate will represent which regional group. The Security Council decides on all PKO deployment by majority vote, and Vivalt (forthcoming) shows that as a consequence PKOs are seldom deployed to conflicts in current Security Council members countries.[37] Table A-4 reports all conflicts that occurred in country-years in which the country was also a Security Council member. Column 4 reports if a PKO was deployed. There are only two examples of PKOs being deployed in such situations: in Rwanda in 1994, and to Pakistan or India at various times in the period between 1967 and the present. In this period India and Pakistan have both seen substantial amounts on intra-state conflict. The PKO in questions, however, is the United Nations Military Observer Group in India and Pakistan (UNMOGIP) which was deployed in 1949 to oversee the cease-fire between Pakistan. UNMOGIP has no role in these countries' civil armed conflicts.

UN Security Council membership therefore appears to satisfy the two criteria for instruments: relevance and exclusion (Kennedy 2008; Greene 2003). Security Council membership is relevant since it is highly correlated with the (non)deployment of PKOs. And, it is exogenous and therefore also satisfies the exclusion criteria. We run a IV-probit model (Newey 1987) with this instrument in the first stage of the model and the incidence of major conflict as the dependent variable.[38] We include the same control variables as in the analysis in section . The results of the estimation are shown in Table A-5. The results from the first-stage estimation is reported at the bottom of the table, those from the second stage at the top. The first-stage results show that the instrument have a significant effect on the onset of PKOs.

In the second stage, the instrumented PKO variable has a negative and significant effect on the incidence of major conflict. The magnitude of the estimate is fairly large for a relatively imprecise instrumented variable. The Wald test for exogenity however is not significant, indicating that the original variable is not really endogenous and that it is 'safe' to conduct classical inferences (Wooldridge 2010, 472–77). All in all, we conclude that endogenity is a minor problem for our analysis, and proceed to analyzing the impact of different scenarios for PKO involvement.

[37]See Dreher et al. (2014) for an analysis of the determinants of election to the United Nations Security Council.

[38]We restrict attention to the effect on major conflicts given what we find in Table 2 – PKOs are effective in reducing the intensity of conflict, not in preventing them. We also ran a two-stage probit model given that the dependent variable is dichotomous.

Table A-4: Security Council membership, conflict, and PKO deployment

Country	*Year*	*Conflict*	*PKOs*
United States of America	2001	2	0
Nicaragua	1983–84	2	0
Nicaragua	1984	2	0
Colombia	1969–70, 1989–90	1	0
Colombia	2001–02	2	0
Colombia	2011–12	1	0
Venezuela	1962, 1992	1	0
Peru	1984–85	2	0
Peru	2007	1	0
United Kingdom	1971–91, 1998	1	0
France	1961–62	2	0
Spain	1981–82	1	0
Russia (Soviet Union)	1990–91	1	0
Russia	1993–94	1	0
Russia	1995–96	2	0
Russia	1999–2000	2	0
Russia	2001–03	1	0
Russia	2004	2	0
Russia	2005–13	1	0
Azerbaijan	2012	1	0
Mauritania	1975	1	0
Nigeria	1966	1	0
Nigeria	1967	2	0
Nigeria	2011	1	0
Uganda	1981–82	2	0
Uganda	2009–10	1	0
Rwanda	1994	2	1
Djibouti	1993–94	1	0
Ethiopia	1967–68	1	0
Ethiopia	1989–90	2	0
Angola	2004	1	0
Algeria	2004–05	1	0
Tunisia	1980	1	0
Sudan	1972	2	0
Turkey	2009–2010	1	0
Iraq	1974–75	2	0
Egypt	1996–97	1	0
China	2008	1	0
India	1967–68	1	1
India	1984–85	1	1
India	1991–92	2	1
India	2011–12	1	1
Pakistan	1976–77	1	1
Pakistan	1994	1	1
Pakistan	2004	1	1
Pakistan	2012–13	2	1
Bangladesh	1979–80	1	0
Malaysia	1965	1	0
Philippines	1980	1	0
Philippines	1981	2	0
Philippines	2004–05	1	0

