Kirsti Kuisma

ESSAYS IN FOREIGN AID, CONFLICTS, AND DEVELOPMENT

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To Jani

Acknowledgements

Writing a doctoral thesis is a long and challenging project that few can conduct without help and advice from senior colleagues and support from friends and family. Now I gladly take the opportunity to look back and I wish to thank all these people who have contributed to this process. I have been fortunate to be able to work amongst established and highly qualified economists at the Helsinki School of Economics, and I have also greatly benefited from the contribution of several people outside the school.

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Abstract

This dissertation consists of four essays focusing on current topics in developing economics. The first two essays consider aid allocation and the behavior of donors. The issues relate to the literature on aid effectiveness and this study assumes that the behavior of donors and aid agencies can affect the effectiveness of foreign aid. The first essay "Multilateral vs. Bilateral Aid -a theoretical approach" analyzes foreign aid allocation with a game theoretic framework aiming to explain the division of donor funds into bilateral and multilateral aid. Within this framework donor countries can effectively control rent-seeking in recipient countries by delegating the aid delivery process to the multilateral organization. However, this means that donors lose control over their aid funds. It is shown that if the governments of the recipient countries are rent-seekers, it is optimal for altruistic donors to give all aid in multilateral form. The result emerges equally both in a two country and in a N-country framework.

The second essay "Non-profit Competition" presents a simple framework to analyze competition between non-profit organizations. In particular, the paper focuses on the implications of product differentiation and altruism in a competitive situation. Within this framework the motivation for cost reduction is low if charities are non-altruistic. The higher the 'transportation cost' (the stronger the donor preferences), the smaller the utility of donors and beneficiaries, while the utility of non-profit organizations increase. The quality and quantity of production increase with non-profit organization's altruism and the motivation for cost reduction is strong for altruistic non-profit organizations, whereas non-altruistic organizations do not have an incentive for cost-reduction.

The third and fourth essay examine civil conflicts in developing countries. The third essay "Trade, War, and Peace" extends the basic international trade and

conflict model to analyze the role of trade in local conflict. Within this model the possibility to trade with non-conflict countries increases the intensity of conflict if Cobb-Douglas preferences are assumed. However, conflicts can be reduced when income grows if consumer preferences are non-homothetic. The role of tariffs is twofold: they can either increase of decrease conflict. The last essay "Peace-building and Local Conflicts in Developing Countries" builds on the same the trade and conflict model as the previous essay. If peace building is taken into account, the intensity of conflicts can decline when the conflicting country's income increases and conflicts can even be completely prevented. This paper also argues that successful pre-conflict peace-building requires that both the peace-builder and the conflicting regions are sufficiently rich. Finally, post-conflict operations are time-consistent only if the outside country is rich enough. Repairing war damages is counterproductive because it increases military investments.

Contents

Chapter 1
Introduction

1.1 Background

This dissertation focuses on foreign aid ineffectiveness and civil conflicts in developing countries. It is assumed that these factors are closely related to poverty, which continues to be a severe problem in the third world. The World Bank estimated in 2001 that 1.1 billion people lived in extreme poverty, i.e. on less than 1 $ a day. Respectively, 2.7 billion people lived on less than 2 dollars a day. This is to say that half of the world lives in poverty. Although statistics suggest that during the recent two decades the poverty situation has improved somewhat, progress has been distinctively uneven[1]. China, South and East Asia have experienced rapid economic progress, Latin America has been in stagnated state, but the per capita growth of income in Sub-Saharan Africa has actually been negative during 1980-2000[2].

To alleviate poverty and raise the standard of living in the developing countries, it has been a standard practice of the developed nations to provide assistance, although the appropriate amount of foreign aid has been a subject of ongoing debate[3]. During the last two decades, the total Official Development Assistance (ODA) has been approximately 50-60 billion USD. Of that amount roughly 30 per cent has been disbursed to Africa, its share being approximately

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[1] See e.g. Chen and Ravallion (2004) and World Bank (2004).

[2] According to Sachs et al. (2004). This study includes tropical Sub-Saharan Africa leaving out North Africa, South Africa and a number of very small economies.

[3] Most countries still fall short of the UN target of 0.7 per cent of GNP to development assistance.

20 billion USD annually[4]. ODA was contracted in the mid-1990s reaching record low in 1997, when ODA was only 0.22% relative to donor-country GDP[5]. In the current decade aid disbursements have recovered somewhat, but are still much behind the UN Millennium Development Goal of 0.7 per cent of donor country GDP. The total net Official Development Assistance in 2002 was approximately 58 billion USD, representing a modest increase from 52 billion USD in 2001.

The examination of aid and poverty statistics easily evokes the question of where has all the aid gone? Although aid amounts have probably not been sufficient, it is still surprising that in some countries the situation does not seem to have improved at all. The macro impact of aid, especially in Sub-Saharan Africa, seems to have been small, although few exceptions do exist. It is also important to recall the so called "micro-macro paradox", which has been acknowledged by researchers for some time[6]. This notion refers to situations where the micro evidence clearly shows that aid has been successful, but this is not captured by the macro data. All in all, the issue of aid effectiveness has received a lot of attention during recent decades[7]. Several studies have argued that the performance of foreign aid in reducing poverty has been quite poor. For example, Boone (1996) claims that aid has had no significant effect on economic growth or on other development indicators. It has even been suggested that the relationship between aid and growth could be negative[8]. In the late 1990s Burnside and Dollar (1997; 2000) presented new findings arguing that aid, in fact, was effective and increased growth in the developing countries with sound policies, but had smaller or no

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[4]   Source: OECD aid statistics

[5]   During 1990-1998, net ODA to African countries declined 40 % in real terms (O'Connell and Soludo, 2001).

[6]   The term was first introduced by Mosley (1986).

[7]   See e.g. McGillivray (2003) for survey of recent findings in aid effectiveness research.

[8]   The famous argument by Bauer states that aid promotes dependency on others and is likely to keep development countries in a vicious circle of poverty (Brumm, 2003).

effect in those countries where the quality of institutions and policies was poor. Along with Burnside and Dollar, many other researchers concentrated on the aid and policy interaction seeking to answer the question of how aid should be allocated. For example, Collier and Dollar (2001; 2002), Dollar and Svensson (1998), and Dollar (1998) argue that aid must be directed to poor countries with sound policies. They advocate the so called 'poverty efficient allocation' that, unlike prior aid policies, would take into account the policy environment in the recipient country[9]. This became an important aspect, as aid did not seem to be successful in generating good policies and institutions[10].

The notion that aid is effective in good policy environment soon became famous and has been largely applied by many multilateral donors such as the World Bank. But lately this view has been contested. For example, Hansen and Tarp (2000; 2001; 2004) argue that aid increases growth rate despite policies[11]. Roodman (2003), Easterly et al. (2003) and Brumm (2003) also question the robustness of the findings of Burnside and Dollar[12]. Burnside and Dollar (2004) argue in a new study focusing on the 1990s that there is much stronger evidence to support the theory that aid stimulates growth (conditional on institutions), than the hypothesis that aid has the same positive effect despite the quality of

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[9]   Note that in practice the poverty efficient allocation is almost policy neutral because without policy correction the allocation is strongly biased towards poor policy countries. This results from the fact that the poorest countries usually have the poorest policies.

[10]   See e.g. findings by Alesina and Dollar (2000)

[11]   They stress, however, the decreasing returns to aid and point out that the estimated effectiveness of aid is highly sensitive to the choice of estimator and the set of control variables. Controlling for investment and human capital, no positive effect of aid was found. Yet, aid has an impact on growth via investment. See also the discussion on this subject in Guillamont and Chauvet (2001)

[12]   For example, Brumm (2003) suggests that the OLS regression results reported by Burnside and Dollar (2000) are questionable and that foreign aid affects economic growth negatively even in recipient nations with sound economic policies.

institutions[13]. While the evidence seems contradictory, the policy criteria in aid allocation still receives large support, although this approach has certain difficulties. For example, it is not clear how to determine a 'good policy environment' and how to measure it[14], or how to treat those countries that continue to struggle with poor policies[15]. However, most development economists would probably agree that aid has not been as effective as it should and could be and the failure by donors to take the policy environment into account offers one explanation for the poor effectiveness of aid[16].

Circumstances in the developing countries are undoubtedly important. But also donor behavior and the quality of donor organizations can have an effect on the effectiveness of foreign aid, even though this has been to a large extent neglected in the literature. Obviously, assuming that the Burnside-Dollar hypothesis is robust, the role of donors in aid allocation is of crucial importance in sorting out the best candidates. It is also important to note that donors' motives necessarily are not purely altruistic, in fact, they are probably only partly altruistic at best. Foreign aid is an extension of foreign policy and it has been

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[13]   However, Burnside and Dollar (2004) cannot completely reject the hypothesis that aid never works anywhere. See also their comments on the critique for Burnside and Dollar (2003).

[14]   For example, Collier and Dollar use subjective CPIA (Country Policy and Institutional Assessment) scores, some researchers use objective measures of macroeconomic policy.

[15]   Many researchers argue that the lack of good policy environment as such is not a reason for withdrawing foreign aid, but for using alternative methods of for aid delivery, such as non-governmental organizations (see e.g. Kremer, 2004).

[16]   Of course, other explanations exist as well. It is often claimed that the amount of aid is simply too small and that by increasing the amount of aid, better results would be attained. Yet, even if the level of aid is too low, this still does not explain the fact that in some regions aid seems to have had no effect at all. It has also been proposed that in practice aid has been more effective than can be extrapolated from aid statistics. Curiously, aid seems to be less efficient in the tropics (e.g. Hansen and Tarp, 2004), although this phenomenon is still unexplained. However, Easterly and Levine (2003) argue that the effect goes through institutions.

used to advance donors' self interests, be these political or economic. For instance, the goal of containing communism in the cold war era exemplifies political interests, and the practice of tying aid to purchases of donor country's own products constitutes economic interests. Further, donors have been accused of not including local officials in decision making processes, but still dictating how the aid funds are to be spent. This clearly affects the motivation of local officials to commit to development projects and policies. Finally, it is of utmost importance to recognize that multilateral donors are by no means impartial either, but operate in accordance to shareholder voting rights (for example, in case of the World bank, US clearly has an inbuilt majority).

The donor side can also have an impact on aid efficiency in many other ways. For example, task allocation within aid agencies, interaction of different parties (e.g. donors, sub-contractors, recipients) and evaluation and fundraising practices of donor agencies can affect the success of aid initiatives. There may be direct effects (such as the fluctuating availability of aid to recipients because of different practices) or more subtle effects (for example, the quality of aid project can be affected by task allocation inside an agency). Somewhat surprisingly, the microeconomics of aid delivery has not attained much attention until recently[17]. This dissertation aspires to contribute to this field of research.

Another issue taken up here is the high incidence of conflicts and civil wars in the third world. In general, most wars nowadays are intrastate and occur particularly in poor countries: currently 85% of civil wars occur in the poorest 15% of countries. Sub-Saharan Africa seems to be especially prone to civil wars and

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[17] See Martens et al. (2002) on the instistitutional economics of foreign aid and Murshed (2004) who addresses issues associated with donor behavior from the perspective of agency theory. See also Murshed and Sen (1995) who study the conditioning of aid on the reduction of military expenditure with a model of asymmetric information.

conflict. For instance, during period 1989-1997, the region witnessed 103 armed conflicts, of which 97 were civil wars. This dissertation focuses on conflicts in general, thus the study will not extend to particular types of conflict. It is important to note, though, that there are different typologies of internal conflict: rebellion, secession, ethnic strife and genocide.

Conflict seems to be poverty-related, even though the causality is somewhat unclear[18]. Consequently, civil conflicts in developing countries have been actively researched in development economics during the last decade[19]. The research includes topics such as the economic causes and consequences of civil wars, and the duration and nature of conflicts[20]. Recent empirical research tends to support the view that conflicts are an economic phenomenon, and that civil wars break out in the poor regions. For example, Collier and Hoeffler (1998; 2002a; 2002b) show that dependence on primary commodity exports[21], low average incomes, slow growth, and large diasporas are all significant predictors of civil war. The relation between inequality and conflicts has also been studied considerably both among political scientists and economists. In this context, inequality may refer either to vertical inequality (inequality among classes or individuals in general) and horizontal inequality (e.g. inequality among ethnic, cultural or religious groups). For example, Stewart (2000; 2002) sees horizontal inequality as one of the root causes of conflict. On the other hand e.g. Collier

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[18]   The possibility of poverty-conflict trap has been discussed by Blomberg et al. (2000)

[19]   See for example Collier (1999, 2000), Collier and Hoeffler (1998, 2002a, 2002b, 2002c) and Collier et al. (2003), Elbadawi and Sambanis (2000). See also the research by World Bank research project "The Economics of Civil War, Crime and Violence"

[20]   The current conflict research builds on earlier theoretical conflict models in economics (for example models by Grossman (1991), Hirschleifer (1989) and Skaperdas (1992)), which attribute war to economic factors. In these models the motivation for conflict is gaining control over contestable resources (e.g. natural resources) or capture of the state (its tax base).

[21]   The natural resource predation may be either the primary objective or offer a source of finance for pursuing other objectives; for example natural resources can be used to finance the conflict.

and Hoeffler (2002a) find that grievances are less significant in the incidence of conflict than opportunity factors. A recent study of Besancon (2005) points out that inequality may affect differently depending on the type of conflict[22]. All in all, results have been to some extent ambiguous and the role of inequality in creating conflict is not axiomatic. Finally, as for causes of conflict, it has been suggested that a vicious circle exists between conflict and poverty. On one hand, underdevelopment makes a country prone to conflict. On the other, conflict retards development and further weakens the conflict country's possibilities to escape from poverty[23].

In general, conflicts and civil wars in poor countries are extremely damaging for development: civil wars destroy resources and infrastructure -both public and private-, divert resources from production, destroy social capital, weaken if not totally topple governments, and may trigger a flood of refugees, which further causes problems in the neighbor countries. In addition, civil wars in developing countries tend to last longer than international wars creating a persistent hindrance for development[24]. Likewise, civil wars in developing countries are difficult to end and tend to re-emerge after a short period of peace or cease-fire. Obviously, the longer the duration of the civil war, the more devastating the negative impact becomes.

Material damages from a civil conflict can be massive, but clearly the largest burden in borne by the citizens of the conflicting countries. The number of civil casualties is high in developing countries, as civil wars typically involve a lot

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[22]   For example, deprived identity groups seem to be more likely to initiate a conflict once inequality has been somewhat resolved.

[23]   On the poverty-conflict trap, see e.g. Blomberg et al. (2000)

[24]   Collier, Hoeffler and Söderblom (2001)

of low intensity fighting, looting and violence against civilians rather than direct combat between armies. As a final point it must be noted that the adverse effects of internal conflicts are not limited to the conflict country itself or its immediate surroundings; there are global effects as well (Collier et al., 2003). For example, as a by-product, civil wars create territories not controlled by any government and these become strongholds for criminal activities[25]. Thus, it is clear that civil wars inflict considerable damage both to the countries at war and at the international level. It is therefore imperative that preventive measures are taken to promote peace in conflict regions. Civil wars are by nature a complicated phenomenon and the occurrence of conflict is triggered by various factors: political, social, economic, religious etc. Since this study concentrates on the economic aspects of conflict, other views have to be set aside when possible. Yet, objective and subjective grievances, inequality, ethno-religious aspects etc. are important in order to fully comprehend the profound causes of civil conflicts.

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[25] For example, it has been estimated that 95 percent of the production of hard drugs takes place in civil war countries and major supply routes pass through these regions. Civil war zones are also used as a haven by international terrorists, for example Al Qaeda chose to reside in the Taleban area in Afghanistan.

1.2   Overview of the essays

The first essay "Multilateral vs. Bilateral Aid -a theoretical approach" presents a microtheoretic analysis of aid allocation among multilateral and bilateral aid. This paper is motivated by the empirical observation that donor countries tend to disburse aid both in multilateral and bilateral form. For instance, in year 2001, 42.3% of Finland's development aid was channelled through multilateral organizations. Over 1996-2000 OECD countries disbursed on average 36% of their aid through multilaterals. For the U.S. the corresponding figure was 25% (McGillivray, 2003).

It is obvious that the delivery of foreign aid is a very complicated process even in its simplest form. The interaction among donors, recipients, possible sub-contractors and NGOs, requires careful planning and organizing. Presumably, the inclusion of additional participants and distribution channels is likely to increase the costs of aid delivery. This raises the question of why such a large amount of aid is disbursed through multilateral organizations, even though the use of a multilateral organization involves yet another party, probably complicating the process even more? It is an interesting question, especially as there is no clear evidence to indicate that multilateral aid would be more efficient. However, the current guidelines of aid disbursement suggest that for given level of poverty, countries with sound policies and institutional environment should receive more aid[26]. Here the use of a multilateral agency as a delivery channel may have certain advantages: for example, it has more resources for evaluating the quality of policies and is probably less biased towards certain recipients than bilateral donors, although it is important to note that in reality multilateral organizations

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[26]   In practice, there are problems with conditionality, in particular with time-consistency. See e.g. Svensson (2002).

may be biased as well. However, assuming that the multilateral organization
is neutral, or at least less biased than the individual donor governments, the it
may be more credible both in setting policy conditions and in adhering to them.
In general, donor behavior in the aid delivery process has not been researched
extensively, and the division of aid into bilateral and multilateral has not been
fully explained.

The central research problem is determining the optimal form of aid for donor
countries when the quality of policies and institutions in the recipient countries
is poor. The setup is a standard game-theoretic framework with three stages. The
players include donors, a (neutral) multilateral organization and recipients, and
the analysis is conducted both in two-country and in N-country framework. It is
assumed that donors are biased towards certain recipients, while the multilateral
organization follows established policy criteria in aid allocation. The game pro-
ceeds so that donors act first by deciding the amount of multilateral and bilateral
aid they contribute. Then, the recipient countries' governments establish their
policies, i.e. decide the proportion of aid they will use for the benefit of the
citizens. Lastly, the multilateral organization collects multilateral donations from
all donors taking into account the quality of policies disburses the funds to the
recipients .

Within this framework donor countries can efficiently control rent-seeking by
governments in the recipient countries by delegating the aid delivery process to
the multilateral organization provided that the multilateral organization is neutral.
It turns out that for altruistic donors it is optimal to have all aid delivered as
multilateral, even though there is a cost, i.e. part of the aid goes to not-favored
recipient(s). This result emerges both in a two-country and in a N-country frame-
work. The superiority of multilateral aid results from the ability of the multi-

lateral organization to credibly discourage rent-seeking. It is able to condition aid on the quality of the recipients' policies, which is not possible for bilateral donor. Multilateral organization effectively encourages the recipients to compete with each other for funds so that the country with the least distortionary policies is awarded the largest amount of aid. This of course is contingent on aid being a large component of the recipient country's budget. In this model, assuming that the recipient governments are distorted, bilateral aid cannot be justified solely on the basis of altruism. Instead, there has to be some additional utility related to bilateral aid to induce donors to contribute funds bilaterally. Obviously, the less distorted the recipient country's government is, the more attractive bilateral aid becomes.

It is acknowledged that the results of this paper are quite extreme. Clearly the theoretical examination is bound to exclude many factors that are present in real life situations, for example the model assumes that foreign aid is the only form of assistance, which of course is not the case in the real life. Thus, the findings of this model are not to be taken as policy conclusions *per se*. However, it does offer one explanation for the existence of multilateral organizations. It is important to note that the model does not assume the multilateral organization to be more effective in aid delivery than bilateral donors, it only assumes that the multilateral organization is not biased towards certain recipients. In reality, the reason for multilateral aid has often been contributed to the fact that multilaterals have special knowledge and expertise, which makes them more efficient in aid delivery. The fact that the multilateral was chosen in this model, even though that assumption was not made, makes the result somewhat stronger.

The second essay "Non-profit competition" continues to examine donor behavior and its implications on the welfare of aid recipients. Presently, there are

numerous non-profit organizations (NPOs) working in developing countries, and
their importance in aid delivery has been growing over the past few decades.
Besides the local small NGOs, there are a number of international non-profit or-
ganizations whose work is financed by donors in the developed world. This essay
analyzes the interaction within non-profit organizations, and between non-profit
organizations and philanthropic donors. The analysis is based on a presumption
that the interaction between non-profit organizations is essentially competitive, so
that these non-profit organizations compete with each other for available donor
funds. The central question is: how does the competition affect the recipients,
i.e. do they get more or less assistance because of competition. In addition,
the implications of the degree of market differentiation and donor altruism are
studied.

Non-profit behavior, or altruism in general, has been a topic of active research
for decades, but the focus has mostly been on how to model altruism with regard
to donor's utility[27]. There is little research on the market of non-profit organiza-
tions and the possibility of competition has been to a large extent omitted from the
discussion[28]. The essay "Non-profit competition" presents a theoretical frame-
work building on the traditional Hotelling model of spatial competition. The
model has two charities that are assumed to be differentiated, and a continuum
of donors whose location reveals their preferences concerning the two charities.
As in the Hotelling model, donors have to pay a 'transportation cost'. Within the

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[27]   Essentially, does a donor receive utility from the welfare of the beneficiaries to which
he or she aims to contribute (the public good approach), or from the act of giving itself (the
"impure altruism" approach)? See Rose-Ackerman (1996) for a summary of altruism research in
economics. On the public good approach to altruism, see for example Bergström, Blume and
Varian (1986) and on "impure altruism" see Andreoni (1989;1998).

[28]   See, however, Bilodeau and Slivinski (1997) who examine competition among charities
assuming the public goods approach. Also Glaeser and Schleifer (1998) examine the non-profit
market.

current context, this cost represents the importance of donor preferences. The higher the 'transportation cost', the more costly it is for a donor to contribute to a charity whose preferences are different from that donor's preferences. In the first period charities announce their supply functions, i.e. how much they will produce for a given amount of donations. For analytical convenience production is assumed to be simply the redistribution of funds to the beneficiaries. In the second period donors have to decide which one charity to contribute to, taking into account the policy decisions of charities. The analysis is conducted both with non-altruistic and altruistic charities.

Within this framework the motivation for cost reduction is low if the charities are non-altruistic, because any cost increase is borne by recipients who simply receive less. It is also shown that the higher the 'transportation cost' (the stronger are the preferences of donors), the smaller the utility of beneficiaries, while the utility of non-profits increases. In case with altruistic NPOs, both the quality and quantity of production increase with non-profit's altruism, but again the increase in the 'ideological transportation cost' decreases the amount produced thereby decreasing beneficiaries' utility. Finally, motivation for cost reduction is strong for altruistic non-profits, as they themselves have to bear part of the burden of cost increase. In general, it can be stated that competition among charities is beneficial for recipients, especially when the NPOs are non-altruistic. Competition forces these to act in favor of the recipients, which they would not do otherwise.

In the third essay the focus shifts to conflicts in developing countries. The essay "Trade, War and Peace" concentrates on the role of trade in conflict resolution[29]. According to the classic liberal theory, trade increases peace through the interdependence argument. In other words, trade creates interdependence that

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[29] The essay is joint work with professor Pertti Haaparanta

motivates countries to focus on trade instead conflict, since the latter alternative decreases their own welfare as well. The reasonably peaceful era in the industrialized world since the 2nd World War has been largely attributed to trade. In addition to the direct peace-creating effect of trade, it has also been proposed that trade promotes peace indirectly. According to this hypothesis, trade creates wealth and increases growth, which lead to greater stability[30]. In the developing world, however, attempts to open up trade have not succeeded in creating peace. It is not clear whether this is due to the fact that the extent of integration is still rather low, or is it simply that trade can not mitigate conflict at all. While the interdependence argument is convincing, it has been suggested (e.g. Collier and Hoeffler 1998) that access to the world markets may, in fact, improve the possibilities of potential rebels to start hostilities by making the financing of the conflict easier.