Table A-5: When do they come: Instrumental variable regression

	(1)	
	dummyconflict	
dummyconflict		
ln(PKO budget)	-0.933***	(-4.91)
Minor, t-1	0.684	(1.29)
Major, t-1	1.260	(1.23)
ln(Time in peace)	-0.181**	(-3.11)
Neighboring conflict, t-1	0.583**	(2.63)
nc · conflict, t-1	-0.236	(-0.99)
nc · war, t-1	-0.333	(-1.56)
ln(Time since nc)	0.0516*	(2.17)
ncts0	0.158*	(1.98)
ln(population)	0.0141	(0.25)
ln(GDP per capita)	-0.142*	(-2.10)
ln(GDP) · conflict, t-1	-0.000123	(-0.01)
ln(GDP) · war, t-1	0.0226	(1.21)
ln(GDP) · ln(Time in peace)	-0.00428	(-0.64)
ln(Time since independence)	-0.0305	(-0.66)
1960s	-0.281	(-1.89)
1970s	-0.290	(-1.80)
1980s	-0.207	(-1.15)
1990s	-0.0748	(-0.82)
Random effect, minor	-0.0643	(-1.84)
Random effect, major	0.396	(1.74)
_cons	-0.0134	(-0.01)
lPKObudget		
Minor, t-1	0.0288	(0.32)
Major, t-1	-0.0408	(-0.33)
ln(Time in peace)	-0.151***	(-4.57)
Neighboring conflict, t-1	0.336***	(5.29)
nc · conflict, t-1	-0.0496	(-0.53)
nc · war, t-1	-0.237	(-1.88)
ln(Time since nc)	0.0536***	(4.89)
ncts0	0.0815***	(4.00)
ln(population)	-0.0421***	(-4.80)
ln(GDP per capita)	-0.0480***	(-3.36)
ln(GDP) · conflict, t-1	0.000948	(0.12)
ln(GDP) · war, t-1	0.00728	(0.64)
ln(GDP) · ln(Time in peace)	0.000216	(0.06)
ln(Time since independence)	0.0201	(1.53)
1960s	-0.368***	(-9.54)
1970s	-0.401***	(-11.66)
1980s	-0.357***	(-10.67)
1990s	-0.133***	(-4.12)
Random effect, minor	-0.0482**	(-3.29)
Random effect, major	0.0862***	(5.42)
Sec. council member	-0.0863*	(-2.25)
_cons	1.123***	(7.90)
athrho		
_cons	1.350	(1.53)
lnsigma		
_cons	-0.0303***	(-3.74)
N	7602	

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A.5 Simulation methodology

A central feature in our modeling is the (annual) transition probability matrix for the transitions between peace, minor, and major conflict. The observed transition probability matrix is given in Table A-6. The relative frequency of transition in a given year from minor conflict to major conflict, for instance, have been 0.103, whereas the relative frequency of transition from major to minor conflict was 0.205.

Table A-6: Transition probability matrix: Conflict at t vs. at $t-1$, 1970–2009

	(Conflict level at t)			
Conflict at t-1	No conflict	Minor conflict	Major conflict	Total
No conflict	5078 (0.965)	155 (0.029)	21 (0.004)	5254 (1.000)
Minor conflict	145 (0.207)	481 (0.689)	72 (0.103)	698 (1.000)
Major conflict	24 (0.077)	70 (0.205)	247 (0.724)	299 (1.000)
Observations	5247	706	340	6239

Row proportions in parentheses.

To simultaneously determine how PKOs (and other explanatory variables) have affected the probability of onset, escalation, deescalation and termination of armed conflict in the 1970–2009 period, we estimate a multinomial logit model with lagged dependent variables and interaction terms between explanatory variables and the lagged dependent variables.[39] This model allows representing the transition probabilities in Table A-6 as functions of the explanatory variables we describe in the next section.[40]

We estimate the statistical relationship between the incidence of conflict and the presence of PKOs of various types and budget sizes, controlling for other factors that have been shown to affect the risk of conflict.[41] The models are estimated on data for all countries for the 1970–2009 period.

Our statistical model is able to capture the effects of PKOs along all three pathways for *individual* years, but further analysis is required to assess the effects along all the pathways seen over *multiple* years. To do so, we have developed a simulation routine that takes the estimated annual transition probabilities described above as its point of departure, but repeats the transitions for several consecutive years.[42]

This allows us to estimate the complete effect of PKOs. If a minor conflict breaks out in a hitherto peaceful country, this increases the estimated risk of conflict in that country every year for a couple of decades afterwards, as well as the risks of conflict in neighboring countries. If our statistical model finds that a PKO prevents the onset (or recurrence or escalation) of such a conflict, that is reflected in several subsequent transitions, too. Our simulation procedure allows us to estimate the probability of conflict for every country for every year over a 25-year period under different scenarios presented below, such as one where the UN stops deploying PKOs whatsoever, or one where the UN expands its level of ambition further. By comparing the global and regional

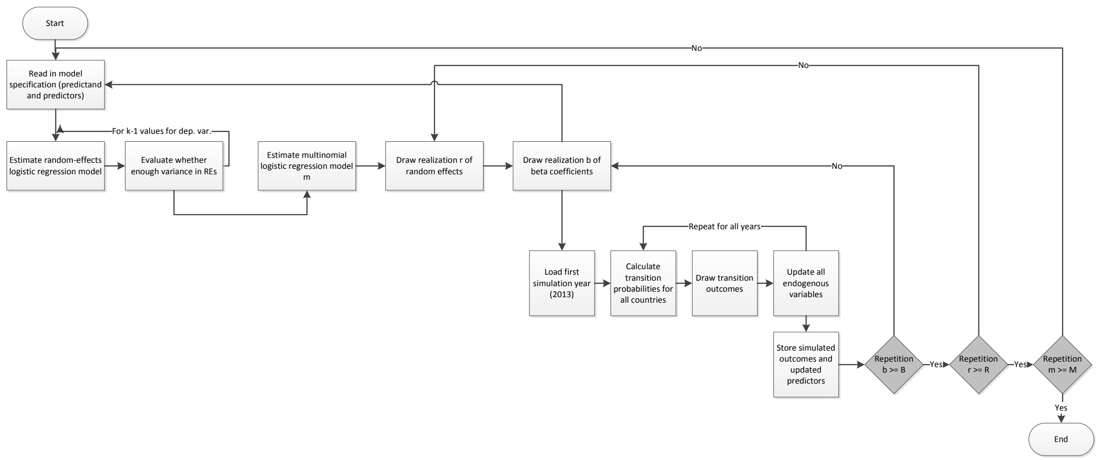
[39]Such models are often referred to as 'dynamic' models, e.g. in Przeworski et al. (2000).

[40]We also make use of information of conflict history before $t-1$, see Section 3.2.

[41]See Hegre and Sambanis (2006) for a review of conflict risk variables.

[42]To illustrate using the transition probabilities in Table A-6: The probability of going from no conflict to minor conflict is 0.033. If that happens, the probability that this country sees an escalation to major conflict is 0.103. If that happens, the probability of sustaining major conflict is 0.724. Over two years, countries can go from no conflict to major conflict through several intermediate steps. Matrix calculation on the transition probability matrix shows that the probability of going from no conflict to major conflict over 2 years through all possible pathways is 0.010.

Figure A-2: Simulation flow chart



incidence of conflict under these scenarios, we can aggregate the short-term effects identified by the statistical model up to a level which makes more sense for decision makers.

Evaluating the effect over as much as 25 years may seem excessive, but the effects of large-scale violent conflict do frequently last for at least as long as that (Collier et al. 2003). Hence, the beneficial effects of PKOs should be seen in a long perspective.

The general setup of the simulation procedure is illustrated in Figure A-2 and summarized below. We use the methodology developed by Hegre et al. (2013). We perform the following steps: (1) Specify and estimate the underlying statistical model; (2) Make assumptions about the distribution of values for all exogenous predictor variables for the first year of simulation and about future changes to these. In this paper, we base the simulations for the predictor variables on UN projections for demographic variables and IIASA projections for education (see Section 3.2); (3) Formulate a set of scenarios for future values of PKO variables (see Section 4); (4) Start simulation in first year. We start in 2010 for the forecasts presented in Section A.4: (5) Draw a realization of the coefficients of the multinomial logit model based on the estimated coefficients and the variance-covariance matrix for the estimates; (6) Calculate the probabilities of transition between levels for all countries for the first year, based on the realized coefficients and the projected values for the predictor variables; (7) Randomly draw whether a country experiences conflict, based on the estimated probabilities; (8) Update the values for the explanatory variables. A number of these variables, most notably those measuring historical experience of conflict and the neighborhood conflict variables, are contingent upon the outcome of step 6; (9) Repeat (4)–(7) for each year in the forecast period, e.g. for 2010–2035, and record the simulated outcome; and (10)Repeat (3)–(8) a number of times to even out the impact of individual realizations of the multinomial logit coefficients and individual realizations of the probability distributions.