Typically the objective of the research on the interaction among trade and conflict is to find out how opportunities to mutual trade affect countries' arming decisions, i.e. does trade bring about positive security externalities[31]. These studies apply well to interstate wars. However, as most conflicts today are intrastate, the possibility of trading with other countries that are not involved in the conflict is also relevant. The third essay "Trade, War and Peace" concentrates on this topic by extending the basic trade and conflict model so that intrastate conflicts can be examined. The framework builds on the conflict model tradition developed e.g. by Skaperdas and Syropoulos (1996; 2001). The model includes two conflict regions and a peaceful third country (the rest of the world). For

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[30] This point has been taken up by Hegre et al. (2002). It is also argued by Collier in numerous articles (see eg Collier et al. (2003)) that low income increaes the risk of conflict. Thus, if free trade increases incomes, the conflict risk decreases.

[31] See for example Skaperdas and Syropoulos (2001)

analytical simplicity all countries are assumed to be exchange economies. First, conflict countries invest in arms after which war erupts. Then, after the period of hostilities goods are exchanged in world markets with the third country. The key question here is to determine whether the possibility to trade with the rest of the world increases or decreases the intensity of local conflict. The essay also takes up another important issue within the international trade context, i.e. trade barriers. Affecting incomes and changing relative prices, trade barriers can have an impact on military investment and thus on the incidence of conflict. Lastly, the essay considers the implications of asymmetric price determination process with regard to conflicts

The essay "Trade, War and Peace" argues that with standard utility functions (Cobb-Douglas and Stone-Geary) the possibility to trade with outside countries increases the intensity of conflict. This is surprising, as it is contrary to the popular interdependence argument. The result is attributed to the positive terms-of-trade effect that dominates in this model. With Stone-Geary utilities the intensity of conflicts can decline when the income in conflict countries increases, which is consistent with empirical evidence. Finally, the paper examines trade restrictions. The role of tariffs is twofold and somewhat ambiguous: tariffs can either increase or decrease conflict. Thus, it is possible that trade barriers set by outside countries can actually intensify conflict, although their existence is justified at times for the reason that they promote peace.

Trade liberalization can be one means to influence conflicts in the developing world. Another, more direct method is peace-building and peace-keeping operations. The fourth essay "Peace-building and Local Conflicts in Developing Countries" concentrates on the economic aspects of peace-building[32]. Although

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[32]   The essay is co-authored with professor Pertti Haaparanta

peace-keeping operations have a long history (the first UN peace-keeping oper-
ation dates back to 1948), they have become a topic of economic research only
recently. The economic theory of peace-building explains the actions of outside
nations based on the assumption that the operations will be executed only if they
are economically rational for the participating countries. This paper extends the
trade and conflict framework used in the essay "Trade, War and Peace". This
time the role of the third country is more active; it can engage in peace-building
operations. The essay distinguishes between ex ante (pre-conflict) and ex post
(post-conflict) peace-keeping. Ex ante measures refer to actions that attempt
to prevent a conflict or at least to mitigate it. These may include measures to
reduce the efficiency of resources devoted to conflict or the formation of safe
zones. Respectively, the aim of the ex post measures such as rebuilding and
reconstruction is to minimize the damage inflicted in the conflict region. The
main objective is to find out when it is profitable for the outside world to engage
in peace-keeping operations, and what are the consequences of these operations.

In this essay we find that if peace building measures are taken into account,
the intensity of conflicts can decline when the conflict country's income increases
(which is consistent with empirical evidence). Thus, the result of the essay
"Trade, War and Peace" is reversed when peace-building is included. This paper
also argues that incomplete pre-conflict peace-building operations will in fact
increase military buildup. In contrast, successful pre-conflict peace-building
is contingent on the outside countries being sufficiently rich, and the conflict
countries also having a high enough income (which conforms with the existing
empirical evidence). Finally, it is noted that post-conflict operations are time-
consistent only if the outside country is sufficiently rich. Repairing war damage,
however, is counterproductive, as it increases military investments.

1.3   Concluding comments

This dissertation takes up current issues in development economics and analyzes them from a microeconomic perspective. The methodology and the problems selected represent a substantially new research field in development economics. Although (empirical) macro analysis continues to be important in development research, the use of microeconomic tools is also vital in understanding the multifaceted problem of underdevelopment. The topics of this dissertation, aid effectiveness and conflicts, have received increasing attention among researchers during the last decade. Having said this, it must be acknowledged, however, that the problems related to these subjects are by no means fully understood and this study aims to present a somewhat different viewpoint on these issues. However, the potential to derive policy conclusions based on the findings of this dissertation is somewhat limited, as the focus is solely on theoretical examination. Thus, the empirical assessment of the topics is the natural extension to the analysis. There is also plenty of room to continue with theoretical research. For instance, the understanding of the microeconomics of foreign aid allocation and delivery, as well as the functioning of multilateral organizations require more research effort. Similarly, as we are witnessing new conflicts constantly emerging in developing countries, the search for optimal rope of the developed nations in promoting peace must be continued in economics. In conclusion, the key objective of this thesis is to take up from a novel perspective a few important issues of conflict and aid effectiveness for further study by the author and other researchers in development economics.

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Chapter 2
Multilateral vs. Bilateral Aid - a theoretical approach

2.1   Background

This paper analyzes foreign aid delivery within a game theoretic framework. The model focuses in particular on the role of a multilateral organization, and on the decision-making process of donor countries, multilateral organization, and recipient country governments. The model also attempts to take into account the interaction among these parties. The objective is to explain what determines the grouping of donor funds into bilateral and multilateral aid, i.e. why donors contribute a large share of aid through multilateral organizations. In this paper, by delegating the aid delivery process to a multilateral organization, donor countries can effectively control rent-seeking in recipient countries. However, donors face a trade-off: either they lose control over donations or disburse funds to rent-seeking officials. If a recipient country's government engages in rent-seeking, it becomes optimal for altruistic donors to give all of their aid in multilateral form. The result holds even if the donors are biased towards certain recipients and emerges equally in a two country and in an N-country framework.

The problem discussed here relates to the literature on the effectiveness of foreign aid. The intuition is that the mechanism of aid delivery can be important for aid effectiveness. While the literature is quite large, the results are somewhat contradictory. First of all, there is the so called micro-macro paradox[33]. This means that while the results from case studies, project evaluations and other

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[33]   The term was first used by Mosley (1986).

micro analyses have generally indicated that aid is efficient, this has not been the case for macro studies. The evidence, however, is inconclusive for the macro studies. Some studies find that aid has no significant effect on economic growth, or on other development indicators (Boone, 1996), and it has even been suggested that the relationship between aid and growth can be negative. The famous argument by Bauer states that aid promotes dependency on others and therefore traps development countries in a vicious circle of poverty (Brumm, 2003). In the late 1990s, however, new empirical findings were introduced by Burnside and Dollar (1997, 2000) as well as Dollar (1998), Dollar and Svensson (1998), among others[34]. According to these studies, aid in itself is not enough to promote growth, but when directed to countries with sound policies, aid can work. The so called poverty efficient aid allocation favors countries with high poverty, low per capita income and sound policy regimes. Thus the optimal aid allocation should take into account both poverty and policy criteria.

The findings of the above mentioned researchers received a lot of attention, and the aid allocation practice they recommended has been adopted by such multilateral donors as the World Bank. Nevertheless, as popular as these findings have become, they have been recently challenged (see e.g. Roodman, 2003; Easterly, Levine and Roodman, 2003; Brumm, 2003; Hansen and Tarp 1999, 2001, and Guillamont and Chauvet, 2001). One key aspect of the critique has been the robustness of these findings[35]. Yet again, in their novel study, Burnside and Dollar (2004) find, that there is much stronger evidence to support the claim

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[34]   McGillivray (2003) offers an update survey of current research. See also Collier and Dollar (2004) for summary of central findings in aid effectiveness research.

[35]   For example, Brumm (2003) suggests that the OLS regression results by Burnside and Dollar (2000) are questionable and that foreign aid affects economic growth negatively, even in countries with sound policies. In contrast, Hansen and Tarp (1999, 2001) argue that aid increases the growth rate, and that this result is not conditional on 'good' policy. Guillamont and Chauvet (2001) find that the effects of aid are positive in a bad environment. According to them, aid seems to have accelerated growth only in the more vulnerable countries.

that aid stimulates growth (conditional on institutions), rather than the hypothesis that aid has the same positive effect regardless of the quality of institutional environment[36]. However, they are not able to completely reject the hypothesis that aid never works anywhere. It is also important to note that when discussing about the efficiency of foreign aid, the methodological issues are of central importance. It is not clear to date, whether the negative results observed in aid studies are really telling the truth, or whether the macro analysis somehow fails to capture the positive effects of aid[37].

Although the debate on aid effectiveness is still ongoing and clearly requires more empirical and theoretical work, at least to some extent there exists consensus that aid can work, especially if targeted to countries with a stable political and economic environment. Nonetheless, the research indicates that aid has not been systematically channelled to countries with sound policies[38]. Furthermore, it seems that aid has not been directed to the poorest countries either[39]. Therefore, it can be suggested that the actual aid allocation has been based on neither policy nor development criteria. As will be discussed later in section 2.2, there is substantial amount of research to support this claim.

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[36]   In addition, see their reply to the critique in Burnside and Dollar (2003). See also Collier and Dollar (2004).

[37]   See for example Hansen and Tarp (1999) for an examination on the literature of aid and growth. They argue, in fact, that studies claiming that aid is inefficient are actually in the minority and that the positive evidence is convincing.

[38]   For example, Collier and Dollar (2002) argue that the actual aid allocation is very different from the poverty-efficient one. Also Svensson (2002) concludes that foreign aid funds have not been directed to countries which could have made most efficient use of the resources in terms of poverty relief or growth.

[39]   It is important to note that the poverty efficient allocation recommended by Burnside and Dollar is actually almost neutral with respect to policy. The fact that policy is taken into account simply corrects the bias towards countries with poor policies. The bias is implicit when aid is targeted towards poorest countries, which also have the poorest policies. See Collier and Dollar (2004) for more detailed discussion.

Typically, the effectiveness of foreign aid has been analyzed from a macro perspective, concentrating mainly on the political and economic circumstances in recipient countries. While this evidently is an important consideration, it is not the only one. Recently the research has started to focus not only on the behavior of the recipients, but also on that of donors. For example, Martens et al. (2002) analyze the institutional economics of foreign aid and especially the behavior of various organizations in the foreign aid delivery chain[40]. They do not, however, consider what might be the optimal delivery mechanism.

Undoubtedly, the delivery of foreign aid is a very complicated process even in its simplest form. The mere interaction among donors and recipients, possible sub-contractors and NGOs, all of which can have different preferences, is likely to be quite troublesome. This raises a question: why then is a large share of aid disbursed through multilateral organizations, even though the involvement of a multilateral organization brings in yet another party, probably complicating the process even more? For instance, in year 2001, 42.3% of the development aid given by Finland was channelled through multilateral organizations. For the U.K. the respective share in 2001-02 was 46%. Over 1996-2000 OECD countries disbursed on average 36% of their aid through multilaterals while for the U.S. it was 25% (McGillivray, 2003). Thus, the role of multilateral organizations is of importance in foreign aid delivery. However, it is still not clear whether multilateral aid is more successful than bilateral *per se*. In fact, there is no solid evidence in favour of either form of aid, and the division of aid into bilateral and multilateral forms has not been fully explained.

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[40] See also Murshed (2004) who analyzes the behavior of donors and aid agencies from a principal-agent perspective. The paper also discusses aid policy formation.

This chapter is organized as follows. First, the framework is introduced briefly in Section 2.2. Then the analysis proceeds by assuming specific functional forms and a two country framework in Section 2.3. Section 2.4 extends the case for N countries and discusses alternative possibilities for modeling donor behavior. Section 2.5 concludes.

2.2   Introduction to the framework

The model assumes a three stage game involving a multilateral aid organization, recipients, and donors, where donors and recipients can be understood as countries. In the basic version of this model there are only 2 donors, one multilateral organization, and 2 recipients. It is further assumed that donors are altruistic[41], but in a biased way: donor 1 cares for the utility of recipient 1 and donor 2 respectively for the utility of recipient 2. Let us briefly discuss this assumption before proceeding with the model. There is considerable empirical evidence supporting the claim that bilateral aid allocation has been distorted. To mention a few, Alesina and Dollar (2000) find that the direction of bilateral aid flows has been determined by donors' political and strategic considerations, instead of the true needs of the recipients[42]. According to Alesina and Dollar, colonial history and political alliances have been the major determinants of foreign aid. Furthermore, one should also note the practice of tying aid to products or services offered by donor country producers which was common particularly previously. As for the policy criteria, Alesina and Weder (1999) examined the relation between corruption and aid and find no evidence to indicate that less corrupt countries receive

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[41]   It is recognized, of course, that whether foreign aid in general is given based on altruism is still unclear. As already mentioned in the introduction, foreign aid has been used as a part of foreign policy to advance the interests of donors, not necessarily the interests of the recipients.

[42]   The misdirection of aid funds has been noted by many other researchers too, see e.g. Dollar and Burnside (2000), Svensson (1999).

more foreign aid. It is also noted that only a part of the aid funds has actually gone to the least developed countries, and that a large share of funds has ended up in rather prosperous developing countries (for example Israel). Remarkably, the proportion of aid disbursed to more developed countries has been higher for the U.S., the U.K. and France than for Nordic countries or Japan (Lahiri and Raimondos-Moeller, 2000). Sarafidis (2002) also finds that countries which vote similarly to the U.S. get a larger per capita share of aid, although recipient needs are also significant determinants. On the other hand, Arvin et al. (2002) find that the Italian aid allocation has been biased as well[43], and the same seems to apply for Japan[44]. Despite the seemingly biased practices, the recent research indicates that the situation may be changing. Burnside and Dollar (2004) find that in the 1980s, there was no significant relationship between aid (either ODA[45] or IDA[46]) and institutional quality. However, parallel regressions for the 1990s reveal a somewhat different situation; both ODA and IDA are positively correlated with the quality of institutions. Interestingly, this relationship for ODA is still not very strong, but is noteworthy for IDA. This could reflect the fact that IDA funds (multilateral aid) have been targeted better than overall assistance which includes also bilateral aid.

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[43]   Italy seems to have favored middle-income countries and countries geographically close to Italy.

[44]   As for Japan, Katada (1997) has analyzed Japan's aid flows to Latin America and the Caribbean during 1971-1991, and concludes that foreign aid to that region has had various objectives. In addition to furthering Japan's own political and economic interests, Japan has improved its relationship with the U.S. by furthering the U.S. interests in the area, and these factors have contributed to aid allocation decisions.

[45]   ODA=Official Development Assistance

[46]   International Development Association (of the World Bank)

All in all, it appears that donor countries have some traditional "favored countries" which they tend to assist[47]. Even though there are signs that this tendency may be diminishing, it would be too optimistic to think that current aid is distributed on the basis of development considerations only. Historical reasons (for example colonial past) can play a role in bringing some developing countries "closer" to the donor and thus creating obvious candidates as aid recipients. One must also take into account the fact that no single donor is simply large enough to support all of the developing world, and has to make a choice regarding the countries to assist. Yet again, this donor-recipient relationship, once developed, is difficult to end, even if theoretical aid allocation guidelines support this option.

Timing in the model is the following: first, donors decide on the amount of multilateral and bilateral aid they are willing to contribute, taking as exogenous the total amount of foreign aid they can give. Thus, the decision regarding the total amount of resources to be devoted to foreign aid by donor countries is left out of this discussion [48]. At the second stage, after donors decisions, recipient governments respond by taking the donor decisions as given. Recipient governments select their policy considering the use of funds. Specifically, they will choose how much to use on poverty alleviation and how much to capture for own use. The latter option will called "rent-seeking" later in this paper. Finally, at the last stage the multilateral organization decides how to allocate the multilateral aid between the two recipients.

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[47]   For example, from early 1970s to early 1990s, about one third of total assistance given by the U.S. has gone to Egypt and Israel. During the same time period France has given 57% and the U.K. 78% of total aid to their former colonies.

[48]   It would be simple to include an outside option for the donor, but this would not add anything relevant to the current discussion.

This choice of timing may be contested by suggesting that it is the recipients who decide first and donors act accordingly. However, as we are interested in the functioning of conditionality in aid allocation process, it seems natural to assume that donors make the first move, i.e. set the conditions. Clearly, government policy choice (regarding rent-seeking practices) that is followed by donor decisions would still take into account the amount of aid in a framework where donations are determined by a concave "utility from helping"-type of donor preferences. In this case, however, it should be assumed that these preferences are known to recipients at the time of their decision. The current framework does not require this.

In addition to timing, the choice of players may raise some questions. This paper treats donors and the multilateral organization separately, whereas often in aid literature these two are often considered to be a single party (donor). Yet, as the multilateral is a separate organization with its own goals and projects, and even though its actions are at least to some extent affected by the views of the donor community, it seems reasonable in the model to separate the donors from the organization representing them in multilateral aid delivery.

Finally, the use of the term 'rent-seeking' requires a few words of clarification, as it appears in the literature in many different connotations. In this paper the term is used in a broad sense to mean any exploitation or misuse of (aid) funds by the government or officials or in general by the political elite in power. The funds are not used for the benefit of the citizens, but end up either to the government (and its favoured groups) or are wasted otherwise. The exploitation may, or may not be deliberate, the latter case referring to situation with weak policymaker unable to take adequate measures to prevent the rent-seeking by certain groups. It is acknowledged that rent-seeking is different from quality

of policies and clearly policies and institutional framework cannot be changed quickly. However, it is assumed that rent-seeking level reflects the willingness to change policies and is a step towards that direction.

The model is solved by working backwards, so we first start by analyzing the last stage, i.e. multilateral's problem. Multilateral organization is assumed to be utilitarian and unbiased, i.e. symmetrically altruistic towards both recipient countries[49]. Clearly this is a somewhat oversimplifying assumption, as the multilateral's neutrality and altruism may also be questioned. However, as the multilateral organization represents many different donors, it is likely to be less biased than the individual donor countries. In this model the multilateral organization acts according to the explicit goal of multilateral development organizations, i.e. it rewards good policies[50], which in this model means a low level of rent-seeking by the recipient government[51]. It is acknowledged that in practice there is obviously more to the quality of policies than just the level of government rent-seeking. Within the model, however, it is analytically reasonable to include the choice of one variable only. A multilateral organization, by maximizing its own utility, now creates competition between the recipients of foreign aid resources. This behavior is optimal for the multilateral organization itself as well, because

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[49]   Here altruism is defined so that the utility of an altruist depends on wealth or consumption of the beneficiary.

[50]   In practice, the multilateral organizations aim to reward sound policies and institutions. Institutions, however, are not variable in the short run so we do not include the determination of their quality in the discussion. On the distinction between institutions and policies, see e.g. Easterly and Levine (2003).

[51]   It must also be noted that there are problems with the allocation decisions of large organizations as well. E.g. Svensson (2003) points out to the problem of time inconsistency in the behavior of large aid organizations, namely the separation of the allocation and disbursement decisions. This means that actual disbursement does not depend on the relative performance of the recipients, but the amount, once allocated to certain country, also gets disbursed despite of the circumstances. In this case, the problem is that while policy criteria exist, they are not observed in practice.

of its utility function. In the basic version of the model, the utility function of the multilateral organization does not explicitly take into account poverty in the recipient country, but allocates aid only according to policy performance only. It is assumed that the potential aid recipients are all extremely poor countries, so that they only differ in the quality of government. Obviously, this is a simplification. However, in terms of the current model the simultaneous inclusion of both policy and poverty criteria becomes analytically overly complicated .

The framework also assumes that the multilateral organization makes its disbursement decisions independently and unbiasedly, i.e. once donors have contributed a given amount of aid to the multilateral, they give up the right to influence the future use of these funds. In reality, multilateral organizations have to take into account the opinions and objectives of the donors as well, and the objectives of multilateral and bilateral donors may be conflicting[52]. Moreover, in reality the multilateral aid allocation may be very biased as well. In the model, however, the multilateral organization is independent of donors, and this is exactly why it can act as a commitment device for donor countries. Being independent, the multilateral organization offers donors a means to credibly tie their hands and to fight rent-seeking. It is implicitly assumed that donors cannot commit to behave similarly as the multilateral with respect to the performance of the recipients, because they are altruistic towards certain countries only. In addition, altruism may make donors prone to the so called Samaritan's dilemma, where it is in the single donor's interest to assist its preferred country, irrespective of the conditions[53].

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[52] See Murshed and Sen (1995) for donor interaction in the context of adverse selection with different types of donors dealing with one agent. In that model donors are better off if they can trade in these conflicting objectives.

[53] In the context of aid effeciency the Samaritan's dilemma has been analyzed recently by Pedersen (2001). He finds that actions of an altruistic donor may cause a deterioration of the

In the second stage of the model, the recipient observes the division of aid into multilateral and bilateral, and chooses the level of rent-seeking (β) to maximize its own utility. Here "recipient" refers to the government of the recipient country, that is assumed to be at least partly, if not totally, distorted. The recipient i, $i = 1, 2$ takes into account the effect of β_i on the multilateral aid it receives. The recipient faces a clear trade-off: the higher the level of rent-seeking, the lower the share of aid, *ceteris paribus,* it gets from the multilateral. On the other hand, by increasing rent-seeking, trivially, the resources acquired increase. Decisions by the recipients depend on the total amount of aid, opponent's rent-seeking, and bilateral aid. Recipients act simultaneously and recipient $i's$ policy choice is assumed to be the best response to the policy choice of the other recipient. Thus, we look at Nash equilibrium.

Finally, in the first stage donors decide the amount of bilateral and multilateral aid they give while being altruistic towards their favorite recipients. Therefore, it is logical to write donor's utility as a function of the welfare of the recipient citizens. Donors are highly averse to rent-seeking by the government, i.e. they only get utility from welfare accruing to the citizens, not to the recipient government. Since donor behavior is modelled from a single donor country's point of view, it is possible to take into account the effect of donor interaction, which often is omitted in aid discussion[54].

Donors, like recipients, act simultaneously in a non-cooperative fashion too, playing the best response to other donors' actions. It is important to note that a donor can significantly affect the quality of government policies in its favoured

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relative distribution of income and increase poverty as an altruistic donor is not credible in setting conditions.

[54]   Often models study donor-recipient interaction and there are assumed to be only one donor or several donors acting as a uniform group.

country, within certain limits of course. Through the determination of the rent-seeking level of the recipient the donor can also influence the multilateral's decision. Donor's equilibrium choice for bilateral aid becomes a function of the total amount of aid available, and the decision of the other donor.

In the next section the problem is analyzed in detail using specific functional forms.

2.3   Case of 2 donors and recipients

In order to obtain specific results the analysis is conducted using functions of CES-type. The setup is simplified by restricting the examination to a case of 2 donors and 2 recipients. Let the multilateral organization maximize the following problem:

$$\max_{m_1,m_2} \frac{[(1-\beta_1)\,m_1]^\rho}{\rho} + \frac{[(1-\beta_2)\,m_2]^\rho}{\rho} \tag{2.1}$$

$$s.t.\; m_1 + m_2 = M$$

where β_i is the level of rent-seeking for recipient country i, $0 \leq \beta_i \leq 1$, $M = m_1 + m_2 = a_1^m + a_2^m = (A_1 - a_1^b) + (A_2 - a_2^b)$, i.e. the total amount of multilateral aid by donors 1 and 2. A_i is the total amount of aid given by donor i and respectively, a_i^b and a_i^m are the amounts of bilateral and multilateral aid by donor i. The multilateral must decide on the shares of multilateral aid m_i it disburses to both recipients $i = 1, 2$ taking total amount of multilateral aid M as given. Rent-seeking means that the recipient country's government can take a share β_i of funds for its own use, leaving only $(1 - \beta_i)$ for the people. In order to maintain analytical simplicity, it is assumed that $0 < \rho < 1$. This can be done without jeopardizing the results, since allowing negative values for ρ would not add any relevant insight into the discussion. Also, usually in CES-utility

functions both terms in 2.2 should have an exponent $\frac{1}{\rho}$, but in this case it would not add anything to the results either and is therefore left out.