The simulation methodology is reasonably accurate. Hegre et al. (2013) show that the model specification used in this paper is able to predict about 63% of conflicts (minor or major) 7–9 years after the last year of data, with about 4% false positives.[43]

[43] Hegre et al. (2013) estimate the relationship between predictors and risk of conflict based on data for 1970–2000, simulates up to 2009 and compares simulation results for 2007–2009 with the most recent conflict data available for the same years (Harbom and Wallensteen 2010).

A.6 Simulation results in number form

Table A-7: Proportion of countries in conflict globally across scenarios, 2001–2013

	Observed conflict	S2: Observed PKOs	S1: No PKOs	S3: Trad 100M USD/year	S4: Trans 800M USD/year	S5: Trans 800M USD/year, all
Year	Major Both	Major Both	Major Both	Major Both	Major Both	Major Both
2001	.054 .176	.051 .169	.054 .170	.051 .169	.041 .161	.04 .14
2002	.036 .133	.048 .168	.054 .171	.050 .168	.035 .156	.032 .155
2003	.024 .133	.047 .169	.055 .173	.049 .169	.030 .152	.026 .149
2004	.042 .145	.047 .169	.056 .175	.048 .170	.026 .148	.022 .145
2005	.030 .133	.046 .169	.057 .177	.047 .170	.023 .145	.020 .141
2006	.030 .145	.045 .168	.057 .176	.047 .170	.021 .142	.018 .138
2007	.024 .145	.044 .168	.058 .180	.045 .169	.020 .141	.017 .135
2008	.030 .157	.042 .168	.058 .181	.044 .169	.019 .139	.016 .134
2009	.036 .157	.041 .168	.059 .182	.043 .169	.018 .137	.015 .132
2010	.030 .145	.041 .168	.059 .183	.043 .169	.017 .137	.014 .131
2011	.036 .163	.040 .168	.060 .184	.043 .169	.016 .136	.014 .130
2012	.036 .139	.041 .168	.059 .185	.042 .169	.017 .135	.014 .129
2013	.036 .139	.040 .169	.060 .186	.042 .171	.016 .134	.014 .128

Table A-7 reports the simulated global proportion of countries in conflict for each of the scenarios. These are the numbers that underlie Figure 3. There were 171 countries in our dataset. Hence, the simulated proportions can be translated into number of countries in conflict by multiplying the proportion with 171. In 2013, the UCDP recorded 6 countries in major conflict and 24 countries in minor or major conflict for our 171 countries. Given the no-PKO scenario (S1), our simulations yield 10.3 countries in major conflict and 31.8 conflict countries overall. Given the peacekeeping as observed scenario (S2), we simulate 6.8 countries in major conflict and 28.9 in minor or major conflict. If the UN had opted for the most ambitious scenario (S5), we simulate 2.4 countries in major conflict and 21.9 in minor or major conflict.

Table A-8: Observed and Simualted PKO Budget, billion USD/year

	S2: Observed PKOs	S1: No PKOs	S3: Trad 100M USD/year	S4: Trans 800M USD/year	S5: Trans 800M USD/year, all
Year	Budget	Budget	Budget	Budget	Budget
2001	.902	0	1.215	8.601	10.295
2002	1.582	0	1.443	10.429	12.290
2003	1.780	0	1.606	11.870	13.909
2004	1.976	0	1.758	13.081	15.227
2005	2.180	0	1.897	14.216	16.432
2006	3.596	0	2.023	15.251	17.543
2007	3.920	0	2.056	15.336	17.670
2008	4.901	0	2.124	15.305	17.624
2009	7.162	0	2.162	15.176	17.458
2010	7.103	0	2.205	14.928	17.172
2011	7.803	0	2.242	14.656	16.848
2012	9.387	0	2.267	14.425	16.579
2013	7.409	0	2.283	14.181	16.303

A.7 Detailed description of predictor variables

To predict the future incidence of conflict, we add predictor variables that are associated with the risk of conflict and for which we have good projections for the 2010–2035 period.[44] As our baseline model, we use the model specification that was shown to produce the most accurate out-of-sample predictions in Hegre et al. (2013). For more information see this article.

Conflict History We model the *incidence* of conflict, i.e. whether the country is in a minor or major conflict in a given year. To model this appropriately, we include information on conflict status (no conflict, minor, or major conflict) at $t-1$, the year before the year of observation in the estimation phase in order to model the probability of transitions between each conflict level. The log of the number of years in each of these states up to $t-2$ is also included. We refer to this set of variables jointly as 'conflict history' variables.

Neighborhood We include information on conflicts in the neighborhood in order to model and simulate the spatial diffusion of conflicts. The neighborhood of a country A is defined as all n countries $[B_1 ... B_n]$ that share a border with A, as defined by Gleditsch and Ward (2000). More specifically, we define 'sharing a border' as having less than 100 km between any points of their territories. Islands with no borders are considered as their own neighborhood when coding the exogenous predictor variables, but have by definition no neighboring conflicts. The spatial lag of conflict is a dummy variable measuring whether there is conflict in the neighborhood or not. Hegre et al. (2013) does not find any difference between minor and major conflicts in terms of their diffusion potential.[45]

Socio-economic data We use two indicators of socio-economic development, given development's strong relationship with the risk of conflict (Collier and Hoeffler 2004; Fearon and Laitin 2003; Hegre et al. 2001): The extent of secondary education and the infant mortality rates. Both variables are highly correlated with GDP per capita, for which we have no authoritative projections.

We use the education data of Lutz et al. (2007), providing historical estimates for 120 countries for the 1970–2000 period. The dataset is based on individual-level educational attainment data from recent Demographic Health Surveys (DHS), Labour Force Surveys (LFS), and national censuses. Historical estimates are constructed by five-year age groups and gender using demographic multi-state methods for back projections, and taking into account gender and education-specific differences in mortality. We employ a measure of male secondary education, defined as the proportion of males aged 20–24 years with secondary or higher education of all males aged 20–24. For the 2001– period (including forecasts) we use the accompanying scenario for educational attainment until 2050 (Samir and Lutz 2008). Our base scenario is their General Trend Scenario.

Infant mortality is defined as the probability of dying between birth and exact age 1 year, expressed as the number of infant deaths per 1000 live births. We use the medium scenario from the population projections, where total fertility rates for all countries are assumed to converge towards 1.85 children per woman according to a path similar to historical experiences of fertility decline.

[44] Plausible and authoritative forecasts are required for our simulation exercise. This precludes including numerous interesting variables to the model, such as level of democracy, or characteristics of the termination of a previous conflict such as military victories or aspects of peace agreements. Taking these factors fully into account would require specifying a forecasting model also for these.

[45] Beardsley (2011) does not analyze this particular question.

Demographic data The demographic variables originate from the World Population Prospects 2006 (United Nations 2007), the most authoritative global population data set which covers all states in the international system between 1950 and 2005 and provides projections for the 2005–2050 period. Two key demographic indicators are used in this study. Total population is defined as the *de facto* population in a country, expressed in thousands. The measure has been log-transformed following an expectation of a declining marginal effect on conflict risk of increasing population size (see Raleigh and Hegre 2009).

We also add a variable reflecting the country's age structure. Cincotta, Engelman and Anastasion (2003) and Urdal (2006) report increasing risks of minor armed conflict onset associated with youth bulges. An emerging consensus is that youth bulges appear to matter for low-intensity conflict, but not for high-intensity civil war. Age-specific population numbers are provided by the United Nations (2007), and youth bulges are measured as the percentage of the population aged 15–24 years of all adults aged 15 years and above. For the youth bulge measure, the three scenarios yield identical estimates until 2024 since the relevant youth cohorts were already born by 2005. Beyond 2025, the different fertility assumptions lead to significant variation in the youth bulge projections for many countries.

Temporal and regional dummies We could fit the model better to the data by adding yearly fixed effects – there are good reasons to believe that the underlying transition probability matrix for a country with a given set of characteristics is fluctuating over the observed period. Hegre et al. (2013), however, are unable to find temporal dummies that unambiguously improve the predictive performance of the model. Consequently, we do not include such terms in the model for this paper.