The utility function (2.1) has been simplified as much as possible to keep the analysis tractable. To this end, parameters indicating income in the recipient countries and bilateral aid are left out here, but are included in the next section. Thus, the multilateral is assumed to receive utility only from the impact of its own aid for the benefit of the recipient countries' citizens. This of course requires some explanation. If a multilateral is truly altruistic towards poor countries, one would assume that it would get as much utility from any improvement in poverty, regardless of their source. Nevertheless, in addition to altruism the multilateral can have other motives, for example the so called empire building motive. In view of this, it seems reasonable that the multilateral's utility is increased as its own aid disbursement grows.

By solving the problem for the multilateral organization we obtain a solution for the optimal amount of multilateral aid for country 1:

$$m_1 = \left[\frac{(1 - \beta_2)^{\,\sigma}}{(1 - \beta_1)^{\sigma} \ + (1 - \beta_2)^{\sigma}} \right] \times \left[A_1 - a_1^b + A_2 - a_2^b \right] \qquad (2.2)$$

where $\left[A_1 - a_1^b + A_2 - a_2^b \right] = M$ and $\sigma = \frac{\rho}{(\rho-1)}$. Respectively, for country 2, $m_2 = (1 - m_1)$. This sharing rule gives the intuitive result that the recipient's share of multilateral aid is decreasing in rent-seeking by own government and increasing in the rent-seeking of the other recipient, *ceteris paribus*. This can be easily seen by calculating the partial derivatives:

$$\frac{\partial m_1}{\partial \beta_1} = M \times \frac{(1-\beta_2)^{\frac{\rho}{(\rho-1)}} \left(\frac{\rho}{\rho-1}\right)(1-\beta_1)^{\frac{1}{(\rho-1)}}}{\left[(1-\beta_1)^{\frac{\rho}{(\rho-1)}} + (1-\beta_2)^{\frac{\rho}{(\rho-1)}}\right]^2} < 0$$

$$\frac{\partial m_1}{\partial \beta_2} = M \times \frac{-\left(\frac{\rho}{\rho-1}\right)(1-\beta_2)^{\frac{1}{(\rho-1)}} (1-\beta_1)^{\frac{\rho}{(\rho-1)}}}{\left[(1-\beta_1)^{\frac{\rho}{(\rho-1)}} + (1-\beta_2)^{\frac{\rho}{(\rho-1)}}\right]^2} > 0$$

Due to multilateral's utilitarianism, the increase in the total amount of multilateral aid adds to the amount of multilateral aid for both countries in the same proportion as the countries receive aid. With this functional form necessarily $\beta_i < 1$, since $\frac{\rho}{\rho-1} > 0$. Thus $m_i > 0$ for both $i = 1, 2$. As for corner solutions it can be seen that $m_i \rightarrow 0$, when $\beta_i \rightarrow 1$ and $\beta_{-i} \rightarrow 0$. In this case, taking into account that the exponent σ is negative, $\left(1 - \beta_{-i}\right)^{\sigma} \rightarrow 1$ and $(1 - \beta_i)^{\sigma} \rightarrow \infty$, and thus, the whole term $\frac{(1-\beta_{-i})^{\sigma}}{(1-\beta_i)^{\sigma} + (1-\beta_{-i})^{\sigma}} \rightarrow 0$. Respectively, $m_i \rightarrow M$, when $\beta_i \rightarrow 0$ and $\beta_{-i} \rightarrow 1$. In that case $(1 - \beta_i)^{\sigma} \rightarrow 1$, but as $\left(1 - \beta_{-i}\right)^{\sigma}$ becomes infinitely large, term $(1 - \beta_i)^{\sigma}$ can be neglected and $\frac{(1-\beta_{-i})^{\sigma}}{(1-\beta_i)^{\sigma} + (1-\beta_{-i})^{\sigma}} \rightarrow 1$. When rent-seeking is the same for both countries, $m_i = \left(\frac{1}{2}\right)M$. This effectively means that multilateral aid is being disbursed to the recipient countries even if the level of rent-seeking is high. It is assumed that the multilateral is bound to disburse the available funds despite the conditions in the beneficiary countries. This framework does not allow for the possibility that the multilateral could withhold the funds and refrain from disbursing to either one of the recipients, should the conditions be very bad[55]. Finally, it has to be checked what happens if $\rho \rightarrow 0$ or $\rho \rightarrow 1$. In the former case the function approaches logarithmic and in the latter it becomes linear. The closer ρ gets to zero, the less the aid disbursement decision of the multilateral is affected by corruption. At the extreme when $\rho = 0$,

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[55] Svensson (2002) notes that aid that has been earmarked to a specific recipient country, usually gets disbursed even if its policy environment turns out to be poor.

both recipients get $(\frac{1}{2})M$ irrespective of their corruption levels. Conversely, in the linear case the marginal utility for the multilateral is constant and aid goes entirely to the country with lower rent-seeking level, i.e. $m_i = M$, if $\beta_i < \beta_{-i}$.

The next step is to analyze the behavior of the recipient country's government. The recipient government maximizes its own rents only (and rents of its favored interest groups) and does not care for the welfare of the people. This may sound rather severe, but disappointingly, it is not uncommon in the developing world. One can easily find countries where people live in extreme poverty while the ruling elite is very wealthy. Referring to the discussion earlier, rent-seeking can also be interpreted in this paper to mean not only the intentional appropriation of the aid resources, but poor quality of policies in general. This is certainly not to say that all governments in developing countries are rent-seekers and/or lack the ability to run their country properly. However, this study specifically focuses on countries with these characteristics, and therefore the utility function of the recipient country represents only its government's self-interest. An altruistic element could easily be included in the recipient's utility function, but is omitted as it introduces very little information while unnecessarily complicating the analysis. This possibility, however, is briefly discussed at the end of section 2.4.

Let us write the utility function for recipient 1:

$$\max_{\beta_1} \; \beta_1 \left[m_1 + a_1^b \right] \tag{2.3}$$

where m_1 is determined by equation (2.2) above. The first order condition can be written as an implicit function representation for the reaction curve of country 1. This form clearly reveals the trade-off between rent-seeking and received aid :

$$(m_1 + a_1^b) + \beta_1 \left(\frac{\partial m_1}{\partial \beta_1}\right) = 0 \tag{2.4}$$

It is straightforward to see that the first argument represents the positive effect from increasing rent-seeking. The second term captures the negative effect through decreased m_1. From the above equation (2.4) we can find out that (proof in *Appendix to Section 2.3*):

$$\frac{d\beta_1}{d\beta_2} > 0$$

This is to say that the rent-seeking levels are strategic complements near the symmetric case, provided that we do not allow $\rho \to 1$ (see details in *Appendix to section 2.2*). Thus, rent-seeking increases with an increase in the rival recipient's rent-seeking. The intuition is that as $\rho < 1$, the punishment for rent-seeking by the multilateral is not severe enough, especially if the levels of rent-seeking are not too different from one another. Although lower rent-seeking would mean a larger share of multilateral aid, this positive effect is not strong enough to induce the recipient to maintain rent-seeking at a lower level or to decrease it if the other recipient increases its rent-seeking.

It is also easy to find that:

$$\frac{\partial \beta_1}{\partial a_1^b} > 0, \frac{\partial \beta_2}{\partial a_1^b} > 0 \frac{\partial \beta_1}{\partial A_1} < 0, \frac{\partial \beta_2}{\partial A_1} < 0$$

Rent-seeking is increasing in the amount of bilateral aid, which is quite intuitive; the more aid the recipient is about to receive in bilateral form, the greater level of rent-seeking becomes optimal. Interestingly, rent-seeking is also increasing in bilateral aid received by the other recipient. This follows from the strate-

gic complementarity between rent-seeking levels. As an increase in a_1^b causes recipient 1 to increase its own rent-seeking, this further induces an increase in the rent-seeking level for recipient 2. Furthermore, if either donor increases its bilateral aid, this effectively reduces the total amount of multilateral aid resulting in more rent-seeking by the governments. The latter effect can be illustrated by the last two differentials: rent-seeking is decreasing in total amount of aid by both recipient's "own donor" (the donor that is favoring this particular recipient) as well as "the donor of the other recipient" (the donor favoring the other recipient), provided that a_1^b and a_2^b are held constant. This is equivalent to increasing the amount of multilateral aid. We can collect the discussion in the following:

Proposition 1   *Replacing bilateral aid with multilateral aid is a means of reducing rent-seeking in the recipient countries provided that the multilateral organization is neutral (or less biased) towards different recipients than individual donor countries.*

Solution to the recipient's optimization gives the equilibrium levels of rent-seeking for both countries. Unfortunately, an explicit solution for β_i cannot be found in the two-country framework either with the current sharing rule for the multilateral, or with other types of sharing rules where multilateral aid depends on rent-seeking[56].The situation is different, however, in an N-country framework, which is examined in Section 2.4 below.

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[56]   For example, the simple sharing rule $m_1 = \frac{\beta_2}{\beta_1 + \beta_2} M$ as well as the exponential form $(1 - \beta_1)^{-\alpha(1-\beta_1)m_1} = (1 - \beta_2)^{-\alpha(1-\beta_2)m_2}$ give only implicit solutions.

In the two country framework reaction functions with β_1 and β_2 implicitly defined can be written as follows:

$$\frac{(1-\beta_2)^{\sigma}\left[(1-\beta_1)^{\sigma}+(1-\beta_2)^{\sigma}\right]+\beta_1\left(1-\beta_2\right)^{\sigma}\left(1-\beta_1\right)^{\sigma-1}\sigma}{\left[(1-\beta_1)^{\sigma}+(1-\beta_2)^{\sigma}\right]^{2}}=$$

$$-\frac{a_1^{b}}{\left[A_1-a_1^{b}+A_2-a_2^{b}\right]} \tag{2.5}$$

$$\frac{(1-\beta_1)^{\sigma}\left[(1-\beta_1)^{\sigma}+(1-\beta_2)^{\sigma}\right]+\beta_2\left(1-\beta_1\right)^{\sigma}\left(1-\beta_2\right)^{\sigma-1}\sigma}{\left[(1-\beta_1)^{\sigma}+(1-\beta_2)^{\sigma}\right]^{2}}=$$

$$-\frac{a_2^{b}}{\left[A_1-a_1^{b}+A_2-a_2^{b}\right]} \tag{2.6}$$

Because rent-seeking levels cannot be solved analytically, we are able to solve the model only by conducting a numerical analysis. Before moving on to that, we need to specify the problem for donors. Donors are assumed to have identical total aid budgets A_1, A_2 so that $A_1 = A_2$. As specified earlier we postulate that donor 1 (donor 2) is altruistic towards recipient 1 (recipient 2). Let us write problems for donors:

$$\max_{a_1^{b}}\ (1-\beta_1)(a_1^{b}+\frac{(1-\beta_2)^{\sigma}}{(1-\beta_1)^{\sigma}+(1-\beta_2)^{\sigma}}\ \left[A_1-a_1^{b}+A_2-a_2^{b}\right]) \tag{2.7}$$

$$\max_{a_2^{b}}\ (1-\beta_2)(a_2^{b}+\frac{(1-\beta_1)^{\sigma}}{(1-\beta_1)^{\sigma}+(1-\beta_2)^{\sigma}}\ \left[A_1-a_1^{b}+A_2-a_2^{b}\right]) \tag{2.8}$$

where β_1 and β_2 are determined implicitly by (2.5) and (2.6) above. At

this point the donor decides how much to contribute in bilateral and multilateral aid, taking into account the effect of this decision on rent-seeking, and further through the level of rent-seeking, the effect on the multilateral organization's disbursement allocations (m_1, m_2). The analysis of the linkages between agents in the different stages indicates that, up to a certain point, the donor can influence the policy choice of recipients through its aid decisions. Obviously, this is an extremely strong assumption and the intention is not to claim that the donor alone controls rent-seeking. Yet, we are examining developing countries with very limited wealth and foreign aid to these countries is indeed an important source of income. Hence, it is possible that aid disbursement decisions can have a significant effect on the behavior of the recipient policymaker. Despite the considerable effect of aid decisions on government behavior, the power of donor is vertically limited. It is easy to check that even if both donors set $A_i = a_i^m$, rent-seeking still remains at a positive level. Another key point to note at this stage is that while the donor decides on multilateral and bilateral aid, it can at the same time influence the effectiveness of its own bilateral aid. By increasing multilateral and decreasing bilateral aid *ceteris paribus*, the donor can lower the level of rent-seeking, thus making bilateral aid more effective, as the amount targeted to recipient citizens, $(1 - \beta)a_b$, becomes larger.

Proposition 2 *Donors can affect rent-seeking in the recipient country and simultaneously influence the effectiveness of their own bilateral aid. In case of very poor countries the effect can be significant.*

The numerical analysis is conducted by assuming that the donor's total amount

of aid is 10 for both donors and letting bilateral aid to take any (integer) number[57] from 0 to 9. Rent-seeking levels are then calculated[58] for both recipients for all combinations of multilateral and bilateral aid and after that, donor utilities are calculated taking into account the effect on rent-seeking. This process enables us to determine the Nash equilibrium of the donor game.

The computation is carried out with different values for ρ (see *Appendix* for numerical solutions). It turns out that in equilibrium no bilateral aid is given. The same result emerges equally with all parameter values. Assuming $\rho = 1/2$, $\rho = 2/3$ or $\rho \rightarrow 0$ the equilibrium is $a_1^B = 0$, $a_2^B = 0$. Thus, with this particular setup, no interior solution is found and, perhaps surprisingly, there is no advantage in giving bilateral aid at all. When $\rho \rightarrow 0$, the equilibrium rent-seeking is extremely high, $\beta_i = 0.995$ for $i = 1, 2$. Of course, the magnitude of this number reflects the choice of multilateral's utility function. With this kind of function the penalty for high rent-seeking is negligible with small values of ρ permitting high β. With $\rho = 1/2$ the equilibrium β is still high, but at much lower lever though ($\beta_i \approx 0.667$). At $\rho = 2/3$ we obtain rent-seeking of somewhat more modest level ($\beta_i \approx 0.5$). This clearly demonstrates the influence of the multilateral organization on recipient government's policy. As a final point it is noted that when $\rho \rightarrow 1$, no pure strategy equilibrium was found. However, there may exist an equilibrium in mixed strategies. The rent-seeking levels are very low overall as ρ approaches unity. For example, with $\rho = 0.98$ if $a_i^b = 0$ for both $i = 1, 2$, rent-seeking is low ($\beta_i = 0.1817$). In this case, the multilateral penalizes for the misuse of aid resources severely. This presumably gives donors an incentive to provide bilateral aid as well, as rent-seeking can be driven

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[57]   In order for reaction functions to be defined, multilateral aid must be positive, therefore the range for value of bilateral aid is 0,...,9

[58]   The calculation has been conducted using Excel.

down to a low level with the cooperation of a powerful multilateral organization. Therefore, positive levels of bilateral aid seem intuitive with high ρ.

The numerical analysis also reveals an important fact about donor interaction: the lower the bilateral aid of the opponent, the higher the utility for donor i. This is intuitive; the more the opponent puts in the common pool of multilateral aid, the lower the rent-seeking for both recipients, thus benefitting the other donor as well.

Proposition 3   *It is optimal for both donors to give all of their aid in multilateral form as long as ρ does not approach unity.*

The results presented above give one explanation for the existence of multilateral aid. With this specification we get an extreme result; if the multilateral organization is neutral, i.e. bases its disbursement decisions on objective policy criteria, no bilateral should be given. If the preferences of recipients and/or donors are slightly modified to include an altruistic element in recipients' utility functions, or if we assume that donors somewhat prefer bilateral aid over multilateral, an interior solution can be found with positive levels of bilateral aid. This possibility is be taken up again in the next section. It is also important to note that in reality the neutrality of multilateral organizations can and should be questioned.

2.4   Case of N donors and recipients

This section focuses on extending the model for N donors and N recipients. Choosing the similar utility function as in section 2.2., the maximand for the multilateral can be written:

$$\max_{m_i} \sum_{i=1}^{N} \frac{[(1-\beta_i)m_i]^\rho}{\rho} \tag{2.9}$$

$$s.t. \sum_{i=1}^{N} m_i = M$$

Solution for (2.9) gives the following sharing rule that must hold for any recipient i:

$$m_i = \frac{\sum_{j \neq i}(1-\beta_j)^\sigma}{\sum_j(1-\beta_j)^\sigma} M \tag{2.10}$$

As in the case of 2 countries, the share of received multilateral aid decreases with the rent-seeking of own government and increases with the rent-seeking of the other recipient governments. Based on analysis in section 2.2 the problem for recipient i is straightforward to write, and will not be replicated here. The interesting question in the N-country framework is to detect what happens when the number of countries grows. We would expect that as the number of countries grows, the equilibrium level of rent-seeking becomes lower. This stems from the idea that increasing the number of potential recipients means that there are more candidates for the multilateral organization to target its funding. Thus, the competition for multilateral aid between recipients becomes more intense leading to lower levels of rent-seeking. By the same logic it can therefore be expected that bilateral aid becomes more attractive to donors as N grows. It is important

to note that this creates an incentive for the donors to free-ride. As there is a large number of donors, rent-seeking has presumably been driven to quite low levels, which makes bilateral aid more appealing from the donors' point of view. Now, the share of one donor's contribution in M is very small and therefore, if a single donor decreases its multilateral aid while correspondingly increasing bilateral, it does not increase rent-seeking much, as the totality of multilateral aid remains approximately the same. Thus, it may be beneficial from a single donor's point of view to increase bilateral aid while decreasing multilateral.

Let us assume that the number of countries (recipients and donors) approaches infinity[59]. Setting $N \rightarrow \infty$ leads to a very simple division rule for the multilateral organization. As the number of donors and recipients approaches infinity, the effect of the decisions of the single recipient and of the donor on the behavior of others becomes insignificantly small. In the case with $N \rightarrow \infty$ the optimality conditions can be written as follows:

$$m_i = \varphi\left(\beta_i, \beta, a^m\right) \tag{2.11}$$

$$\beta_i = \Psi(a_i^b, a^m, \beta) \tag{2.12}$$

$$a_i^b = \Phi(a^m, \beta) \tag{2.13}$$

where β_i is the rent-seeking of recipient i, β is the rent-seeking of other

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[59]   This is necessary as otherwise the model cannot be solved in N-country framework without assuming symmetry between recipients, i.e. $\beta_i = \beta$ for all i. Postulating symmetry already in the recipient stage causes problems, since it is not possible to solve the maximization problem for donors if recipient behavior has already been restricted to be symmetric.

recipients, a^m is the multilateral aid by a single donor and a_i^b the bilateral aid given by donor i. In order to solve the problem, we must also assume symmetry between recipients and donors at the last stage. According to equation (2.11) the equilibrium amount of multilateral aid to country i depends on the rent-seeking in that particular country, on the rent-seeking in other countries and on the amount of multilateral aid. This form is obtained by taking into account that when the number of counties approaches infinity, the total amount of multilateral aid M is approximately $N \cdot a^m$ and $\sum_j (1 - \beta_j)^\sigma \approx N(1 - \beta)^\sigma$. Rent-seeking by country i's government (equation (2.12) depends on its own bilateral aid, as well as on the multilateral aid given by donors and clearly on the rent-seeking of other countries' governments. Finally, equation (2.13) defines bilateral aid given by country i as a function of rent-seeking and multilateral aid by other donors. We also need to assume symmetry between donors and between recipients. Thus, the equilibrium conditions are:

Recipient symmetry:

$$\beta_i = \beta, \ \beta = \Psi(a_i^b, a^m, \beta) \tag{2.14}$$

Donor symmetry:

$$a_i^b = A - a^m, \ A - a^m = \Phi(a^m, \beta) \tag{2.15}$$

Finally, plugging (2.15) into equation (2.14) we get:

$$\beta = \Psi(A - a^m, a^m, \beta) \tag{2.16}$$

Hence, having two equations and two unknowns we are able to solve a^m and β.

The analysis proceeds in a familiar manner. First, assuming that $N \rightarrow \infty$, the division rule of the multilateral can be expressed as suggested by optimality condition (2.11):

$$m_i \approx \frac{(1 - \beta_i)^{-\sigma} a^m}{(1 - \beta)^{-\sigma}} \tag{2.17}$$

It is easy to see that $\frac{\partial m_i}{\partial \beta_i} = \frac{\sigma(1-\beta_i)^{-\sigma-1}a^m}{(1-\beta)^{-\sigma}} < 0$ and

$\frac{\partial m_i}{\partial \beta} = \frac{(1-\beta_i)^{-\sigma}a^m - \sigma(1-\beta)^{-\sigma-1}}{((1-\beta)^{-\sigma})^2} > 0$, i.e. multilateral aid is again decreasing in own rent-seeking and increasing in the rent-seeking of other governments.

Secondly, for any recipient i, the maximand can be written:

$$\max_{\beta_i} \beta_i(a_i^b + \frac{(1 - \beta_i)^{-\sigma} a^m}{(1 - \beta)^{-\sigma}}) \tag{2.18}$$

The first order condition for recipient i is:

$$a_i^b + \frac{(1 - \beta_i)^{-\sigma} a^m}{(1 - \beta)^{-\sigma}} + \beta_i \sigma \frac{(1 - \beta_i)^{-\sigma-1} a^m}{(1 - \beta)^{-\sigma}} = 0 \tag{2.19}$$

It is essential to note that when calculating the first order condition, we do not take into account the effect of β_i on the rent-seeking of others, β. As the number of countries approaches infinity, the impact of one country's decisions becomes negligible and can be ignored altogether. Provided that the second order condition holds (see *Appendix to section 2.4* for details), it is clear that $\frac{\partial \beta_i}{\partial a_i^b} > 0$, as it was in 2-country case as well. Rent-seeking is increased with more bilateral aid. Respectively, $\frac{\partial \beta_i}{\partial a^m} < 0$, i.e. increase in multilateral aid induces the recipient to reduce its rent-seeking.

As the problem the for recipient in (2.18) cannot be solved analytically for all values of ρ, the analysis is carried out by assuming specific values for ρ. The easiest case is to set $\rho = 1/2$. As postulated in the optimality condition (2.12) rent-seeking becomes a function of bilateral and multilateral aid and rent-seeking of other recipients:

$$\beta_i = \frac{1}{2} + \frac{a_i^b(1 - \beta)}{2a^m} \tag{2.20}$$

where $0 \leq \beta_i \leq 1$. The minimum rent-seeking share is as high as $\frac{1}{2}$, which is obtained by setting $a_i^b = 0$[60]. It is worth noting that the general rent-seeking level enters the function with the negative sign, with opposite-direction effect than that in the 2-country case, where rent-seeking levels were strategic complements (near the symmetric case). Conversely, now it turns out that if the general rent-seeking share β is raised (lowered), it is optimal for country i to decrease (increase) β_i because in the N-country case other recipients do not react to the policy choice of recipient i.

Finally, let us write the problem for donor i:

$$\max_{a_i^b} \ (1 - \beta_i)(a_i^b + m_i) \tag{2.21}$$

where m_i and β_i are as defined in equations (2.17) and (2.20). The solution is again $a_i^b = 0$, similarly as in the previous cases. Taking into account the equilibrium conditions (2.14)-(2.16) we find that $A - a^m = 0$ for all donors, i.e. $a^b = 0$ and $\beta_i = \beta = 1/2$ for all recipients. Utility for a single donor is therefore $U_{eq}^D = \frac{1}{2}A$. The respective values in the 2-country case with $\rho = 1/2$ were $\beta \approx 0,667$ and $U^d = 0.333A$. Thus, the government's share is lower in the

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[60] This, of course, reflects the choice of ρ which was quite small.

$N-$country setup as anticipated, and the introduction of large number of countries results in higher welfare for donors. The aggregate welfare of the recipient countries' citizens is also higher, i.e. aid effectiveness has been improved, since now the share of aid reaching the population is higher.

Proposition 4 *In the case of N donors and N recipients with $N \rightarrow \infty$ and $\rho = 1/2$, the optimal amount of bilateral aid is zero. Equilibrium amount of rent-seeking is lower and donor utility higher than in the equivalent 2-country case. The aggregate welfare of the recipient countries' people has improved. Again this requires that the multilateral organization is neutral and independent from donors.*

As pointed out earlier in the discussion, one would expect to see a free-rider effect emerging in the N-country case. In the current framework, however, this effect is not strong enough to induce donors to contribute bilateral aid. Rent-seeking increases rather rapidly with bilateral aid reaching its maximum level $\beta \rightarrow 1$ already at the stage when $a^b = \frac{1}{2}A$.

It is informative to doublecheck whether $a^b = 0$ is equilibrium, as this helps us to detect if the free-riding effect is present. This is done by calculating the utility for donor i in case of deviation. It is illustrative to use a simple numerical example: let us assume that donor i deviates by setting $a_i^b = 1$, while other donors remain in their equilibrium solution $a^b = 0$

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For simplicity let us set $A = 10$ for all donors. In this case rent-seeking by the recipient i is $\beta_i = \frac{1}{2} + \frac{a_i^b(1-\beta)}{2a^m} = \frac{1}{2} + \frac{\frac{1}{2}}{20} = \frac{21}{40} \approx 0.525$ and rent-seeking of the other recipients remains at $\beta = \frac{1}{2}$, as the impact of one recipient's decision on the decisions of others is insignificantly small and therefore ignored[61]. In addition, even though donor i deviates and sets $a_i^b = 1$, the other donors retain their equilibrium choices. As the number of donors approaches infinity, the impact of this one donor's choice is negligible. Therefore, a^m remains at 10, despite the fact that one donor has deviated. Utility for donor i in case of deviation is $U_i^d = (1 - \frac{21}{40})(1 + \frac{(1-\frac{21}{40})\cdot 10}{\frac{1}{2}}) = 4.9875$, while in case of $a_i^b = a^b = 0$, the equilibrium utility $U^d = 5$. Thus, it does not pay to deviate. This example shows that despite the positive free-riding effects, the donor is still better of by remaining in the symmetric equilibrium with zero bilateral aid. This is due to the fact that there is a counter-effect which offsets the positive free-riding effect for the donor. As the donor increases its bilateral aid, rent-seeking in the target country increases compared to the situation $a_i^b = 0$, while rent-seeking in other countries remains at the equilibrium level, which is lower than β_i. Consequently, recipient i receives smaller amount of multilateral aid and this obviously decreases utility for donor i. In addition to the indirect effect, higher rent-seeking naturally decreases donor's utility directly as well. Thus, it is not profitable to increase a_i to positive levels.

Next, let us examine a similar case with $\rho = 2/3$. Again, this particular numerical value is chosen for analytical convenience only. With $\rho = 2/3$, rent-seeking β_i can be solved from the following quadratic equation: $(1 - \beta_i)^2 - 2\beta_i(1 - \beta_i) = -\frac{a_i^b(1-\beta)}{a^m}$.

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[61]   Clearly, rent-seeking is lower now than in the case of all donors setting $a^b = 1$, when it would be $\beta = \frac{10}{19} = 0.52632$. This figure is obtained by setting symmetry at the recipient stage and solving corruption $\beta = \frac{a^m+a^b}{2a^m+a^b}$.

Solving this yields:

$$\beta_i = \frac{2 - \sqrt{1 - 3\frac{a_i^b(1-\beta)^2}{a^m}}}{3} \tag{2.22}$$

In order for this solution to be determined we obviously must have $\frac{a_i^b(1-\beta)^2}{a^m} \leq$ 1/3. Clearly, again $\frac{\partial \beta_i}{\partial a_i^b} > 0$ and $\frac{\partial \beta_i}{\partial a^m} < 0$. Rent-seeking is increasing in bilateral aid reaching its maximum level $\beta_i = 2/3$, when $\frac{a_i^b(1-\beta)^2}{a^m} = 1/3$. Maximizing the problem for the donor determined in (2.21), taking into account (2.17) and (2.22), gives us a solution that again $a_i^b = a^b = 0$, i.e. no bilateral aid is given. The equilibrium rent-seeking is $\beta_i = \beta = \frac{1}{3}$ and utility for donor $U_{eq}^d = \frac{2}{3}A$. This clearly illustrates the impact of a powerful multilateral organization. As it penalizes severely for high rent-seeking, this leads to better policy choices and a higher utility both for donors and citizens of the recipient countries.

Let us again check what happens if donor i deviates from the equilibrium $a_i^b = 0$ by setting $a_i^b = 1$. As the impact of one donor's choice is again extremely small, the other donors maintain their equilibrium choices $a^b = 0$. By assuming that $A = 10$, $a_i^b = 1$ and $a^b = 0$ the solution for rent-seeking becomes: $\beta_i = \frac{2}{3} - \frac{1}{3}\sqrt{1 - \frac{3 \cdot (2/3)^2}{10}} = 0.356\,35$, which is higher than in the symmetric case. Utility for donor i is $U_i^d = (1 - 0.35635)(1 + \frac{(1-0.35635)^2}{(2/3)^2} \cdot 10) = 6.643\,4$, which is somewhat lower than that in the symmetric equilibrium $(U_{eq}^d = \frac{2}{3}A)$. Consequently, deviation is not profitable for donor i. Finally, we can check what happens if all players were to play $a^b = 1$. In this case, utility for the single donor is $U_i^d = 6.428\,6$ which is, as intuitive, slightly lower than utility when it was the only one deviating from equilibrium $a^b = 0$. Thus, there is clearly a positive free-riding effect, but it is much weaker than the negative effect of the recipient's loss of multilateral aid and higher rent-seeking, effects which decrease

donor's utility. It can be concluded that if the multilateral penalizes severely for bad policy, it can more than offset the free-riding effect.

Proposition 5 *As the multilateral organization becomes more powerful ($\rho=2/3$), rent-seeking decreases and the utility of the donors and recipient citizens increases. The optimal bilateral aid remains at zero. Strict rent-seeking averse behavior by the multilateral organization can effectively eliminate the gains from free-riding for donors.*

In the current setup it is optimal for donors to provide only multilateral aid, even in the N-country framework. The original aim of this paper was to find an answer to why donors give multilateral aid. However, the analysis in this paper suggests that the question should instead be: why do donors give bilateral aid at all? Of course, the model introduced in this paper offers an extremely simple explanation for the division of aid. Furthermore, in order to achieve results, many generalizations and assumptions have been adopted. Therefore, one must be careful with conclusions for policy concerning bilateral aid. Nevertheless, it can be stated that bilateral aid cannot be justified merely by the altruism of donors in this model .

Proposition 6 *Altruistic donors should give all of their aid through a multilateral organization, provided that the multilateral organization can credibly commit to a policy penalizing rent-seeking governments. This holds even if the number of donors and recipients approaches infinity.*

Throughout this paper it has been assumed that donors receive as much utility from multilateral as from bilateral aid. In practice, however, this may not necessarily be the case. Therefore, the final issue in this section is to examine the game when donors' preferences are not symmetric towards different forms of aid. However, as the modified setup involves quite specific assumptions, it is taken up as an example only.

Let us begin by assuming that donors, for whatever reason, derive more utility from bilateral than from multilateral aid. This has been done by including an additional element into donor's utility. Because this additional term represents extra utility for the donor only, it is not affected by rent-seeking. The donor's utility function can be written:

$$\max_{a_i^b} \ (1 - \beta_i)(a_i^b + m_i) + \xi a_i^b \qquad (2.23)$$

where term ξa_i^b represents the additional utility the donor gets from giving bilateral aid, m_i is determined in equation (2.17) and β_i in (2.14). The additional utility from bilateral aid can result from many sources. The practice of tying aid provides the most obvious example; the donor country can boost production at home by tying aid to purchases of its own domestic products. Another explanation could be that bilateral aid is used to advance the donors' strategic or political position[62]. With this particular utility function an analytical solution is easy to reach when assuming specific value for parameter ρ. Bilateral aid with modified donor preferences when $\rho = 2/3$ is:

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[62] Even though nowadays the trend to use aid to forward own self-interests may be weakening, it is still a relevant consideration as was pointed out in the introductory section of this paper.

$$a_i^b = \left(-\frac{3}{2}\xi + \frac{1}{2}\sqrt{\left(9\xi^2 + 4\right)} \right) a^m \frac{\xi}{(\beta - 1)^2} \qquad (2.24)$$

and taking into account the symmetry assumption that $a_i^b = a^b = A - a^m$ for all donors, we can solve multilateral aid:

$$a^m = 2A \frac{\beta^2 - 2\beta + 1}{2\beta^2 - 4\beta + 2 - 3\xi^2 + \xi\sqrt{\left(9\xi^2 + 4\right)}} \qquad (2.25)$$

It is straightforward to see that by setting $\xi = 0$, we get the same solution as in previous example with $\rho = 2/3$, i.e. $a^m = A$. Finally, we plug solution for β in symmetric case, $\beta = \frac{A}{2a^m + A}$ into equation 2.25 and get multilateral aid:

$$a^m = \left(\frac{1}{2\left(32\xi^2 - 8\right)} \right) \times \qquad (2.26)$$

$$\left(-8\xi^2 + 8\xi\sqrt{\left(9\xi^2 + 4\right)} - 8 + 4\sqrt{\left(34\xi^2 - 10\xi\sqrt{\left(9\xi^2 + 4\right)} + 4 \right)} \right) A$$

where $\xi > 1/2$. It can be seen that multilateral aid is decreasing in ξ. To illustrate how the additional term in the utility function changes the results, a^m can be calculated for different values of ξ. For example, with the above donor preferences with $\xi = 2/3$, multilateral aid is $a_m = 0.445\,9 \cdot A$. When $\xi = 1$, $a_m \approx 0.384 \cdot A$ and if $\xi = 2$, multilateral aid is $a_m \approx 0.316 \cdot A$. Thus, by assuming that there is additional value to the donor in bilateral aid we are able to find interior solutions with close resemblance to reality. This model therefore suggests that in order to validate the disbursement of bilateral aid there has to some complementary motive in addition to altruism.

2.5   Conclusions

The purpose of this paper has been to explain theoretically the division of aid funds into bilateral and multilateral aid. The study also aimed to shed light into the relationship between donors, as well as the interaction between donors and recipients. The paper has presented a three-stage model which includes donors, recipients, and a multilateral organization, where this organization is responsible for allocating aid funds on the basis of recipients' behavior in terms of policy. It is acknowledged that the analysis includes a number of assumptions regarding the player preferences, as well as the timing of the game. These assumptions may have influenced the results to some extent. However, all of the assumptions are based on empirical findings given in foreign aid research. The model is analyzed in the case for two donors and recipients, as well as in the case for N donors and recipients.

The central finding emerges equally in both cases: the optimal amount of bilateral aid is zero and a neutral multilateral organization can be very efficient in reducing rent-seeking by the recipient governments. This increases both the welfare of the donors and the welfare of the people in the developing countries. The advantage of the multilateral organization results from its ability to credibly stand against distortinary policies by compelling recipient governments to compete with each other so that the country with best policies is rewarded the largest amount of aid. This, of course, requires that the multilateral is neutral and independent from donors in its decision making. In this model bilateral aid cannot be justified only by altruism, but there has to be some additional utility in order to induce the donor to contribute funds bilaterally. This is not to say that bilateral aid should not be given at all. Yet, the findings suggest that the role of multilateral organizations is very important in achieving higher aid effectiveness.

The model also offers one justification for the current practices by explaining the use of a multilateral organization as an intermediary in the aid delivery process. Furthermore, the results imply that other motives for bilateral aid in addition to pure altruism may also exist. It is equally important to note that in reality the multilateral organization may be corrupted and biased, which also may induce donors to contribute bilateral aid. Finally, as the number of recipient countries expands, rent-seeking by recipient governments decreases. This suggests that the greater the number of countries that one multilateral disburses to, the better.

As was mentioned in the introduction, the implications of donor behavior on aid effectiveness have not been studied very much. Therefore, many questions remain unanswered for future research. For example, the model does not take into account the fact that often other parties in addition to the donors, recipients and the multilateral are involved. These may include local non-governmental organizations (both in the recipient country and on the donor side), sub-contractors, international aid organizations etc. The interaction among these different agents offers many interesting topics for research. Another subject that was omitted in the current paper is the decision making process within a multilateral organization. This paper assumes that donors, in contributing the aid funds to a multilateral, relinquish the right to decide on the use of these funds. This, in fact, is the multilateral's greatest advantage with respect to donors. However, one may question whether in reality this is the case, or do donors compete in trying to affect the decisions of the multilateral. Lastly, in this paper the multilateral only follows the established policy criteria. In reality, aid allocation is a multifaceted issue as such and also other criteria should be included.

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Appendices

Appendix to section 2.3

Let us denote the first order condition for recipient 1by F, and respectively, the first order condition for recipient 2 by G. The second order condition for recipient 1 is therefore $\frac{\partial F}{\partial \beta_1} < 0$. Calculating the second order condition we find that:

$$\frac{\partial F}{\partial \beta_1} = \left(-\frac{\sigma}{(\beta_1-1)^2((1-\beta_1)^\sigma+(1-\beta_2)^\sigma)^3}\right) \times ((1-\beta_2)^\sigma (1-\beta_1)^\sigma (2\beta_1-2)-$$
$$(1-\beta_2)^\sigma (1-\beta_1)^{2\sigma}-(1-\beta_1)^\sigma (1-\beta_2)^{2\sigma}+\beta_1\sigma (1-\beta_1)^\sigma (1-\beta_2)^{2\sigma}-$$
$$\beta_1\sigma (1-\beta_2)^\sigma (1-\beta_1)^{2\sigma})$$

The first term inside the brackets is clearly positive, the sum inside the second brackets is negative as long as we examine the case near symmetric equilibrium and do not allow very large values for σ. Therefore, it can be concluded that within relevant range $\frac{\partial F}{\partial \beta_1} < 0$ and the second order condition holds.

Next we need to check the sign for $\frac{\partial F}{\partial \beta_2}$. This derivative can be expressed as:

$$\frac{\partial F}{\partial \beta_2} = \left(-\sigma (1-\beta_1)^\sigma (1-\beta_2)^{\sigma-1}\right) \times$$
$$\left((1-\beta_1)^{2\sigma} + (1-\beta_2)^{2\sigma} + 2(1-\beta_1)^\sigma (1-\beta_2)^\sigma - \beta_1\sigma \left(\frac{(1-\beta_1)^{2\sigma}-(1-\beta_2)^{2\sigma}}{(1-\beta_1)}\right)\right)$$

The first term of the product is always positive. The second term is positive, if we again limit the examination near the symmetric equilibrium and do not allow σ to become very large, i.e. do not let $\rho \to 1$. This is the region where second order condition holds. In this case, the first three positive items dominate and the overall effect is positive. As $\frac{\partial F}{\partial \beta_1} < 0$, $\frac{\partial \beta_1}{\partial \beta_2} > 0$ indicating that rent-seeking levels are strategic complements.

Should we allow σ to take large values and term $(1-\beta_1)^{2\sigma} - (1-\beta_2)^{2\sigma}$ to be negative and large, there would appear a possibility that $\frac{\partial F}{\partial \beta_2} < 0$ which leads to $\frac{\partial \beta_1}{\partial \beta_2} < 0$. This clearly means that rent-seeking levels would be strategic substitutes. This situation is less interesting, however, as the possibility of having

an extremely powerful multilateral, but still very different rent-seeking levels is unlikely. Therefore, it can be concluded that within the relevant range, rent-seeking levels are strategic complements and $\frac{\partial \beta_1}{\partial \beta_2} > 0$.

Assuming that the equilibrium is stable we are able to determine that:

$$\det \begin{vmatrix} \frac{\partial F}{\partial \beta_1} & \frac{\partial F}{\partial \beta_2} \\ \frac{\partial G}{\partial \beta_1} & \frac{\partial G}{\partial \beta_2} \end{vmatrix} > 0$$

By applying Cramer's rule, we are able to solve:

$$\frac{\partial B_1}{\partial a_1^b} = \frac{\det \begin{vmatrix} -\frac{\partial F}{\partial a_1^b} & \frac{\partial F}{\partial \beta_2} \\ -\frac{\partial G}{\partial a_2^b} & \frac{\partial G}{\partial \beta_2} \end{vmatrix}}{\det \begin{vmatrix} \frac{\partial F}{\partial \beta_1} & \frac{\partial F}{\partial \beta_2} \\ \frac{\partial G}{\partial \beta_1} & \frac{\partial G}{\partial \beta_2} \end{vmatrix}}$$

which clearly is positive. Other effects solved similarly.

Appendix to section 2.4 and Numerical Analysis

Let us determine the first order condition for recipient $F = a_i^b + \frac{(1-\beta_i)^{-\sigma}a^m}{(1-\beta)^{-\sigma}} +$
$\beta_i\sigma\frac{(1-\beta_i)^{-\sigma-1}a^m}{(1-\beta)^{-\sigma}} = 0$. Thus, $\frac{\partial F}{\partial \beta_i} = \frac{\left[\sigma(1-\beta_i)^{-\sigma}a^m\right]\left[(1-\beta_i)^{-1}-\beta_i(-\sigma-1)(1-\beta_i)^{-2}+1\right]}{(1-\beta_i)^{-2\sigma}}$.
The first term in the nominator is obviously negative. The second term is positive
unless $-\sigma$ becomes very large, which happens for values $\rho \to 1$. However, the
examination is restricted to analytical solutions by assuming that $\rho = 1/2$ or
$\rho = 2/3$. In the former case, the second term is always positive, i.e. the second
order condition holds, as $\frac{\partial F}{\partial \beta_i} < 0$. When setting $\rho = 2/3$, $\frac{\partial F}{\partial \beta_i} < 0$ holds for rent-
seeking levels $\beta_i < 0.5858$. As the equilibrium rent-seeking becomes $\beta_i = 1/3$,
the second order condition holds at the equilibrium and its surroundings.

CASE $\rho=0$

$\beta 1$:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,995	0,995	0,995	0,995	0,995	0,995	0,995	0,995	0,995	0,995
1	0,9955	0,9955	0,9956	0,9956	0,9956	0,9957	0,9957	0,9957	0,9958	0,9959
2	0,9959	0,996	0,996	0,9961	0,9961	0,9962	0,9963	0,9964	0,9964	0,9966
3	0,9963	0,9964	0,9964	0,9965	0,9966	0,9967	0,9968	0,9969	0,997	0,9972
4	0,9967	0,9968	0,9968	0,9969	0,997	0,9971	0,9972	0,9974	0,9975	0,9977
5	0,997	0,9971	0,9972	0,9973	0,9974	0,9975	0,9976	0,9978	0,9979	0,9981
6	0,9973	0,9974	0,9975	0,9976	0,9977	0,9979	0,998	0,9982	0,9983	0,9985
7	0,9976	0,9977	0,9978	0,9979	0,998	0,9982	0,9983	0,9985	0,9987	0,9989
8	0,9979	0,998	0,9981	0,9982	0,9983	0,9985	0,9986	0,9988	0,999	0,9992
9	0,9981	0,9982	0,9983	0,9985	0,9986	0,9988	0,9989	0,9991	0,9993	0,9995

Utility for donor 1:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,0498	0,0472	0,0448	0,0423	0,0398	0,0372	0,0348	0,0323	0,0299	0,0274
1	0,0473	0,0448	0,0423	0,0398	0,0374	0,0349	0,0324	0,0299	0,0274	0,0249
2	0,0448	0,0423	0,0398	0,0374	0,0349	0,0324	0,0299	0,0274	0,0249	0,0224
3	0,0424	0,0399	0,0374	0,0349	0,0324	0,0299	0,0274	0,0249	0,0224	0,02
4	0,0399	0,0373	0,0349	0,0324	0,0299	0,0274	0,0249	0,0224	0,02	0,0175
5	0,0374	0,0349	0,0324	0,0299	0,0274	0,025	0,0225	0,02	0,0175	0,015
6	0,0349	0,0324	0,0299	0,0274	0,0249	0,0225	0,02	0,0175	0,015	0,0125
7	0,0324	0,0299	0,0274	0,0249	0,0225	0,02	0,0175	0,015	0,0125	0,01
8	0,0299	0,0274	0,025	0,0225	0,02	0,0175	0,015	0,0125	0,01	0,0075
9	0,0274	0,025	0,0225	0,02	0,0175	0,015	0,0125	0,01	0,0075	0,005

CASE ρ=0

β2:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,995	0,9955	0,9959	0,9963	0,9967	0,995	0,9973	0,9976	0,9979	0,9981
1	0,995	0,9955	0,996	0,9964	0,9967	0,9971	0,9974	0,9977	0,998	0,9982
2	0,995	0,9956	0,996	0,9964	0,9968	0,9972	0,9975	0,9978	0,9981	0,9983
3	0,995	0,9956	0,9961	0,9965	0,9969	0,9973	0,9976	0,9979	0,9982	0,9985
4	0,995	0,9956	0,9961	0,9966	0,997	0,9974	0,9977	0,998	0,9983	0,9986
5	0,995	0,9957	0,9962	0,9967	0,9971	0,9975	0,9979	0,9982	0,9985	0,9988
6	0,995	0,9957	0,9963	0,9968	0,9972	0,9976	0,998	0,9983	0,9986	0,9989
7	0,995	0,9957	0,9964	0,9969	0,9974	0,9978	0,9982	0,9985	0,9988	0,9991
8	0,995	0,9958	0,9964	0,997	0,9975	0,9979	0,9983	0,9987	0,999	0,9993
9	0,995	0,9959	0,9966	0,9972	0,9977	0,9981	0,9985	0,9989	0,9992	0,9995

Utility for donor 2:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,0498	0,0473	0,0448	0,0424	0,0399	0,062	0,0349	0,0324	0,0299	0,0274
1	0,0473	0,0448	0,0423	0,0399	0,0374	0,0349	0,0324	0,0299	0,0274	0,0249
2	0,0448	0,0423	0,0398	0,0374	0,0349	0,0324	0,0299	0,0274	0,025	0,0225
3	0,0423	0,0398	0,0374	0,0349	0,0324	0,0299	0,0274	0,025	0,0225	0,02
4	0,0398	0,0373	0,0349	0,0324	0,0299	0,0274	0,025	0,0225	0,02	0,0175
5	0,0373	0,0349	0,0324	0,0299	0,0274	0,025	0,0224	0,02	0,0175	0,015
6	0,0348	0,0324	0,0299	0,0274	0,0249	0,0225	0,02	0,0175	0,015	0,0125
7	0,0323	0,0299	0,0274	0,0249	0,0224	0,02	0,0175	0,015	0,0125	0,01
8	0,0299	0,0274	0,0249	0,0224	0,02	0,0175	0,015	0,0125	0,01	0,0075
9	0,0274	0,0249	0,0224	0,0199	0,0175	0,015	0,0125	0,01	0,0075	0,005

Symbols:
a1b=bilateral aid to recipient 1
a2b=bilateral aid to recipient 2
β1=rent-seeking in country 1
β2=rent-seeking in country 2

Note: small asymmetries between rent-seeking and utility levels of donor 1 and donor 2 are caused by rounding made by computer programme.