We include three regional dummies to account for residual regional differences in risk of conflict after controlling for all predictor variables. Hegre et al. (2013) only find three regions to be at least vaguely distinct in this manner: Eastern Europe, Western Africa, and the rest of Africa south of Sahara. The rest of the world is the reference category for the regional variable.

Interaction terms Our control variables may not have the same effect on the probability of conflict onset as on conflict termination. To model this 'dynamic' model (Przeworski et al. 2000), we include multiplicative interaction terms between the control variables and the conflict history variables.[46]

A.8 GDP per capita fixed-effects model

The simulation algorithm allows us to endogenize the effect of conflict on variables of interest such as GDP per capita. To do this we first need to build a model estimating the effect of conflict on GDP. For this we utilize log GDP per capita (referred to as y below) from the World Bank's World Development Indicators (World Bank 2010). The data cover the period 1960 to 2012. Growth g is the difference $y_t - y_{t-1}$.[47] For the forecasts we construct a standard growth model (Acemoglu 2008) in which y which is a function of a country's lagged GDP level y_{t-1}, lagged minor and major conflict from $t-1$ to $t-5$, a dummy for whether the country is an oil producer, population size,

[46] The sizeable number of interaction terms entails some loss of efficiency, but also improves the predictive performance of the model (Hegre et al. 2013). Since we assess the total impact of our variables by means of simulations, the high number of parameters do not give rise to interpretational or collinearity problems. The only concern is whether the complexity of the model gives rise to 'empty cell' problems. As can be seen from the frequencies in Table A-6, this is not likely to be a problem. The estimates obtained above (e.g., Table 5) do not indicate any such difficulties.

[47] Growth g is the difference $y_t - y_{t-1}$ since y is measured in log form. A growth rate of 0.01 in this metric corresponds to a 1% growth rate.

and the proportion of a country's population made up of youths between the ages 20–25 (all three variables discussed below). In addition we add a country fixed effect μ_i , resulting in the following growth model:

$$g_{i,t,t-1} = \mathbf{X}_{i,t}^T \beta + y_{t-1} + \mu_i + \epsilon_{i,t} \tag{1}$$

where t, T indexes years, and i countries. X is a n by k matrix of data, β is a k by 1 vector of parameters to be estimated, ϵ is a n by 1 vector of disturbances.

Table A-9: Fixed-effects regression of conflict on GDP

	log(GDP growth)	
log(GDP per capita)$_{t-1}$	0.0128***	(5.90)
Time independen	0.0132***	(6.40)
Minor conflict$_{t-1}$ (c1)	-0.0145**	(-2.72)
Major conflict$_{t-1}$ (c2)	-0.0228**	(-3.01)
log(time in peace)$_{t-2}$	-0.000863	(-0.76)
Neigh. conflict$_{t-1}$ (nc)	-0.00745**	(-2.99)
nc * c1$_{t-1}$	-0.000417	(-0.07)
nc * c2$_{t-1}$	0.00521	(0.62)
log(population)$_{t-1}$	-0.0299***	(-8.13)
PKO traditional$_{t-1}$	0.0176*	(2.03)
PKO transformational$_{t-1}$	0.0572***	(4.29)
log(PKO budget)$_{t-1}$	-0.00336	(-1.63)
PKO neighbor$_{t-1}$	0.0234***	(5.92)
N	7591	

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A-9 shows the results from estimating this growth regression. The conflict variables have considerable effect on growth here as in the studies reviewed above: A minor conflict cuts about 1% off annual growth in the conflict country, and a major conflict more than 3%, for every year the conflict lasts. Conflicts in a neighboring country also leads to about a 1% annual loss. The lagged conflict terms indicate that post-conflict recovery is weak on average, such that most of the growth loss is permanent.

In the simulation below, the values for GDP per capita used are calculated as

$$y_t = y_{t-1} + \hat{g}_{i,t,t-1} \tag{2}$$

where $\hat{g}_{i,t,t-1}$ is the predicted growth rate based on Equation 1 and Table A-9. To account for the uncertainties in this model, we draw 50 different random realizations of the β and μ estimates (using Clarify Tomz, Wittenberg and King 2003) for use in the simulations.