CASE ρ=1/2

β1:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,6667	0,671	0,6763	0,6816	0,6875	0,6939	0,701	0,7087	0,7174	0,727
1	0,6843	0,6897	0,6952	0,7011	0,7076	0,7147	0,7225	0,7311	0,7406	0,7513
2	0,7026	0,7082	0,7142	0,7208	0,7279	0,7357	0,7442	0,7537	0,7641	0,7759
3	0,7213	0,727	0,7336	0,7407	0,7484	0,7569	0,7662	0,7765	0,788	0,8007
4	0,7397	0,7462	0,7532	0,7608	0,7692	0,7783	0,7884	0,7996	0,812	0,8258
5	0,7584	0,7655	0,773	0,7813	0,7901	0,8	0,8107	0,8228	0,8362	0,8512
6	0,7777	0,785	0,793	0,8018	0,8113	0,8218	0,8333	0,8461	0,8604	0,8766
7	0,7968	0,8047	0,8132	0,8224	0,8325	0,8436	0,8559	0,8696	0,8848	0,902
8	0,8163	0,8245	0,8335	0,8431	0,8538	0,8655	0,8785	0,8929	0,9091	0,9274
9	0,8358	0,8444	0,8538	0,8639	0,875	0,8873	0,9009	0,9009	0,9331	0,9524

Utility for donor 1:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	3,3334	3,1904	3,0369	2,8843	2,7266	2,5661	2,4001	2,2304	2,0554	1,876
1	3,254	3,1034	2,953	2,7982	2,6402	2,4772	2,3104	2,1387	1,9609	1,7787
2	3,1574	3,0086	2,858	2,7016	2,541	2,3776	2,208	2,0337	1,854	1,6688
3	3,0486	2,9026	2,7496	2,5928	2,432	2,264	2,0929	1,916	1,7328	1,545
4	2,934	2,7845	2,6303	2,4714	2,3078	2,1394	1,9647	1,7846	1,5985	1,4065
5	2,8065	2,6537	2,498	2,3374	2,1716	2,0004	1,8234	1,6393	1,4491	1,2519
6	2,6611	2,51	2,3525	2,1898	2,0215	1,8473	1,6674	1,4797	1,285	1,0827
7	2,5075	2,3536	2,1942	2,0293	1,8583	1,6809	1,4966	1,3045	1,1049	0,8967
8	2,3382	2,1833	2,0214	1,8553	1,6817	1,4998	1,3112	1,1146	0,9091	0,6944
9	2,1558	1,9988	1,8356	1,6664	1,4905	1,3058	1,1127	1,0686	0,6986	0,4762

CASE ρ=1/2

β2:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,6667	0,6843	0,7027	0,7209	0,7395	0,7585	0,7775	0,7968	0,8163	0,8359
1	0,6712	0,6897	0,7085	0,7269	0,7461	0,7654	0,785	0,8048	0,8245	0,8444
2	0,6762	0,695	0,7143	0,7336	0,7531	0,7731	0,793	0,8132	0,8334	0,8537
3	0,6818	0,7009	0,7206	0,7407	0,7609	0,7811	0,8018	0,8224	0,8431	0,8639
4	0,6875	0,7076	0,7278	0,7483	0,7692	0,7902	0,8113	0,8325	0,8538	0,875
5	0,6938	0,7147	0,7357	0,757	0,7782	0,8	0,8217	0,8436	0,8655	0,8873
6	0,7009	0,7225	0,7442	0,7662	0,7884	0,8108	0,8333	0,8559	0,8785	0,9009
7	0,7086	0,7311	0,7537	0,7765	0,7996	0,8228	0,8462	0,8696	0,8929	0,916
8	0,7175	0,7407	0,7643	0,788	0,812	0,8361	0,8605	0,8848	0,9091	0,9331
9	0,7269	0,7513	0,7759	0,8008	0,8259	0,8512	0,8766	0,8766	0,9274	0,9524

Utility for donor 2:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	3,3334	3,2524	3,1571	3,0537	2,9374	2,8054	2,6642	2,5075	2,3387	2,1547
1	3,1868	3,1034	3,0061	2,9057	2,7852	2,6556	2,5102	2,3522	2,1837	1,9991
2	3,038	2,9547	2,8564	2,7504	2,6325	2,4969	2,3532	2,1941	2,0219	1,8361
3	2,8833	2,8019	2,7038	2,5926	2,4715	2,3392	2,19	2,0292	1,8551	1,6666
4	2,7275	2,6399	2,5426	2,4334	2,3077	2,1715	2,0223	1,8582	1,6809	1,4901
5	2,5676	2,4776	2,3772	2,263	2,1405	2,0005	1,8477	1,681	1,5001	1,3058
6	2,4018	2,3099	2,208	2,0929	1,9647	1,8231	1,6673	1,4963	1,3115	1,1128
7	2,2318	2,138	2,0334	1,9158	1,7846	1,6391	1,4791	1,3044	1,1147	0,9106
8	2,0542	1,9607	1,8525	1,7326	1,5978	1,4494	1,2849	1,1046	0,9091	0,6986
9	1,8759	1,7788	1,6685	1,5449	1,4062	1,2522	1,0827	1,1377	0,6944	0,4762

CASE ρ=2/3

β1:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,4998	0,5067	0,5138	0,5219	0,5312	0,5416	0,5537	0,5676	0,5839	0,6031
1	0,5192	0,5266	0,5343	0,5428	0,5527	0,5639	0,5767	0,5916	0,6088	0,6292
2	0,5397	0,547	0,5555	0,5651	0,5754	0,5874	0,6011	0,6169	0,6352	0,6568
3	0,5611	0,5689	0,578	0,5882	0,5995	0,6123	0,6269	0,6437	0,6632	0,6861
4	0,5838	0,5924	0,602	0,6128	0,625	0,6387	0,6541	0,6721	0,6929	0,7173
5	0,6171	0,2609	0,6275	0,639	0,6519	0,625	0,6832	0,7024	0,7246	0,7507
6	0,6335	0,6435	0,6545	0,6669	0,6808	0,6965	0,7144	0,7347	0,7584	0,7863
7	0,6611	0,6718	0,6836	0,697	0,7116	0,7284	0,7473	0,7693	0,7947	0,8245
8	0,6903	0,7019	0,7147	0,7287	0,7446	0,7623	0,7826	0,806	0,8333	0,8655
9	0,7222	0,7343	0,7478	0,7628	0,7796	0,7985	0,8202	0,8452	0,8744	0,9091

Utility for donor 1:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	5,0044	4,8066	4,6156	4,41	4,1949	3,9695	3,731	3,4824	3,2128	2,9306
1	4,9296	4,7337	4,535	4,3324	4,1145	3,8855	3,643	3,3845	3,1138	2,8207
2	4,837	4,6468	4,4443	4,2299	4,0147	3,7807	3,5354	3,2722	2,9923	2,6919
3	4,7295	4,5413	4,3356	4,1173	3,8928	3,6569	3,4042	3,1359	2,8492	2,5399
4	4,6006	4,405	4,1996	3,9813	3,7495	3,5065	3,2521	2,9753	2,68	2,3613
5	4,2744	11,372	4,0375	3,8164	3,5837	3,7496	3,0697	2,7865	2,4819	2,1521
6	4,2661	4,0623	3,8488	3,623	3,3842	3,1281	2,8556	2,5653	2,2508	1,9079
7	4,0494	3,8435	3,6261	3,3931	3,1509	2,8882	2,6107	2,3072	1,9801	1,6233
8	3,8023	3,589	3,3662	3,131	2,8786	2,612	2,3227	2,009	1,6667	1,292
9	3,5048	3,2921	3,0652	2,8247	2,5669	2,2904	1,9912	1,6643	1,3054	0,9092

CASE ρ=2/3

β2:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,5001	0,5192	0,5397	0,5611	0,5838	0,6078	0,6335	0,6611	0,6903	0,7222
1	0,5066	0,5266	0,5472	0,5692	0,5925	0,6173	0,6436	0,6717	0,702	0,7344
2	0,5138	0,5338	0,5555	0,578	0,6022	0,6276	0,6548	0,6837	0,7146	0,7479
3	0,5219	0,5429	0,565	0,5882	0,6129	0,6392	0,6671	0,6969	0,7288	0,7628
4	0,5312	0,5528	0,5756	0,5996	0,625	0,6519	0,6809	0,7116	0,7445	0,7796
5	0,5416	0,564	0,5875	0,6123	0,6386	0,625	0,6964	0,7283	0,7624	0,7986
6	0,5537	0,5768	0,6009	0,6267	0,6541	0,6833	0,7143	0,7474	0,7827	0,8202
7	0,5676	0,5917	0,6168	0,6436	0,6721	0,7024	0,7347	0,7692	0,8061	0,8452
8	0,5839	0,6089	0,6353	0,6632	0,6928	0,7246	0,7585	0,7946	0,8333	0,8744
9	0,6031	0,6292	0,6568	0,6861	0,7173	0,7506	0,7863	0,8245	0,8655	0,9091

Utility for donor 2:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	4,9959	4,9315	4,837	4,7295	4,6006	4,4468	4,2661	4,0494	3,8023	3,5048
1	4,8087	4,7344	4,647	4,5336	4,4019	4,245	4,0604	3,8455	3,5878	3,2919
2	4,6155	4,5416	4,4451	4,335	4,1951	4,0356	3,8451	3,6248	3,3663	3,0649
3	4,41	4,327	4,2309	4,1182	3,9796	3,8135	3,6211	3,395	3,1302	2,824
4	4,1949	4,1106	4,0107	3,8914	3,7506	3,5833	3,3814	3,1513	2,8798	2,5665
5	4,0497	2,0116	3,7794	3,6557	3,508	3,7506	3,1299	2,8894	2,6107	2,2893
6	3,731	3,6412	3,5356	3,4053	3,251	3,0693	2,8574	2,6092	2,3216	1,9905
7	3,4824	3,3852	3,2727	3,1373	2,9755	2,7865	2,5657	2,3082	2,0087	1,6641
8	3,2128	3,113	2,991	2,8493	2,6814	2,4819	2,25	1,9801	1,6667	1,3056
9	2,9306	2,8208	2,6923	2,54	2,3611	2,1521	1,908	1,6233	1,2921	0,909

CASE ρ->1

β1:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,1817	0,1868	0,1926	0,1995	0,2078	0,2182	0,2313	0,2485	0,2726	0,3081
1	0,1928	0,1979	0,2042	0,2116	0,2206	0,2316	0,2456	0,264	0,2895	0,3273
2	0,2048	0,2106	0,2174	0,2254	0,2349	0,2467	0,2618	0,2814	0,3087	0,3493
3	0,2186	0,2249	0,2322	0,241	0,2512	0,264	0,2802	0,3014	0,3304	0,3739
4	0,2347	0,2415	0,2495	0,2589	0,2702	0,284	0,3015	0,3245	0,3558	0,4026
5	0,2533	0,2609	0,2697	0,2801	0,2926	0,3077	0,3266	0,3516	0,3857	0,4364
6	0,2756	0,2842	0,2941	0,3056	0,3194	0,3361	0,3572	0,3845	0,4219	0,4774
7	0,3033	0,3131	0,3243	0,3373	0,3527	0,3717	0,3952	0,4255	0,4671	0,5285
8	0,3391	0,3504	0,3633	0,3785	0,3963	0,4178	0,4447	0,4792	0,5263	0,5957
9	0,3877	0,4015	0,4171	0,435	0,4562	0,482	0,5135	0,554	0,6089	0,6897

Utility for donor 1:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	8,1827	7,9756	7,7682	7,5457	7,3099	7,0563	6,7854	6,4879	6,1395	5,7114
1	8,2293	8,0219	7,8089	7,5801	7,336	7,0758	6,7931	6,4818	6,1152	5,6556
2	8,2555	8,0492	7,8255	7,5913	7,35	7,0792	6,7891	6,4574	6,0687	5,5766
3	8,2656	8,0551	7,8322	7,5887	7,339	7,0612	6,7547	6,4064	5,9958	5,4676
4	8,2491	8,0342	7,807	7,5631	7,2988	7,0148	6,6918	6,3239	5,8858	5,3195
5	8,1933	7,9778	7,744	7,4926	7,217	6,9223	6,5901	6,2009	5,7316	5,118
6	8,0925	7,8694	7,6279	7,3735	7,0911	6,7813	6,4276	6,0157	5,5133	4,8493
7	7,9197	7,6856	7,4412	7,1791	6,8861	6,5568	6,1838	5,745	5,1997	4,4739
8	7,6404	7,4039	7,1468	6,866	6,558	6,2114	5,8094	5,3345	4,7368	3,9315
9	7,1919	6,938	6,6632	6,3667	6,0349	5,6537	5,216	4,6874	4,0193	3,1031

CASE ρ->1

β2:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	0,1817	0,1927	0,2049	0,2187	0,2346	0,2532	0,2756	0,3033	0,3391	0,3877
1	0,187	0,1979	0,2106	0,225	0,2414	0,2607	0,2841	0,3131	0,3504	0,4013
2	0,1925	0,2043	0,2174	0,2322	0,2495	0,2696	0,2942	0,3243	0,3636	0,4174
3	0,1995	0,2117	0,2254	0,241	0,2589	0,2801	0,3057	0,3374	0,3785	0,4352
4	0,208	0,2207	0,2351	0,2514	0,2702	0,2925	0,3194	0,3529	0,3963	0,4564
5	0,2182	0,2317	0,2469	0,2641	0,284	0,3077	0,3361	0,3717	0,4179	0,4818
6	0,2312	0,2457	0,2618	0,2802	0,3015	0,3267	0,3572	0,3951	0,4447	0,5135
7	0,2485	0,2639	0,2814	0,3013	0,3242	0,3516	0,3845	0,4256	0,4792	0,554
8	0,2725	0,2895	0,3086	0,3305	0,3558	0,3857	0,422	0,4671	0,5263	0,609
9	0,3081	0,3274	0,3491	0,3738	0,4024	0,4364	0,4774	0,5286	0,5957	0,6896

Utility for donor 2:

a1b/a2b	0	1	2	3	4	5	6	7	8	9
0	8,1824	8,2285	8,2528	8,2618	8,2459	8,1956	8,0941	7,9188	7,6398	7,1917
1	7,9723	8,0206	8,0417	8,0486	8,0319	7,9781	7,8716	7,6886	7,4009	6,9402
2	7,7666	7,8005	7,8256	7,8313	7,8004	7,7438	7,6248	7,4418	7,1408	6,659
3	7,5418	7,5732	7,5897	7,5915	7,559	7,4919	7,3705	7,1754	6,8644	6,3641
4	7,3032	7,3319	7,3419	7,3322	7,2979	7,219	7,0913	6,8839	6,5579	6,0312
5	7,0582	7,0729	7,0761	7,0584	7,0149	6,9236	6,781	6,5576	6,211	5,6584
6	6,7872	6,7933	6,7873	6,7523	6,6927	6,5886	6,4279	6,1866	5,8106	5,2165
7	6,4871	6,4854	6,4588	6,4052	6,3262	6,2019	6,0171	5,7442	5,3345	4,6882
8	6,1402	6,1124	6,0674	5,9943	5,8864	5,7322	5,513	5,199	4,7369	4,0181
9	5,7106	5,656	5,5767	5,4675	5,3201	5,1211	4,8493	4,4729	3,9315	3,1037

Chapter 3
Non-profit competition

3.1   Background

This paper aims to contribute to the research of non-profit organizations[63] by analyzing the interaction between non-profit organizations, and between non-profit organizations and philanthropic donors. The analysis is based on an assumption that the interaction between non-profit organizations (NPOs) is essentially competitive so that these have to compete with each other for donor funds. The competitive situation among NPOs differs from that existing between normal firms in that non-profits are assumed to be (at least partly) altruistic. In other words, they do not maximize profit in a traditional sense. In this paper it is assumed that the market is differentiated, i.e. donors have some kind of preference over the use of their donations The model builds on the classic model of horizontal differentiation by Hotelling and on the concept of supply function equilibria.

Within this framework the motivation for cost reduction is low if charities are non-altruistic, because any cost increases are borne by the recipients who simply receive less. It also turns out that the higher the 'transportation cost' (the stronger the donor preferences), the smaller the utility of beneficiaries, while the utility of NPOs increases. In case of altruistic non-profits, both the quality and quantity of production increase with non-profit's altruism, but again the increase in the 'transportation cost' reduces the amount produced, thereby decreasing beneficiaries' utility. Finally, it turns out the motivation for cost reduction is

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[63]   The words "non-profit organization", "non-profit" and "charity" are used invariably in reference to not-for-profit organizations that receive donations and undertake charity projects or other work for the benefit of the beneficiaries.

strong for altruistic NPOs, as they themselves have to bear part of the burden of a possible cost increase. In general, it can be stated that competition between NPOs is beneficial for the recipients, especially if the NPOs are not altruistic. Competition forces non-profit organizations to act in favor of the recipients which they would not otherwise do.

This work relates to the literature on altruism, which has been a subject of active research in economics during recent decades[64]. Despite the large applied literature on altruism, there is surprisingly little theoretical research on altruistic (non-profit) organizations or on the market for non-profit goods and services in general. Yet, the size of this market is certainly not small. According to a recent study[65] including 22 countries, nearly 19 million people worldwide were employed in the non-profit sector in 1995. The size of that industry rose to 1.1 trillion USD that year and is expected to be growing steadily. Nowadays, there is a huge amount of non-profit organizations ranging from small scale 'one cause associations' to multinational humanitarian organizations such as Red Cross and Oxfam.

It is usually assumed that non-profit organizations are altruistic. This implies that they have other aims than profit maximization or provision of benefits to personnel. In terms of economic theory there are two traditional approaches to altruism. The first is to assume that a donor receives utility from the welfare of the beneficiaries to which he or she contributes. In this case the donor is referred to as a genuine altruist. To the extent that the welfare of the beneficiary is the concern

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[64] Aspects of altruism research in economics are summarized by Rose-Ackerman (1996). See also other research by Rose-Ackerman (1982; 1987) and by Andreoni (1989; 1998). On the theory of reciprocity and the assumption of self-interest in economics in general see e.g. Fehr and Gachter (2000)

[65] Johns Hopkins University (2001)

of other donors too, it is a public good[66]. Public good models predict strong
neutrality results, for example a complete crowding-out of private contributions
in case of increased government funding. However, in many cases empirical
evidence has not been consistent with the neutrality assumption; crowding-out
has turned out to be incomplete or even nonexistent.

The second tradition to model philanthropy is the so called 'impure altruism'-
approach[67]. In models with impure altruism, the donor's utility is private and
is derived from the act of giving itself, not from the supply of the good as in
public goods models. In public good models the utility of a donor is positively
affected by the contributions of other donors, whereas in impure altruism models
donors usually care only for their own contributions[68]. Therefore, no crowding-
out occurs. In fact, if giving yields a status of some kind, the possibility of
crowding-in must be recognized[69].

A recent study by Duncan (2003) has introduced another approach based on
impact philanthropy. In this model the motive for altruistic behavior is donor's
desire to have a personal effect on the well being of the beneficiary. As the
donor's utility depends on his own individual impact, it is not possible to free-

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[66]   On the public good approach, see for example Warr (1982;1983) and Bergström, Blume and
Varian (1986). On financing of public goods see Roberts (1987)

[67]   On impure altruism, see for example Andreoni (1989) and Harbaugh (1998)

[68]   It is important to note that the theory chosen to model donor behavior is important for the
non-profit firm. For example, Yildirim and Romano (2001) suggest that if donors are public
good philanthropists, it is not beneficial to publically announce donations received. On the other
hand, if donors' motives include "impure elements" such as warm glow, the announcement of
contributions may be beneficial.

[69]   Crowding-in simply means the opposite of crowding-out, i.e. donor's utility is mitigated if
other donors contribute to the same cause. This is related to situations where it is important for a
donor to be the only contributor (for publicity, reputation or other reasons).

ride on the donations of other people. Hence, there is no crowding-out either[70]. In public goods models the failure to take into account the positive externality leads to a situation where donors contribute too little, but impact philanthropists fail to notice the negative externality, which causes them to contribute too much. In summary, the impact philanthropy approach resembles the impure altruism approach as in both approaches the utility from giving is personal rather than resulting from the provision of public goods. However, in the impact philanthropy approach it is the impact on the recipient that gives utility to the donor, whereas in impure altruism models it is the mere act of giving itself.

Irrespective of the motive for benevolent behavior, theoretical literature on altruism typically assumes a direct relationship between the donor and the recipient, which is seldom possible in reality. Although clearly there are certain situations in which philanthropists and beneficiaries are able to interact directly (the most obvious example being parental altruism), the allocation of charity funds normally involves a third party, often a charity organization working on a non-profit basis. Thus far the economic literature has not paid much attention to the interaction between non-profit organizations, nor to the interaction between donors and non-profits. This, however, is an important topic, considering the fact that a large share of funding comes from donors (either the government or individual donors).

Even though the competition between non-profits has not yet been studied to a large extent, there is some research on the subject. Bilodeau and Slivinski (1997) examine charity competition with a 3-stage model with the aim to

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[70] The impact model, in fact, predicts a crowding-in effect among donors in certain circumstances. The logic is intuitive; a donor perceives his impact becoming smaller when another party also contributes to the same beneficiary and thus this donor overcontributes.

find out whether charities should be diversified or specialized[71]. They find that competition leads to the tendency of non-profit firms to differentiate. In this model, competition can be desirable, as competing NPOs may be able to attract larger amount of contributions, thereby increasing the production of otherwise underprovided public goods. However, the model by Bilodeau and Slivinski does not take into account the possibility that charities may have other preferences than merely producing the goods, and that the preferences of donors and charities may affect the amount of donations.

Duncan (2003) also acknowledges the competition between charities and suggests that when donors are impact philanthropist, it may be optimal from charity organizations' point of view to extend the target of contributions instead of specializing. The competitive situation among charities is not, however, actually modelled in Duncan. Feigenbaum (1987) on the other hand, analyzes empirically the competition among US medical research charities by estimating the structure-performance relationships. She finds that increased market concentration leads to reduced funding for research projects and greater discretionary expenditures. In other words, less competition seems to have negative effects[72].

This paper proceeds so that the framework is first presented in its simplest form; that is, we assume that non-profit organizations are non-altruistic, but want to maximize the amount of money used for salaries (or perquisites) to employees. This is done in order to isolate the implications of competition. Second, the

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[71]   They assume charity goods to be public goods and the order of events to be the following: First, individuals decide whether or not to become non-profit entrepreneurs. Second, individuals choose the amount to donate to NPOs. At the third stage, entrepreneurs make allocation decisions concerning the production of public goods.

[72]   Feigenbaum also suggests that the share of revenues devoted to research projects is increasing in firm size, but decreasing in the firm's age. The former effect is explained by increased monitoring of larger organizations, while the latter may result from the exploitation of the increased trust placed in established charities.

framework is modified to study altruistic charities. The objective is to explain the behavior of charities and donors in a competitive environment. In particular, the implications of product differentiation and altruism are studied. The aim is find out how the 'transportation cost', which in this paper represents the importance of ideological or other preferences to a donor, affects the utility of the NPOs, donors, and the beneficiary groups. Another objective is to determine how competing non-profits react to changes in costs. Finally, the effects of non-profit altruism are studied. The chapter proceeds so that section 3.2 introduces the framework, section 3.3 presents the model in the basic form with non-altruistic non-profits, section 3.4 considers (partly) altruistic non-profits, section 3.5 discusses cost efficiency of NPOs, and section 3.6 discusses possible extensions. Section 3.7 concludes.

3.2   Introduction to the framework

Before moving on to the analysis, let us first discuss the general features of the model. The basic framework presents a two-stage game between two non-profits and a continuum of donors. At the first stage, NPOs set the policy, i.e. specify the amount to be used for the supply of charity goods and the amount to be retained within organization for different level of donations. This means that charities optimize by choosing the best 'supply function', taking into account the effect of the allocation decision on the behavior of donors. The supply function idea has been adopted from the literature of supply function equilibria[73]. NPO's action in the first period is therefore, in fact, a commitment to use the funds in a certain way. At the second stage, donors decide to the charities to which they will donate to, acknowledging the policy decisions of the charities at the first stage. Then, payoffs for the donors and charities are realized.

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[73]   See Klemperer and Meyer (1989)

When examining competition between standard products or services, a market clearing price is determined as a result of the interaction among buyers and sellers. Competition between non-profit organizations, however, is a somewhat different process. In this case the product is the work done by the NPOs, for example projects in developing countries. Clearly, each project is different and it becomes difficult to create a market for projects in the traditional sense. This paper views the competition as a process in which charities offer to conduct projects (or other kinds of charity work), conditional on the amount of aid they receive. In other words, a non-profit organization chooses the optimal amount of work it agrees to do, taking into account that this commitment affects donors behavior. Commitment by the NPOs is assumed to be binding, so that these cannot use the acquired funds for other purposes than announced[74]. One can see an analogy with the supply function models, where each firm chooses an optimal supply function specifying the quantity it will produce at each price. In the present model the non-profit organizations choose a supply function specifying the quantity of output for a given amount of donations.

In this model 'production' means merely the delivery of resources to beneficiaries. Thus, a non-profit organization announces the policy determining the share of total incoming donations it will redistribute. An actual production function could easily be included into the model to represent the production. This, however, would not be informative from the current perspective and would complicate unnecessarily the analysis. In the analysis that follows, a non-profit evaluated in terms of its efficiency. Efficiency means that the NPO redistributes a high proportion of incoming funds to beneficiaries. The outcome of non-profit

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[74]   The assumption that non-profits are credible is crucial in this model. Shold we allow the possibility of NPOs deviating from previously announced policies, we would have to consider the time-consistency of non-profits' behavior.

organizations' work is therefore the amount they disburse to beneficiaries[75].

Donors' decision on the choice of charity to which they contribute involves two dimensions: the relative effectiveness of charities, and the individual preferences of the particular donor. This is to say that donors initially have preferences regarding the NPOs, but they may also donate to the less-preferred charity, should this be significantly more efficient. Respectively, non-profit organizations are assumed to be differentiated in their operations. Differentiation means that NPOs may, for example, operate in a different countries, have different values or specialize to work for the benefit of certain groups. For example, one charity may be specialized to helping children in developing countries, while another one focuses in building infrastructure in the developing world.

3.3 Model of non-altruistic organizations

As the analysis is conducted in a 2-stage framework, we proceed backwards by solving first the second period problem for donors. Let us assume that donors are uniformly distributed along the line $k = [0, 1]$ (linear city) and that they have preferences concerning the two charities $i \in \{0, 1\}$, that are differentiated in their operations. In modelling differentiation the paper uses the linear city-approach by Hotelling[76]. It is clear that having only two competing non-profits this is a simplification, The linear city model, however, provides the easiest approach to model horizontal differentiation and is chosen because of analytical convenience.

Donors are assumed to be identical in respects other than their preferences

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[75]   This model excludes the possibility of waste during the delivery process. Thus, the funds disbursed by the non-profits truly reach the recipients and possible problems on the recipient side relating to the delivery are ignored.

[76]   as presented in Tirole (1989)

(location). The charities are located so that charity 0 is at location $k = 0$ and charity 1 at $k = 1$.(let us call them 'NPO 0' and 'NPO 1'). This paper takes the locations as exogenously given and assumes maximal differentiation. It is also possible to include the choice of location by adding another stage into the model. However, the purpose of the current model is to examine the behavior of differentiated charities and thus, the choice of location is left out. The implications of location choice will be discussed briefly in the end of this section, though.

Similarly as in Hotelling's model, there is a 'transportation cost' per unit of length involved, but in the current context the interpretation is different. The cost represents donors preference so that a donor at location k must pay a cost of kz when donating to the non-profit at location $k = 0$. Respectively, the cost is $(1 - k)z$ when donating to the other non-profit. In short, k illustrates the distance in ideological sense meaning similarity of preferences. The closer the donor's preferences are to the ideology of a non-profit organization, the closer the donor is to that NPO in the linear city and this naturally leads to smaller cost. Parameter z represents the importance of preferences or ideology to donors; the larger z is, the more likely a donor will give to the organization it is closer to, as costs from going to the other non-profit become high. Conversely, if z is very small, a donor is more likely to choose between the non-profit organizations on the basis of effectiveness only. This leads to an interesting question; what is the role of donor preferences in the game between charities? It is not clear *per se,* whether it is beneficial or harmful for non-profits and beneficiaries if donors' preferences are strong. On one hand, strong preferences mitigate competition as donors are less likely to move, and this probably benefits non-altruistic NPOs. On the other hand, NPOs find it hard to attract donors from outside their 'natural' region.

The parameter z can also be interpreted to reflect the extent of market differentiation. If z is low, donors see the products of the charities as quite homogenous despite the location choices of the firms[77]. Respectively, if z is high, donors perceive even a small difference in the location of the non-profits as highly significant.

It was stated above that donors are concerned about the efficiency of the non-profits, meaning that the more the non-profit distributes to the beneficiaries, the more efficient it is. The easiest approach to take this factor into account is to assume that donors care about the average efficiency of non-profit organization (i.e. the ratio of total amount of production to total amount of donations) and that the amount donated is constant[78]. Thus, donors can be considered to be public good philanthropists, even though we do not explicitly model donor behavior and ignore the possible crowding-out effect. Then, the donors' problem is to choose the non-profit organization to which to donate. A donor who is indifferent between the two charities must equate utilities:

$$Q_0/D_0 - d - k^* z = Q_1/D_1 - d - (1 - k^*)z$$

and the location of indifferent donor at k^* is:

$$k^* = \frac{Q_0/D_0 - Q_1/D_1 + z}{2z} = \frac{a_0 - a_1 + z}{2z} \qquad (3.1)$$

where d is the amount donated by a single donor, Q_0/D_0 and Q_1/D_1 are the average productivity of the non-profits, as Q_i is the amount of the "charity good"

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[77]   In other words, even though the non-profits try to differentiate by choosing the maximum distance, either donors do not see this difference or it is not important to them. This can be interpreted as the firms not having been successful in differentiation, because the cost for going to either of the charities is approximately the same irrespective of the location of the charities or the donor itself.

[78]   Note that in this case average productivity equals marginal productivity.

produced by non-profit i, and D_i is the total amount of donations to that non-profit. In principle, d should be included in D_0 or in D_1. That effect is excluded in the analysis, as it is assumed that the effect of a single donor's donation is negligible in the total amount of donations because there exists a continuum of donors. a_i is the share of incoming donations that non-profit i disburses to beneficiaries. It is easy to see that k^* is increasing in a_0 and decreasing in a_1 as is intuitive; the more a charity invests in production, ceteris paribus, the more it is able to attract donations. The effect of z depends on the policy variables as $\frac{\partial k^*}{\partial z}$ $= \frac{1}{2}\frac{a_1-a_0}{z^2}$. If $a_0 > a_1$, $\frac{\partial k^*}{\partial z}$ becomes negative which means that k^* is decreasing in z. Thus, non-profit 0 loses donations while non-profit 1 receives more. An increase in 'transportation cost' therefore harms the party originally attracting donors farther away (as was non-profit 0 in this case), i.e. the more productive charity. Similarly, if $a_0 < a_1$, an increase in 'ideological transportation cost' causes non-profit 1 to lose donations and non-profit 0 to gain. The intuition can be illustrated with the following example. Let us assume, that a donor is donating to charity 0 that is ideologically farther away than the other alternative at $k = 1$. As the former charity has been more efficient, it can attract funds from that donor despite the distance. If, for some reason, 'transportation cost' increases, the donor may want to change to charity 1 which is closer, even though it might still be less efficient. In this case, charity at $k = 0$ loses.

It is clear that this approach is somewhat problematic, because the donated amount is not endogenous[79]. Because of this property, we are not able to discuss

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[79] The analysis was also conducted by assuming that donations are endogenous such that donors had to decide how much and to which one of the non-profits to give. It was assumed that a donor cares for the effectiveness of his donation ad, i.e. wants to maximize the amount of production that can be produced with the donation d. Donor's utility function was postulated

$\max_{d_i} a_i d_i - \frac{d_i^2}{2}, i \in \{0,1\}$.

However, in endogenous case no analytical solution was found, not even in the case assuming symmetry. Therefore, the analysis is left outside the paper.

the effects of the policy choices of non-profits on the amount donated by donors. This is undoubtedly a deficiency, if the amount from a single donor is considered to be very elastic. However, it seems plausible that individual donors usually have a somewhat fixed amount available for charity in a given time and if we assume that an impurely altruistic element is involved in the single donor's decision, this deficiency does not seem to be a very crucial problem. Provided that the donor derives some utility from the act of giving itself, it is reasonable to assume that donor contributes a fairly fixed amount.

In this version of the model, the non-profit organizations are assumed to derive utility from the difference between incoming donations and money used for charity projects[80]. The basis for this assumption is that non-profits, at least the larger ones, employ professionals on competitive salaries (we are excluding small charities that rely purely on voluntary workforce) and clearly the higher the salaries and perquisites the higher the utility for the employees. NPOs can also retain funds within the organization and compensate workers in the form of perquisites, even though by definition they are not able to make profit. It must be emphasized that the absence of an altruistic element in the model is not to say that charity organizations in reality are motivated by self-interest only. Altruism and high degree of commitment to a cause seem to be strong motives for people working for non-profit organizations, as well as a reason to establish one. For the current purpose, however, this utility function is most suitable as our focus is essentially on the effects of competition for donor funds in a situation where donors are concerned only about the quantity of outcome. Later on, the framework is extended to include quality considerations and altruism as well.

Let us next consider the first stage of the model. Non-profit organization at

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[80]   It is acknowledged that this is a strong assumption and will be relaxed later.

$k = 0$ maximizes a following utility function (maximization for non-profit at $k = 1$ conducted analogously):

$$\max_{a_0} \ D_0 - c_0 \cdot [Q_0(D_0, a_0)] \tag{3.2}$$

$$s.t.$$

$$D_0 \ = \ \int_0^{k^*} (k \cdot d) \ dk \tag{3.3}$$

where k^* determined by equation (3.1) above, c_0 is the unit cost of production which is constant and $c_0 \geq 1$, Q_0 is the total amount produced so that $Q_0 = a_0 D_0$. Thus, the second term of the equation resembles production function, although it is in an extremely reduced form. Finally, d is again the amount donated by a single donor, which is constant and equal for all donors. Also, $0 \leq a_0 \leq 1$, as the NPO cannot use more resources than are available from the donors. Thus, non-profit at k=0 optimizes by choosing the following supply function:

$$Q_0(D_0, a_0) = a_0 \left(\frac{a_0 - a_1 + z}{2z} \right) d \tag{3.4}$$

The amount of funding charity at $k = 0$ receives, k^*d, depends on the choice of a_0 through k^* and as was already pointed out earlier, k^* is increasing in a_0. Therefore, choosing a supply function effectively means choosing an optimal a_0. Clearly, the charity gets more funding the more it is willing to use in favor of the intended beneficiaries. For analytical simplicity supply functions are restricted to be linear[81] .

The first order condition for non-profit organization's problem is:

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[81]   One could assume these to be e.g. quadratic, but it is not clear whether this form would be any more realistic than the linear one. The model could, however, be extended to that direction too.

$$\frac{d}{2z} - c_0 \left(\frac{2a_0 - a_1 + z}{2z} \right) d = 0 \tag{3.5}$$

This illustrates a twofold effect resulting from an increase in a_0; increasing a_0 obviously increases revenue for the NPO as it is able to attract more donors by choosing higher a_0. On the other hand, increasing a_0 causes the share retained within the organization to decline.

Solving the above problem yields a solution for a_0 (problem for NPO 1 is solved similarly). Thus, we obtain reaction functions for NPOs at $k = 0$ and $k = 1$:

$$a_0 = \frac{a_1}{2} + \frac{1}{2c_0} - \frac{z}{2} \tag{3.6}$$

$$a_1 = \frac{a_0}{2} + \frac{1}{2c_1} - \frac{z}{2} \tag{3.7}$$

It is straightforward to see that a_0 and a_1 are strategic complements, i.e. the share of total donations allocated to charity projects is increasing in the contribution of the other non-profit. If the other donor increases a, this clearly results in fewer donations for the non-profit with lower a. Thus, it must increase its own share allocated to recipients as well. This illustrates the potential upside of competition from the beneficiaries' and donors' viewpoint. Competition for donor support forces non-profits to direct more funds to the actual charity work. It must also be noted that d disappears from the equations if we assume that the donated amount is constant.

From the above reaction functions we can find solutions for a_0 and a_1 as functions of unit costs c_0, c_1 and the parameter z:

$$a_0 = \frac{2}{3c_0} + \frac{1}{3c_1} - z \tag{3.8}$$

$$a_1 = \frac{2}{3c_1} + \frac{1}{3c_0} - z \tag{3.9}$$

where $0 \leq a_i \leq 1$ and $0 \leq \frac{1}{6c_0z} - \frac{1}{6c_1z} + \frac{1}{2} \leq 1$ (the latter property results from the restriction $0 \leq k^* \leq 1$).

It is interesting to note that both own costs and the costs of the rival non-profit affect the decision of a_i in the same way, only the magnitude of this effect differs[82]. As $\frac{\partial a_0}{\partial c_0} = -\frac{2}{3c_0^2}$, an increase in own costs reduces a_i, which of course is intuitive. However, it appears that increase in the costs of the rival non-profit also decreases a_i, since $\frac{\partial a_0}{\partial c_1} = -\frac{1}{3c_1^2}$. This stems from the fact that the increase in rivals costs (c_1) leads it to decrease its own a_1, and because a_0 and a_1 are strategic complements, it is optimal for NPO 0 to decrease a_0 as well. As a_0 and a_1 are decreased, increased costs reduce the utility of all beneficiaries indirectly through lower production. In other words, the cost effect negatively also affects the beneficiaries of the NPO whose costs remain the same.

We can also see that an increase in z decreases a_i one to one. The higher the 'ideological transportation cost', the less it benefits the non-profit organization to try to attract more donors with higher a. In other words, competition is less intense the stricter donors are in following their preferences. This implies that successful differentiation increases the utility of the NPOs. In contrast, the fact

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[82]   The source of the increase in costs is not specified here. For example, a natural interpretation would be that there is competition for good aid workers, which creates additional costs for the non-profits.

that donors have strong preferences might be a disadvantage from recipients' point of view, as less funds are directed to charity work.

Next, let us write the supply function for NPO at $k = 0$:

$$
Q_0 \left(d, c_0, c_1, z \right) = a_0 D_0 = \left(\frac{2}{3c_0} + \frac{1}{3c_1} - z \right) \left(\frac{1}{6zc_0} - \frac{1}{6zc_1} + \frac{1}{2} \right) d
$$
(3.10)

The supply is decreasing in own costs for all reasonable values of c_0, c_1 and z, i.e. as long as $4c_1 + 3zc_0c_1 > c_0$. Respectively, the supply is decreasing in the costs of the rival charity provided that $6zc_0c_1 - c_1 - 2c_0 > 0$ and is also decreasing in the parameter z, if $2c_1^2 + 9z^2c_0^2c_1^2 > c_0c_1 + c_0^2$. To sum up, if c_0 and c_1 are approximately the same size and nonzero and z is nonzero, the NPO's supply is decreasing in both own and competitor's costs and increasing in donations d. In addition, the higher is the 'ideological transportation cost' for donors, the smaller the amount to be disbursed to recipients.

Proposition 7 *If non-profit organizations are non-altruistic, recipients' utility increases with the extent of competition. The increase in the importance of preferences to donors (z) decreases the amount of funds distributed to the recipients because of mitigated competition. An increase in either of the NPOs' costs decreases utility for both recipient groups.*

Finally, we are able to calculate the equilibrium utility for NPO 0. The quantity of funds accruing to non-profit 0 is $k^*d = (\frac{1}{6zc_0} - \frac{1}{6zc_1} + \frac{1}{2})d$ and the utility of that non-profit is:

$$\Pi_0^* = (\frac{1}{6zc_0} - \frac{1}{6zc_1} + \frac{1}{2})\left(\frac{1}{3} - \frac{c_0}{3c_1} + zc_0\right)d \qquad (3.11)$$

It can be easily verified that the utility for non-profit organization is increasing in z as long as $z > 0$. This is an anticipated result; differentiation increases utility for the non-profit by mitigating competition. Likewise, an increase in the costs of non-profit at $k = 1$ increases the utility for non-profit at $k = 0$, provided that $c_1 + 3zc_0c_1 > c_0$. This again is positive, unless z is very small, and it holds for all nonzero values of z if c_1 and c_0 are approximately equal in size. Surprisingly enough, the increase in own costs may increase utility as well because $\frac{\partial \Pi_0^*}{\partial c_0} = \frac{1}{18}\left(3c_1c_0z - c_0 + c_1\right)d\frac{3c_1c_0z - c_0 - c_1}{zc_0^2c_1^2}$, which is positive unless z is very small. It is important to note that as the NPO at $k = 0$ chooses a lower a_0, this decreases a_1 as well, i.e. both a_0 and a_1 are decreasing in costs c_0. Lower a_0 means that the charity at $k = 0$ is able to keep a larger share of resources D_0. A decrease in a_0 somewhat decreases D_0, but this effect is mitigated as a_1 is decreased too. Furthermore, decrease in D_0 is quite small if we assume z to be not negligible, i.e. donors rely on their preferences. In this case, even though NPO 0 becomes less efficient by choosing a lower a_0, donors who prefer that particular organization do not easily change to NPO 1. Because of the inelasticity of donations, NPO gains from the increase in a induced by cost increase. The cost effect becomes negative, however, if z is very small and $c_1 < c_0$, i.e. own costs are initially higher. In this case, donor preferences are weak and donors allocate their disbursements mainly on the basis of the effectiveness of non-profit organizations. Thus, donors react very strongly to changes in a_i and even a small difference in favor of either NPO causes a large effect in donations.

Let us next look at symmetric solution assuming that production costs are identical $(c_0 = c_1)$. In this case, the solution for a simplifies to:

$$a^* = \frac{1}{c} - z \, ; 0 < a < 1 \qquad (3.12)$$

for both charities. Symmetric solution clearly shows that a is decreasing in c and in z. This illustrates well the impact of differentiation. If $z = 0$, competition is extremely fierce and $a^* = \frac{1}{c}$. This means that charities disburse all donations to beneficiaries. For symmetric charities obviously $k^* = \frac{1}{2}$. Thus, supply of one charity is:

$$Q^* = \frac{d}{2}\left(\frac{1}{c} - z\right) \qquad (3.13)$$

and utility for charity becomes:

$$\Pi^* = \frac{dcz}{2} \qquad (3.14)$$

which confirms the results above. The utility for charity increases with costs in the symmetric case, as a cost increase enables both charities to reduce their disbursements. Likewise, successful differentiation, meaning that donors see the products of these two charities as very different, is profitable for NPO. It must be noted that the result with respect to costs should be taken with caution. The current model proposes that the utility for non-profit actually increases with costs, but this result partly follows from the functional form chosen. As c in the cost term is linear, but a enters the cost term quadratically (and the revenue term linearly), it is clear that the positive effect through reduced a dominates and the overall effect of increased cost is positive as it leads both non-profits to choose a lower a. Increasing c, while decreasing a, therefore decreases total costs so

much that the total effect is positive, although unit costs have increased.

Even though this result seems somewhat controversial, it illustrates well the fact that despite competition, non-profits may end up producing only a relatively small amount, and that this amount is inversely related to the costs of production. The key point is that non-profits can transfer the costs to beneficiaries in terms of smaller disbursements. Eventually it is the beneficiaries who suffer from the cost increase, not NPOs themselves. This also indicates that incentives for NPOs to undertake any cost reducing measures are weak. It is important to note, though, that this result holds only for the symmetric or near symmetric case and it is necessary that donors have quite strong preferences. If the difference between the chosen a_0 and a_1(i.e. among c_0 and c_1) is large and if donor preferences are weak, decreasing a may lead to a large loss in forthcoming funds for the NPO with lower a, and in this case it may decrease its utility.

Proposition 8   *Assuming non-altruistic charities in a differentiated market, the utility for charities is increasing in transportation cost of donors (z), where transportation cost reflects the importance of donor preferences. An increase in own or competitor's unit costs leads to higher utility by decreasing the amount distributed to recipients. This holds near the symmetric case, provided that donor preferences are strong.*

The analysis is based on the assumption that the non-profits are located at the two extremes of the linear city (maximum differentiation). This is because in this paper the market for non-profits is essentially seen as a market for differentiated

products. If we let charities to become less differentiated, i.e. to locate closer to each other, this obviously leads to more intense competition and larger $a's$ chosen and increases the amount of production. In the extreme case with no differentiation, i.e. if when both charities are located at $k = \frac{1}{2}$, donors base their decisions only on the effectiveness and perceive the organizations identical otherwise. The outcome of this game is that both charities have to choose $c_i a_i = 1$. Therefore, they use all of the incoming resources to the production.

3.4   Model of altruistic organizations

The preceding analysis assumed that non-profits do not derive utility from the welfare of the recipients. The next step is to relax this assumption by postulating that NPOs maximize a utility function containing an altruistic element. The inclusion of altruism will probably offer a more realistic view of the charity market. Altruism is formulated here in a similar fashion as in the model by Jack (2001), who analyzes the use of non-profit organizations as providers for publicly funded services, and examines the choice between grassroots and international NPOs[83]. Similarly to Jack the current framework assumes that the utility function of a non-profit organization consists of a non-altruistic and an altruistic element. In this context the term "altruism" means that NPOs are concerned with both for the quality and quantity of production. The function used in this paper differs from that in Jack in two respects. First, in Jack there is an additional parameter representing the so called "non-profit status" so that the share of funds retained by the non-profit organization is multiplied by this parameter, which is smaller than unity in case of non-profit organization and equals unity if a normal for-profit firm is considered. Second, the non-profit organization does not optimize

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[83]   See also Glaeser and Schleifer (2001) for the model of the non-profits that Jack (2001) follows

on quality and quantity together, as it does in the current model, but cares for quality only.

The assumption of exogenous donations is again chosen for analytical convenience, thus k^* is determined by equation (3.1) as in section 3.3. Thus, let us write the problem for the altruistic non-profit organization at location $k = 0$ as follows[84]:

$$\max_{a_0,q_0}\ D_0 - c\left(q_0\right)a_0 D_0 + \alpha_0 q_0 a_0 D_0 \qquad (3.15)$$

where q denotes the quality of production, $c\left(q_0\right) = \left(1 + \frac{q_0^2}{2}\right)$, $D_i = k^*d = \left(\frac{a_0 - a_1 + z}{2z}\right)d$, and $a_0 D_0$ is the supply of the non-profit good. The cost function assumes that costs are unity if quality is zero. Thus, any cost increases must be due to an increase in quality. The parameter α reflects the NPO's 'degree of altruism'. The higher α is, the more the charity cares for the welfare of the beneficiaries, which naturally increases with the quantity and quality of production. Donations accruing to non-profit organizations are determined as in section 3.3 (see equation (3.1)), which implies that NPOs do not make commitments concerning the quality of production. This is based on an assumption that individual donors are unable to assess the quality. They can, for example, observe that a health project has been launched, but are cannot evaluate its quality. Therefore, donors cannot directly influence quality decisions taken by the NPOs. It is important to note that donors' inability to assess quality can lead to an overproduction of low-quality products, as NPOs are evaluated according to quantity only. This problem is of course aggravated if NPO's own preference for quality is low.

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[84]   The non-altruistic element in the utility function is the same as before, except for the cost function, because there are now additional costs for quality. Again, problem for non-profit at $k = 1$ is solved analogously.

The optimization of the non-profit organization at $k = 0$ with respect to a_0 and q_0 yields the following first order conditions:

$$\frac{1}{2z} + \left(\frac{2a_0 - a_1 + z}{2z} \right) \left(\alpha_0 q_0 - \frac{q_0^2}{2} - 1 \right) = 0 \qquad (3.16)$$

$$a_0 \left(\frac{a_0 - a_1 + z}{2z} \right) (\alpha_0 - q_0) = 0 \qquad (3.17)$$

Assuming that $\left(\frac{a_0 - a_1 + z}{2z} \right) \neq 0$ provides a simple solution for quality: $q_0 = \alpha_0$. Therefore, quality increases with altruism one to one. Plugging this into equation (3.16) gives us the reaction function for the non-profit organization at $k = 0$:

$$a_0 = \frac{1}{2} \left(a_1 - z - \frac{2}{\alpha_0^2 - 2} \right) \qquad (3.18)$$

Policy parameters a_0 and a_1 are strategic complements, similarly as in the case without altruism. From the reaction functions for the NPOs it is possible to analytically solve the equilibrium values of a_0 and a_1 as functions of z and α.

Let us first look at the situation for NPOs that are identical in terms of altruism, i.e. $\alpha_0 = \alpha_1 = \alpha$. It is easy to see that:

$$a_0^* = a_1^* = a^* = \frac{2z - z\alpha^2 - 2}{\alpha^2 - 2} \qquad (3.19)$$

where it must hold that $0 \leq \frac{2z - z\alpha^2 - 2}{\alpha^2 - 2} \leq 1$. It is clear that a increases with the degree of altruism of the charity as $\frac{\partial a}{\partial \alpha} = 2\frac{\alpha}{(\alpha^2 - 2)^2}$. This is a highly intuitive result; the greater the concern of the NPO for the welfare of recipients, the more it is willing to produce, ceteris paribus. It can be checked that setting $\alpha = 0$ leads to $a^* = 1 - z$, which is exactly the result in the non-altruistic symmetric case with $c = 1$. On the other hand, e.g. setting $\alpha = 1$ gives the result $a^* = 2 - z$, which means that for values $z \leq 1$, a reaches its maximum value $a = 1$.

Differentiating equation (3.19) with respect to z, reveals that the increase in the strength of donor preferences z decreases a one to one. The effect is the same as in the case without altruism. Thus, the nature of competition is not changed in this sense. The more firmly the donors favor either of the charities, the less the NPOs compete for donations and the lower they set a. Because of this, we can again conclude that from recipients' point of view the fact that donors have strong preferences can lead to smaller welfare than in the case where donors are indifferent among the charities (z is low). It is also noted that quality does not depend on z at all, as $q_i = \alpha_i$. The reasoning behind this is straightforward; if donors cannot observe or specify quality and cannot contract on it, it is not affected by their preferences either.

The equilibrium supplies are:

$$Q_0^* = Q_1^* = Q^* = \frac{1}{2}\left(\frac{2z - z\alpha^2 - 2}{\alpha^2 - 2}\right)d \qquad (3.20)$$

It can be seen that the supply increases with α and decreases with z as $\frac{\partial Q}{\partial \alpha} = 2\alpha \frac{d}{(\alpha^2 - 2)^2}$ and $\frac{\partial Q}{\partial z} = -\frac{1}{2}d$. The equilibrium utilities can be written:

$$\Pi_0^* = \Pi_1^* = \Pi^* = \frac{1}{2}d\left[1 - \left(\frac{2z - z\alpha^2 - 2}{\alpha^2 - 2}\right)\left(1 - \alpha^2\right)\right] \qquad (3.21)$$

We can check that by setting $\alpha = 0$, the equilibrium supply becomes $(1 - z)d$ and $\frac{\partial Q}{\partial z} = -d$. Thus, while the increase in z decreases the utility of the beneficiaries and donors also in the case of altruistic charities as $\frac{\partial Q}{\partial z} = -\frac{1}{2}d$, in the current case the decrease is only half of the effect that it would be in case of non-altruistic charities (with cost $c = 1$). It is also important to note that the increase in z can either increase or decrease the utility for the NPOs. The direction of this effect depends on the degree of altruism. If $\alpha^2 < 1$, meaning that the non-profit organization is not very altruistic, an increase in z increases

its utility, as it mitigates competition and both NPOs choose a lower a and can retain more funds within organization. However, with higher values of α, i.e. when $\alpha^2 > 1$, the effect of an increase in z is negative. With higher z donors do not react much to efficiency and therefore non-profits cannot easily attract more donors by setting a higher, which is a negative property for an altruistic charity.

Proposition 9 *With charities identical in their degree of altruism (α), the amount and quality supplied increase with the degree of altruism. Increase in the strength of donor preferences (z) decreases the share to be disbursed for beneficiaries. The effect is the same as for non-altruistic charities implying that recipients' welfare is decreasing in z. As for NPOs, an increase in z may either increase of decrease their utility depending on the value of α. For highly altruistic non-profits $(\alpha^2 > 1)$, increase in z decreases utility.*

Finally, let us briefly look at competition between NPOs that are not identical in the degree of altruism α. This leads to quality decisions $q_0 = \alpha_0$ and $q_1 = \alpha_1$ and solution for a_0 is:

$$a_0 = -z - \frac{4}{3(\alpha_0^2 - 2)} - \frac{2}{3(\alpha_1^2 - 2)} \qquad (3.22)$$

where $0 \leq a_0 \leq 1$. The extent of differentiation z affects a similarly as before, i.e. decreases the amount disbursed one to one. It is to be expected that an increase in own altruism increases a, which indeed occurs as $\frac{\partial a_0}{\partial \alpha_0} = \frac{24\alpha_0}{9(\alpha_0^2 - 2)^2}$. In addition, it is worth noting that $\frac{\partial a_0}{\partial \alpha_1} = \frac{12\alpha_1}{9(\alpha_1^2 - 2)} > 0$, indicating that an increase in altruism of the opponent increases a_0 as well.

Proposition 10   *If either one of the non-profit organizations becomes more al-*
truistic, it benefits the recipients of both NPOs.   This effect is caused by the
competition.

The above analysis is based on the assumption that donors are unable to
observe the quality of NPOs' work. Consequently, their choice does not depend
on quality of production. Compared to the situation where donors can observe
both quality and quantity, the amount produced is likely to be larger, but of
lower quality, as the non-profits can compete with quantity only, while quality
remains an issue of self-preference. In reality, competition in quality is somewhat
problematic as well, especially when we are considering such a diverse market
as the one for charity projects, where projects typically are unique. Evaluating
the performance of NPOs is difficult in general and it is all the more difficult
for individual donors. The only possibility is to rely on other parties such as
governments or research centers, but this cannot be done without costs, as donors
have to familiarize themselves with often complicated reports. Furthermore, in-
formation may not be available at all on the performance of a single non-profit
and evaluation becomes practically impossible. In terms of the model, writing
for example $k^* = \frac{a_i q_i - a_j q_j + z}{2z}$ would enable us to take into account the effects
of quality on donors' decisions. The case in which quality can be observed is
not taken up in this study as it does not offer much information, and becomes
analytically more complicated. A more interesting method of including q into
the donor's decision making process is be to introduce a third party, a monitoring
agent, into the framework. However, this extension is not conducted within the
current study.

3.5   Cost-reducing effort

This final section focuses on the incentives of the altruistic NPOs to engage in cost-reducing activities. Previously, it was noted that non-altruistic charities are not motivated to adopt cost-saving measures as the burden of cost increase was entirely borne by the recipients. However, for altruistic charities the situation is somewhat different[85]. As we know, donations depend positively on the level of output and if production costs are reduced, the quantity a non-profit organization can produce with a given amount of input naturally increases (given quality). For an altruistic charity this matters, as it derives some utility from the amount and quality produced. Clearly, due to the increase in production, the NPO is also able to attract more donations.

Let us assume that the non-profit organizations can make a cost-reducing investment before deciding on a and q. The investment may be, for example, the training of the personnel, which decreases the cost of undertaking high-quality projects. It is assumed that the cost from this investment is linear in the non-profit's utility function[86]. As the investment decision is made in the first period, we work backwards and start by first solving a_i and q_i treating effort e as a parameter. Non-profit at $k = 0$ maximizes:

$$\max \; D_0 - c_0(q_0, e_0)a_0 D_0 + \alpha q_0 a_0 D_0 - e_0 \tag{3.23}$$

where $c_0(q_0, e_0) = \left(1 + \frac{q_0^2}{2e_0}\right)$ and as before, $D_0 = k^* d$. Cost function

---

[85]   It must be noted that the motivation for cost-efficiency results from the assumption that the non-profits have independent preference for quality and that cost-efficiency does not necessarily reduce the quality of production. There are other ways to model this, for example Glaeser and Schleifer (1998) postulate that cost-efficiency results in lower quality. Because of this, as the non-profits are not able to make profit, they have lower incentives for cost-reducing efforts, which implies that they strive for higher quality than for-profit firms.

[86]   Effort is modelled following Jack (2001).

has the intuitively rational properties so that $\frac{\partial c_0(q_0,e_0)}{\partial e_0} < 0$ and $\frac{\partial^2 c_0(q_0,e_0)}{\partial e_0^2} > 0$. Therefore, investment e_0 reduces costs, but at a declining rate. With the given functional form it also appears that $\frac{\partial^2 c_0(q_0,e_0)}{\partial e_0 \partial q_0} < 0$, meaning that cost-reducing effect becomes weaker as quality rises. For analytical simplicity it is again assumed that the NPOs are identical in their degree of altruism, $\alpha_0 = \alpha_1 = \alpha$.

Solving the problem for NPOs gives us solutions for a_i and q_i:

$$q_0 = \alpha e_0 \tag{3.24}$$

$$a_0 = -z - \frac{2}{3\left(\alpha^2 e_1 - 2\right)} - \frac{4}{3\left(\alpha^2 e_0 - 2\right)} \tag{3.25}$$

where $0 < a_0 < 1$. It turns out that in this model quality increases with effort, because larger effort makes quality production cheaper and the effect is stronger the higher is α. Previous cost-reducing investment therefore leads to higher quality production in the second period. As for a_0, it appears that both $\frac{\partial a_0}{\partial e_0}$ and $\frac{\partial a_0}{\partial e_1}$ are positive as long as $a_0 > 0$. For altruistic non-profit organizations, cost decrease in own production therefore causes them to produce more. The positive effect from a cost reduction of the rival is due to strategic complementarity of policy parameters (a_0 and a_1). As increase in the rival's choice of e_1 increases its production, and it becomes optimal for non-profit organization 0 to also increase its own production.

Plugging solutions for a_0 and q_0 in the equation for k^*, the location of in-different donor can be written as a function of e_0 and e_1 and parameters α and z:

$$k^* = \frac{1}{2z}\left(\frac{2}{3\alpha^2 e_1 - 6} - \frac{2}{3\alpha^2 e_0 - 6} + z\right) \tag{3.26}$$

Differentiation of the above equation shows that the location of indifferent donor moves to the right with an increase in e_0 as $\frac{\partial k^*}{\partial e_0} = \frac{1}{2z}\left(\frac{6\alpha^2}{(3\alpha^2 e_0 - 6)^2}\right) > 0$. Thus, the higher the cost reducing effort, the more donations the non-profit is able to attract. Respectively, the increase in e_1 causes k^* to move left causing an increase in donations to non-profit at $k = 1$, because $\frac{\partial k^*}{\partial e_1} = \frac{1}{2z}\left(\frac{-6\alpha^2}{(3\alpha^2 e_0 - 6)^2}\right) < 0$. Equation (3.26) therefore clearly demonstrates an additional motivation for cost-reducing effort besides the direct effect that enables greater production and more funds to be retained within the organization. While increasing e_0 leads to the NPO at $k = 0$ receiving more donations, this effect can be decreasing in the degree of altruism, if effort is already at high level and/or the firm is very altruistic. This effect emerges when calculating the cross derivative $\frac{\partial^2 k^*}{\partial e_i \partial \alpha}$, which becomes negative if $(3\alpha^2 e_0 - 6) > 0$. The positive effect of increasing e_0 also decreases with z, i.e. there is less incentive for cost reducing investment as z becomes higher. This seems plausible; if donors start to follow their preferences more rigorously, it becomes harder for the NPOs trying to acquire donors from a distance. Therefore, the upside of cost efficiency in terms of attracting new donors is mitigated. It is important to note that e_i has been thus far treated as exogenously given, thus we do not take into account the effects $\frac{\partial e_0}{\partial e_1}$, $\frac{\partial e_0}{\partial \alpha}$ and $\frac{\partial e_0}{\partial z}$ when examining the above differentials.

Proposition 11   *The motivation for cost reducing activities is twofold for altruistic charities: lower costs enable larger size and higher quality production, and with lower costs the NPO is able to attract more donors (the indirect effect). The positive effect of cost reducing effort* (e) *is decreases with the degree of market differentiation* (z).

An obvious step would then be to endogenize the determination of e_0 and e_1 so that they could be solved as a function of α and z. This step includes solving the non-profit's problem (3.23) with respect to e_0, taking into account the solutions for a_0 and q_0 in (3.24) and (3.25). The problem for the NPO at $k = 0$ can becomes:

$$
\max_{e_0} \left(\frac{\frac{2}{3\alpha^2 e_1 - 6} - \frac{2}{3\alpha^2 e_0 - 6} + z}{2z} d \right) \times \tag{3.27}
$$
$$
\left(1 + \left(-z - \frac{2}{3(\alpha^2 e_1 - 2)} - \frac{4}{3(\alpha^2 e_0 - 2)} \right) \left(\alpha^2 e_0 - \left(1 + \frac{\alpha^2 e_0}{2} \right) \right) \right) - e_0
$$

However, as the solutions for a_0 and k^* are much more complicated than in the prior cases, the solution also becomes exceedingly rigorous, so that even though an analytical solution can be reached, it is not informative because of its complex form. Consequently, the examination of the third step is omitted and we must settle for concluding that potential benefits from cost-reducing activity exist for altruistic NPOs. Thus, this model does not support the hypothesis that cost efficiency is inconsistent with altruism.

3.6   Possible extensions and topics for future research

There are many possibilities to extend the framework so that other important features of the competition between non-profit organizations can be examined. First, the location choice of the charities could be included. One possibility is to assume, for example, an "innate" preference for the charity to help either of the possible beneficiary groups. However, it would have to choose a location to attract as many donors as possible and the choice of location is not necessarily the same as its ideological position.

Second, the model could be reformulated so that donors cannot perfectly

observe policy decisions by the charities, but that these would have to use resources to inform the donors. In this case, charities have to advertise, take care of public relations etc. in order to induce awareness about their mission. One possibility is to assume that by advertising NPOs are able to affect parameter z in the model, i.e. influence donor preferences. Including advertising costs into the model would raise interesting questions. For example, it is not clear how the advertising of one firm would affect the funding of other NPOs. On one hand, if one charity is able to attract more funding, this can decrease the support for other NPOs. On the other hand, however, the advertising of one firm can increase donor funding of all non-profit organizations, if that increases donor awareness in general.

Third, the model has assumed that NPOs are specialized in one field only, and that projects are merely the redistribution of resources. An obvious extension is to allow NPOs to choose from several projects which may for example vary with regard to their poverty effectiveness or in their visibility. This relates to the hypothesis that some projects are chosen merely for publicity reasons, as increased public exposure presumably increases funding for a NPO. This could explain the phenomenon that there seems to be an abundance of NPOs in high publicity locations, while only a few organizations operate in equally deprived places that have less exposure.

Forth, endogenizing donations to be function of policy and to allow donors the possibility of choosing the amount and target of donations would be an obvious and certainly interesting extension. However, as noted in section 3.3 there are certain difficulties in endogenizing donations. Thus, extension in this direction might need some reformulation of the model. Lastly, the modelling the utility of donors is, at least to some extent, a matter of taste. As presented in the intro-

duction, a donor can be assumed to be an impact philanthropist, a public good philanthropist or having impurely altruistic preferences, and it is not possible to say that one of the approaches would be the only correct one. One can also construct a utility function that combines all of the above views. The number of non-profits can also be increased. To sum up, there are various possibilities for extending the framework and a lot of interesting questions yet to be answered.

3.7   Conclusions

This paper examines competition between non-profit organizations within a simple framework assuming differentiated charities. The model builds on the familiar model of horizontal differentiation by Hotelling. The basic version of the model assumes charities to be non-altruistic and the amount disbursed by a single donor to be fixed. It turns out that the motivation for cost reduction in this case is low, as the NPOs can compensate possible cost increases by producing less. Thus, any cost increase is transferred to the recipients who simply receive less. The higher the 'ideological transportation cost' for donors, the smaller the utility of the beneficiary groups is, while the NPOs' utility increases. The paper also discusses altruistic non-profit organizations, where altruism is formulated so that NPOs derive utility both from quantity and quality of production. In this case, both the quality and quantity of production increase with non-profit organization's altruism, which is a highly intuitive result, but again the increase in the strength of donor preferences ('transportation cost') decreases the amount produced thereby diminishing beneficiaries' utility. Finally, it is shown that the motivation for cost reduction is strong for altruistic organizations, as they themselves have to bear part of the burden of cost increase.

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Chapter 4
Trade, War, and Peace

4.1 Introduction

This paper extends the basic international trade and conflict model developed by e.g. Skaperdas and Syropoulos (1996; 2001) to analyze the role of trade in local conflicts (either civil wars or international wars restricted to few countries). This is an important topic, as nowadays almost all conflicts are intrastate, and take place within the developing world, thus significantly weakening their growth prospects. Within this framework it turns out that the possibility to trade with outside countries increases the intensity of conflict in the case with Cobb-Douglas as well as with Stone-Geary utilities. We argue that with Stone-Geary utilities the intensity of conflicts can decline when the conflict countries' income increases, which is consistent with empirical evidence. The paper examines trade restrictions as well. The role of tariffs is twofold and somewhat ambiguous: tariffs can either increase or decrease conflicts. Thus, it is possible that trade barriers set by outside countries can actually intensify the conflict, although their existence is often justified by the argument that they promote peace.

Since the 2nd World War, there have been no major international conflicts involving a large number of countries or between the dominant economic powers. Europe in particular, aside from the Balkans and uprisings in Eastern Europe during the Soviet era, has been saved from both intranational and international military conflicts. It has been claimed that this is a consequence of increasing economic integration among the Western countries after the 2nd World War[87].

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[87] Andreatta, Ardeni, and Pallotti (2000) contains a brief survey of the arguments.

The main argument is that integration increases the interdependence between countries making conflicts more costly for individual countries[88]. This classic liberal theory that trade between countries reduces conflicts dates back to the early days of economics and was recognized by other scientists as well. For example, Montesquieu talked about peace as being a "natural effect of commerce" already in 1748. The idea is simply that trade, by causing interdependence, motivates countries to trade instead of capturing others' resources by force, since war leads to weakening of own welfare as well[89]. Indeed, trade has been widely accepted as one reason for the peace and political stability that prevails today in the industrialized world[90]. Furthermore, it has been suggested that globalization could reduce conflicts indirectly by increasing growth and economic stability[91]. A recent study by Polachec et al. (2004) also proposes that, at least in theory, FDI can increase peace. This is a somewhat complex issue, though, as a country usually needs to be reasonably peaceful in order to attract foreign investments in the first place.

Even though the Western developed world has been peaceful, the rest of the world has not. Notably, most of the observed conflicts have been civil wars[92]. During the period 1944-1997 the number of civil wars worldwide was 124 (Doyle and Sambanis, 2000), between 1965-1999 the respective number was 75 (Collier, 2000).

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[88]   The history behind this argument is long. Hirschman (2000) finds that this theory was among the arguments used to justify free market capitalism as early as in the pre-capitalism era. See also Irwin (1996) who gives an account of arguments focusing on free trade only.

[89]   See Hegre (2000) who finds that there is a clear negative relationship between trade and conflicts.

[90]   Current arguments for self-sufficiency in energy supplies recognize the same point. Clearly, with dependence on imported energy a country cannot be too tough against the supplying countries. A pitfall of this argument naturally is that it does not recognize the dependence of energy exporters on supplies from energy importers.

[91]   See Hegre et al. (2004) for recent empirical findings.

[92]   Collier et. al. (2003) offer an excellent survey of research on civil wars.

In 1999 alone there were 27 major armed conflicts, of which 25 were internal and 2 international (Collier, 2000). Almost all of these conflicts took place in the developing countries, and among them the poorest countries experienced a high proportion of conflicts. These numbers somewhat challenge the interdependence argument, as integration has included developing countries since the 1970s, and especially the latest rounds of global integration have witnessed their growing participation[93]. Yet, at the same time conflicts do not seem to have declined[94] and especially Sub-Saharan Africa has been extremely unstable both politically and economically. Of course, one reason for this may be the quite poor performance of regional trade agreements (RTAs) in creating trade between countries. That is to say that even though economic integration genuinely promotes peace, the extent of integration in Africa may still be too low to have an effect on conflict incidence. Indeed, Africa's share of international trade remains very small: for example, in the year 2000 only little more than 2 percent of total world exports were of African origin. As many of the conflicts have occurred in countries rich in natural resources, it has been proposed that access to world markets may, ceteris paribus, actually be an inducement, by making the financing of civil war easier, to start a civil war (Collier, 2000; Collier, 1999; Collier and Hoeffler, 1998; Collier and Hoeffler 2002).

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[93]   For example in Africa, quite a large number of regional trade agreements (RTAs) have been introduced during the last decades and they should have decreased conflicts by the interdepence-agrument. In July 2002 African countries replaced existing OAU with African Union seeking stronger cooperation and unity among African countries in political, social and economic issues. There also exists trade agreements between African countries and other regions (eg the Cotonou Agreement, previously the Lomé Convention).

[94]   The number of conflicts declined during 1990s but this is most likely due to the end of the Cold War, not to economic integration in the traditional sense (certainly the collapse of Soviet Union better integrated that part of the world with the rest of the world) (Collier, 2000)

The studies by Collier and Hoeffler (1998; 2002) suggest that the incidence of civil war is increases with the natural resources a country possesses[95]. Other studies have contested this view and the obtained results seem to be quite ambiguous[96]. However, it seems that some natural resources, oil in particular, significantly increase the likelihood of conflict. Other natural resources (like gemstones) seem to lengthen the duration of conflict, but agricultural commodities had no effect in most studies[97].

In this paper we focus on the potential relationship between the incidence of local conflicts and trade in world commodity markets[98]. Our work extends to the still rather small but expanding literature on conflicts and international trade[99] in two ways. Our first extension is to focus on local conflicts instead of analyzing conflict between two countries that comprise the whole world, as has been the tradition before. By a local conflict we mean a conflict between two regions or countries having economic ties with the rest of the world. The purpose is to study whether the existence of these external global ties increases or reduces incentives

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[95]   This view emphasizing economic aspects in conflicts has been critisized as being overly simplifying and ignoring political, social and religious considerations. Despite this, it is generally accepted that conflicts do have economic aspects. The significance of economic factors in conflicts is a matter of debate, though. See for example Malone and Nitzsche (2004) for a discussion.

[96]   Ross (2004) reviews the recent studies aiming to explain the onset and duration of civil wars and concludes that the association between natural resources and civil war onset is not robust.

[97]   See again Ross (2004). See also Murshed (2004) for discussion of different types of natural resources and the relationship between natural resource endowment and economic growth.

[98]   As one real world example of the potential relationship among trade and conflicts we may take up the Israel-Palestine conflict. Recently it has been argued that the Israeli trade policies on Palestine have prevented Palestinian economy from growing, thus increasing Palestinian aggression (Kanafani 2001; Arnon and Weinblatt, 2001). The policies have restricted trade with countries other than Israel. At the same time the policies have given market power to Israeli firms in Palestinian markets and restricted the access of Palestinian firms to Israeli markets.

[99]   Skaperdas and Syropoulos (2001) offer brief survey of the issues involved including basic references. Skaperdas and Syropoulos (1996) model trade after conflict as trade in labor services as all countries are producing one and the same commodity. In contrast, our paper focuses on goods trade.

for local conflict. Second, we examine how the nature of external economic ties affects these incentives. Among these we study the role of the external world trade policies and market power in creating conflicts. In addition, we also study the interaction between income levels and conflicts. This is an important issue, given the evidence (see for example Collier, 1999 and Collier, 2000) that increases in aggregate income tend to reduce conflicts, while low average incomes significantly increase the likelihood of civil war[100]. A novel empirical study by Krause and Suzuki (2005) suggests that the probability of civil conflict is smaller with trade openness (and increased economic development) in both Sub-Saharan Africa and Asia. Our work is also related to some recent work on poverty. Banerjee (2000) has made a distinction between two views on poverty: poverty as desperation and poverty as vulnerability. Poverty as desperation sees poor people as being so poor that "they have nothing to loose", i.e. the opportunity cost of conflict is very low. In contrast, poverty as vulnerability assumes that due to poverty people will be very much affected by adverse shocks. Our treatment of the role of income in conflicts comes closer to the view of poverty as desperation. In the current context this suggests that the poorer people are, the more likely they are to participate in conflict.

Why do we assume that opportunities to trade should matter in local conflicts? As stated above, the oldest argument is that international trade and the international division of labour help to mitigate conflicts. This reasoning is based on the idea that trade and conflicts are substitutes. They are not perfect substitutes, though, as conflicts destroy resources, which is why trade is Pareto-superior to conflict. However, this does not in itself imply that opportunities

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[100] Low income per capita seems to be the most robust factor in explaining the civil war onset. It is also important to note that the quality of the institutional framework is typically correlated with income. A low income country is likely to have poor quality of institutions and government, and conflicts are clearly more likely to occur within these circumstances.

to trade mitigate conflicts. Trade and conflicts are substitutes, since they both represent the means to benefit from the resources initially owned by other countries/regions. Trade is an indirect means, conflict a direct one for achieving that goal[101]. Given this, it is not clear that trade reduces incentive to conflict, since it is possible to gain a larger share of these resources through conflict. Furthermore, as was mentioned above, access to world markets may actually make it easier to finance conflicts. This is the insight in Skaperdas and Syropoulos (2001) and most of the research in the area[102]. Since we extend the framework used in their work, we study similar mechanisms.

The chapter is organized so that section 4.2 introduces our basic model of local conflicts, sections 4.3 and 4.4 discuss conflicts and global trade by introducing the possibility to trade with the rest of the world and the examination is conducted both with Cobb-Douglas and Stone-Geary utility functions. Section 4.5 extends the framework to include trade restrictions. The final section concludes.

4.2   Model of trade and local conflicts

Let us assume that the world consists of 3 countries (country 1, 2, and 3), and that for some reason countries 1 and 2 have not been able to commit to peaceful co-existence, while country 3 has made a credible commitment of not being hostile to either country, 1 and 2. Within this model we do not consider why countries 1 and 2 engage in conflict and do not model the possible choice between trade and conflict as a means of redistributing resources. In other words, we assume that there will be a conflict between countries 1 and 2, and examine how trade

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[101]   Recent studies confirm the intuition that conflicts destroy local markets and the restoration of markets is difficult after the conflict (Brück, 2001).

[102]   Collier (2000) also makes this point when he proposes that trade restrictions by outside parties should be imposed on the conflicting countries/regions.

opportunities with the rest of the world affect the intensity of conflict. It must be noted that instead of countries we could consider regions and the presented model applies equally well to regional, i.e. intranational conflicts. The important feature of the model is that the conflict is regional in the sense that part of the world is not involved. The model assumes that first countries 1 and 2 invest in arms, after which war breaks out. After a period of fighting and the signing of a peace agreement, goods are exchanged in world markets with country 3 participating in the exchange. Countries 1 and 2 take into account the outcome of this exchange in their investment decisions regarding arms.

For analytical simplicity we abstract from production and consider merely exchange economies. Trade is based on commodity endowments, and again for simplicity, we assume that all countries initially own only one type of endowment. Thus, there are three commodities, let us call them x, y, and z. The total world endowment of x is X and it is initially owned by country 1, the total endowment of y is Y, owned initially by country 2, and respectively the total endowment of z is Z, owned by country 3. In many real-world civil wars, the parties are interested in a single natural resource, for example diamonds as in Angola or Sierra Leone or oil in Nigeria and Congo[103]. Thus, the resource is common property that is to be shared through conflict[104]. Our model assumes that regions have their own endowments, but as will be seen below, they are also treated as common property in the conflict. It must be noted that the common property assumption is not the only way to model conflicts. We could also assume that there is one commodity for which there is a contest and that other commodities are non-contestable. However, it is not uncommon for all resources

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[103]   See discussion about natural resources and conflicts in Ross (2004). See also Addison et al. (2002) who present a theoretical model of war over natural reources.

[104]   See for example Grossman (2001) on this aspect of conflict.

to be redistributed during the hostilities and this assumption helps to keep the analytics as simple as possible.

After the conflict the parties interact in the world commodity markets, and it is assumed that all sellers and buyers act competitively taking world market prices as given. However, later we shall also consider the case where prices of x and y are decided in negotiations between country 3 and countries 1 and 2. Let the world market price of commodity j be p_j, where $j = x, y, z$. The investment of country i in conflict is W_i, $i = 1, 2$. It is clear that country i has to use its initial endowment to make this investment. We assume that x and y are perfect substitutes in producing arms. Consequently, the endowments available after arms investment are $X - W_1$ in country 1 and $Y - W_2$ in country 2[105]. When the war breaks out the investments in arms determine the success of the war .The success of country 1 is given by the success function ϕ, the success of country 2 respectively is $1 - \phi$. The success function has the following properties:

$$\phi = \phi\left(W_1, W_2\right), 0 \leq \phi \leq 1, \phi_{W_1} > 0, \phi_{W_2} < 0. \tag{4.1}$$

The success function can be interpreted as the probability of winning the war (and catching the existing endowment of the other country). As we shall assume that countries decide on war investment to maximize the welfare of the representative agent, we want to simplify the analysis by neglecting all the issues related to risk aversion. Thus, we assume that the success function gives the share of each country in the endowments of the hostile parties. This is also the interpretation chosen by Hirshleifer (1995) and it is used in most conflict models of this type. In our model, after the conflict the relative endowments of countries

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[105]   The military build-up is assumed to be financed by a lump sum tax on endowment. Thus we exclude any distortive effects of military expenses.

1 and 2 of commodities x and y are identical. The post-conflict endowments for country $i = 1, 2$ are given by $\hat{x}_i$, $\hat{y}_i$:

$$\begin{aligned}
\hat{x}_1 &= \phi(X - W_1) \\
\hat{y}_1 &= \phi(Y - W_2) \\
\hat{x}_2 &= (1 - \phi)(X - W_1) \\
\hat{y}_2 &= (1 - \phi)(Y - W_2)
\end{aligned} \tag{4.2}$$

Thus, in the post-conflict era the prospects for trade between 1 and 2 have disappeared since:

$$\frac{\hat{x}_1}{\hat{y}_1} = \frac{\hat{x}_2}{\hat{y}_2} = \frac{\phi}{1 - \phi} \tag{4.3}$$

It is straightforward to see that a comparative advantage between them no longer exists. Hence, there is no role for trade between countries 1 and 2. Potential gains from trade exist only between them and country 3. We have now established the first result:

Proposition 12 *For endowment economies with no property rights enforced war is a costly substitute for mutual trade.*

Although this result is almost trivial, it is important in understanding what happens in hostile regions during the conflict, i.e. part of the resources are completely wasted[106] and as a consequence, the countries end up even poorer than before. As pointed out in the literature on the economic consequences of civil wars[107], the concept of loss in this context is twofold. First, conflicts divert

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[106] For example Brück (2001) shows how conflict destroyed local markets in Mozambique during the civil war.

[107] See, for example, Collier et al. (2003)

resources from other economic activities thereby reducing economic growth. Second, as the above example shows, conflicts directly destroy resources, and losses can be substantial[108]. Furthermore, the indirect costs can also be significant[109].

After the conflict all countries engage in exchange in the world markets. To open up opportunities for trade, it is assumed that property rights are somehow enforced, after the conflict between countries 1 and 2, when the third country is included. For example, the countries in the first period could be countries from a region of high political instability and low level of development (e.g. Sub-Saharan Africa), where trade relations between or within countries are not properly established. As pointed out in the introductory section, most conflicts occur in the developing countries. The third country, on the other hand, is assumed to represent the developed world. Nowadays, wars between a developed country and the LDCs are quite rare, which we believe justifies this assumption. It is acknowledged, though, that conflicts between developing and industrialized nations are clearly possible even today. For example, one can easily see the parallel with the recent conflicts in the Middle-East, where an industrialized nation (USA) was involved. It is also noteworthy that natural resources (oil) have played an important role in these conflicts. Within the framework of this paper we assume, however, that property rights are enforced by 'rules of international community' and country 3 will not take hostile action towards countries 1 and 2.

It is assumed that country $i's$ citizens are all identical, $i = 1, 2, 3$. Thus, we can look at the aggregate welfare only and exclude distributional considerations.

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[108]   Needless to say, the human suffering cannot be measured in economic terms.

[109]   For example, Addison et al. (2004) show that conflicts significantly reduce financial development and that this effect is increasing with the intensity of conflict.

We start by examining the second period first, so the post-conflict incomes of countries 1 and 2 are determined by the following equations:

$$
\begin{aligned}
e\left(p_x, p_y, p_z, u_1\right) &= \phi\left[p_x\left(X - W_1\right) + p_y\left(Y - W_2\right)\right], \qquad (4.4)\\
e\left(p_x, p_y, p_z, u_2\right) &= \left(1 - \phi\right)\left[p_x\left(X - W_1\right) + p_y\left(Y - W_2\right)\right]
\end{aligned}
$$

where $e\left(p_x, p_y, p_z, u_i\right)$ denotes an expenditure function with the usual properties (see e.g. Jehle and Reny, 2000) and u_i is the aggregate welfare in country i. It is straightforward to see that welfare increases with the national share of endowments, in net endowments, and in p_x and p_y, while it is decreasing in p_z. Similarly, welfare of country 3 is given by:

$$
e\left(p_x, p_y, p_z, u_3\right) = p_z Z \qquad (4.5)
$$

which is clearly increasing in p_z and decreasing in p_x and p_y.

The world market equilibrium conditions are:

$$
\frac{\partial}{\partial p_x}\left[e\left(p_x, p_y, p_z, u_1\right) + e\left(p_x, p_y, p_z, u_2\right) + e\left(p_x, p_y, p_z, u_3\right)\right] = \qquad (4.6)
$$

$$
X - W_1
$$

$$
\frac{\partial}{\partial p_y}\left[e\left(p_x, p_y, p_z, u_1\right) + e\left(p_x, p_y, p_z, u_2\right) + e\left(p_x, p_y, p_z, u_3\right)\right] =
$$

$$
Y - W_2
$$

The third equilibrium condition, the equilibrium for good z, is not needed by Walras law. We postulate z to be the numeraire good and accordingly set $p_z = 1$. Equations (4.4), (4.5), and (4.6) determine the prices and welfare levels as functions of endowments and investments in war. In other words, in this period countries choose their consumption levels of each good, given prices and arms investments.

Next, let us turn to the decisions on investment in arms. The prices depend on the exchangeable endowments as follows:

$$
\begin{aligned}
p_x &= p_x \left(X - W_1, Y - W_2, Z \right), \\
p_y &= p_y \left(X - W_1, Y - W_2, Z \right)
\end{aligned}
\tag{4.7}
$$

In case of homothetic preferences it is easy to show that it is the relative endowments that matter, and accordingly we are able to write: $p_x = p_x \left(\frac{Z}{X-W_1}, \frac{Z}{Y-W_2} \right)$, $p_y = p_y \left(\frac{Z}{X-W_1}, \frac{Z}{Y-W_2} \right)$.

Now we are ready to focus on the decisions to arm made in the first period. Countries 1 and 2 decide on their military spending by maximizing the welfare of the representative consumer[110] taking into account the impact of arms stockpiling on prices. This assumption of authorities (partially) internalizing the impact of their decisions on market prices is standard in trade theory[111]. Here the assumption is especially appropriate, as it means that authorities maximize the revenue potential of their resources facilitating the financing of the conflict[112]. In country i, $i = 1, 2$, the consumer welfare is given by the utility function $u = u \left(C_{xi}, C_{yi}, C_{zi} \right)$, where C_{ji} = amount of good j consumed in country i. Now, country i maximizes the indirect utility function generated from maximizing the utility function $u = u \left(C_{xi}, C_{yi}, C_{zi} \right)$ subject to budget constraint. Indirect utility function is maximized by choosing military expenditure W_i subject to the success function (4.1), budget equation (4.4) and price responses (4.7). The first order condition for country 1 (the FOC for country 2 is analogous) takes the following

---

[110]   In reality, of course, leaders of rebel groups may also maximize their own welfare only. Yet, they face the problem of recruiting people to their cause.

[111]   See e.g. Abrego et al. (2001) for references to the relevant literature.

[112]   The recent 'economic view' on conflicts stresses the factors facilitating conflict finance as the reasons for conflict. See e.g. Collier et al. (2003).

form using the envelope theorem (see the details in *Appendix to section 4.2*):

$$\frac{\partial \phi}{\partial W_1} \left[p_x \left(X - W_1 \right) + p_y \left(Y - W_2 \right) \right] - \phi p_x + \left[\phi \left(X - W_1 \right) - C_{x1} \right] \frac{\partial p_x}{\partial W_1} +$$

$$\left[\phi \left(Y - W_2 \right) - C_{y1} \right] \frac{\partial p_y}{\partial W_1} = 0.$$

From the above equation we can see that arms building is determined by four factors. The first is the direct military benefit from the marginal impact of investment on the success of military operations. The second is the direct cost of building arms in terms of post-conflict resources. The third is the terms of trade effect of military spending resulting from the price effect on the resources initially owned by the country. The fourth effect is related to the price of the commodity to be captured in the conflict. Since a reduction in the supply of the commodity initially owned by the country increases its world market price, the financing of the conflict becomes easier. Thus, the terms-of-trade effect is positive. The impact on the price of the resource to be captured in the conflict may either increase or reduce incentives for military buildup. In general, even with homothetic preferences, there is no way to sign the term $\frac{\partial p_y}{\partial W_1}$.

As it is basically impossible to obtain any results on military investment without making specific assumptions concerning the functions, we limit our examination to special cases. We use the following specific form of the success function:

$$\phi = \frac{W_1}{W_1 + W_2}. \tag{4.8}$$

This means that the military buildup will always be positive, but the direct returns from building arms diminish with buildup[113]. We consider two specific utility

---

[113]   This form of success function is typically used in conflict models. For example, Hirshleifer (1995) uses contest success function of type $p_1 = \frac{F_1^m}{F_1^m + F_2^m}$, where p_1 is the success ratio for party 1, F_1 and F_2 are the fighting efforts and m is a decisiveness parameter. The decisiveness

functions: Cobb-Douglas as a case of homothetic utility function, and Stone-Geary as a case of non-homothetic utility function. Specifically, we use the following Cobb-Douglas function:

$$u_i = C_{xi}^\alpha C_{yi}^\beta C_{zi}^\gamma, \ \alpha + \beta + \gamma = 1, \tag{4.9}$$

and the special case of the Stone-Geary function[114]:

$$u_i = (C_{xi} - \theta)^\alpha (C_{yi} - \eta)^\beta C_{zi}^\gamma, \ \alpha + \beta + \gamma = 1. \tag{4.10}$$

The Cobb-Douglas specification is widely used in the literature on conflicts (e.g. Skaperdas and Syropoulos, 2001; Grossman, 2001), though often just for illustration. Thus, the use of Cobb-Douglas functions helps to compare our results with the earlier results. The Stone-Geary specification, on the other hand, allows demand structures to vary with income. In particular, it is interesting to study what is the impact of initial income on conflicts and Stone-Geary specification is a simple means to do so. In (4.10) we assume that the goods originating from the countries in conflict are necessities, i.e. there is a minimum amount of both of the commodities (θ for x, η for y) that everybody must consume. For example, it can be assumed that goods x and y are agricultural products, which typically are exported by developing countries. Alternatively, we can assume that countries 1 and 2 are exporting oil or other essential primary commodities. The good of the outside country is a non-necessity, presumably a manufacturing product. This is one way, albeit crude, to characterize asymmetries in the structure of economy between developing and developed countries.

In the next two sections we use functions (4.9) and (4.10) to *i)* analyze how

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parameter has been excluded from the current discussion for analytical simplicity.

[114]   This is not literally the traditional Stone-Geary function as there is no minimum required consumption for good z.

countries' incentives to invest in arms depend on the possibility to trade with an outside country, *ii)* analyze how military investment depends on the level of income (as measured by the size of endowments), and *iii)* analyze how military investment is affected by changes in the access to outside country markets, i.e. trade policies of country 3. The latter point is interesting because Collier (2000), for example, has proposed restrictions on imports of commodities from conflict prone countries as one useful ex ante measure to contain conflicts. Collier argues that import restrictions (or restrictions on purchases of these goods or bans on their sales) make it more difficult for hostile parties to finance the conflict.

4.3   Conflicts and global trade -Cobb Douglas case

We begin by assuming that utility functions are given by (4.9) so that we obtain demand functions for country i:

$$C_{xi} = \frac{\alpha R_i}{p_x}, \ C_{yi} = \frac{\beta R_i}{p_y}, \ C_{zi} = \gamma R_i$$

where R_i is the income of country i determined in (4.4) and (4.5). Prices in (4.7) are determined as:

$$p_x = \frac{\alpha}{\gamma} \frac{Z}{(X - W_1)}, \ p_y = \frac{\beta}{\gamma} \frac{Z}{(Y - W_2)}$$

Using these and success function (4.8) the following reaction functions can be obtained:

$$
\begin{aligned}
W_1 &= \frac{-W_2(1 + \frac{1}{\alpha}) + \sqrt{W_2^2(1 + \frac{1}{\alpha})^2 + \frac{4W_2 X}{\alpha}}}{2} \\
W_2 &= \frac{-W_1(1 + \frac{1}{\beta}) + \sqrt{W_1^2(1 + \frac{1}{\beta})^2 + \frac{4W_1 Y}{\beta}}}{2}
\end{aligned}
\tag{4.11}
$$

After straightforward but tedious calculations it can be seen from (4.11) that the decisions to arm are strategic complements, since $dW_1/dW_2 > 0$ (and

respectively $dW_2/dW_1 > 0$). Thus, when the opponent increases (decreases) its investment in conflict, country i also increases (decreases) its investment. Equations (4.11) clearly reveal that $\partial W_1/\partial X > 0$ (and $\partial W_2/\partial Y > 0$). This is to say that the bigger the initial endowment, i.e. the larger or more wealthier the country is, the more aggressively it behaves. It must be noted that this implication is contrary to the findings in recent empirical work on conflicts. In an empirical survey, Collier (2000) concludes that it is a robust result that the probability of a conflict (civil war) declines with the national income. Thus, the results obtained with Cobb-Douglas utility functions must be treated with caution[115].

To see the role of global trade in conflict as clearly as possible let us next consider only the symmetric equilibria between regions 1 and 2. This is done by assuming that $X = Y, \alpha = \beta = (1 - \gamma)/2, and\ W_1 = W_2 \equiv W$. The solution for W becomes:

$$W = \frac{X}{(2 - \gamma)} \tag{4.12}$$

The commodity owned initially by the third country, Z, disappears from the symmetric equilibrium. This occurs because the third country symmetrically affects both countries $i = 1, 2$. Is easy to see that, contrary to what could be expected by interdependence argument, W is increasing in γ, i.e. increased trade opportunities lead to more intensive conflict between developing countries. The greater the importance of good z in consumption, the more is invested in conflict. As the amount of resources utilized for conflict increases, less of x and y are available for trade with the third country and terms-of-trade for countries $i = 1, 2$ vis á vis the third country improve. Clearly, the greater the importance of good

---

[115]   In a compelementary paper (Haaparanta and Kuisma, 2005, see the next chapter) we argue, however, that taking into account the possibility of peace-building by outside countries the Cobb-Douglas specification can be consistent with the empirical evidence.

z in consumption, the more important becomes the terms-of-trade effect. It turns out that the positive terms-of-trade-effect dominates.

Proposition 13 *In symmetric case with Cobb-Douglas utilities trade increases investment in conflict. Investment in conflict (W) is also increasing in X, i.e. the wealthier the country is, the more aggressive it becomes.*

Even though the conflict is more intensive due to the possibility to manipulate the terms of trade against the outside country, it can be easily verified that welfare is always lower with conflict than without it. With conflict welfare in the symmetric equilibrium is $\alpha^{2\alpha}\gamma^{\gamma}\left(\frac{1-\gamma}{2-\gamma}\right)X$. In the free trade no-conflict equilibrium, welfare is $\alpha^{2\alpha}\gamma^{\gamma}X$. Clearly, $\alpha^{2\alpha}\gamma^{\gamma}X > \alpha^{2\alpha}\gamma^{\gamma}\left(\frac{1-\gamma}{2-\gamma}\right)X$. Thus, both countries would be better off if they were somehow able to commit to peace and both choose $W_i = 0$. Within this model it does not happen, though, as choosing $W_i = 0$ is always a dominated strategy. It was shown that investment in conflict increases with γ. Investing more on conflict effectively means less resources available on consumption as an increase in γ induces higher conflict investment due to the positive terms-of-trade effect. It is easy to see that the term $\left(\frac{1-\gamma}{2-\gamma}\right)$ is decreasing in γ. Thus, the higher γ is, the larger the welfare loss becomes (compared to the non-conflict equilibrium). In other words, through this effect, globalization has a welfare decreasing effect.

Proposition 14 *Conflict becomes more costly as the share of non-conflict country's goods in consumption increases, i.e. as γ grows.*

4.4　Conflicts and Global Trade -Stone-Geary -case

In our earlier analysis all three goods were needed for consumption and the differences in their importance were reflected by weights in the Cobb-Douglas utility function. In order to gain further insight, the analysis is replicated using Stone-Geary utility function (4.10). This allows us to analyze the case of countries having different demand structures, as the Stone-Geary utility is non-homothetic. Developing countries differ from the rest of the world in that their initial endowments consisting of goods x and y are necessities (e.g. food) that must be consumed in certain quantities in order to survive. Good z, on the other hand, is assumed to be a manufacturing good that can be consumed in quantities according to the countries' preferences (as long as the amount is positive). It is assumed that the relative share of subsistence consumption in total consumption is larger in poorer countries. Subsistence consumption of x is denoted by θ and subsistence consumption of y by η[116]. Similarly as before, utility maximization gives the demand functions for country i :

$$
\begin{aligned}
C_{xi} &= \frac{\alpha \left[R^i - p_x \theta - p_y \eta \right]}{p_x} + \theta \\
C_{yi} &= \frac{\beta \left[R^i - p_x \theta - p_y \eta \right]}{p_y} + \eta \\
C_{zi} &= \frac{\gamma \left[R^i - p_x \theta - p_y \eta \right]}{p_z}
\end{aligned}
\tag{4.13}
$$

---

[116]　In case of diamonds or other luxury goods, it would be more natural to assume that the survival consumption of country 1 and 2 goods is 0. The best way to take these types of resources into account would be to assume that countries 1 and 2 (possibly only one of them) have an endowment of a good of this type in addition to the endowment specified here.

and prices in equation (4.7) now become:

$$p_x = \frac{\alpha}{\gamma} \frac{Z}{[(X - W_1) - 3\theta]},$$

$$p_y = \frac{\beta}{\gamma} \frac{Z}{[(Y - W_2) - 3\eta]}$$

(4.14)

The equilibrium value for conflict investment W_i is obtained by plugging demands (4.13) and prices (4.14) into utility function to get an indirect utility function which is then maximized with respect to W_i. For analytical simplicity we again proceed by assuming symmetry between countries 1 and 2, i.e. we set $X = Y$, $\alpha = \beta = \frac{1-\gamma}{2}$, $\theta = \eta$, and $W_1 = W_2 \equiv W$ and use them in the first order conditions. Dependence of W from the parameters can be analyzed from the following equation:

$$\frac{X - W}{W} = 1 - \frac{\gamma(X - W - 2\theta)}{(X - W - 3\theta)}$$

(4.15)

which is equivalent to writing:

$$(2 - \gamma) W^2 - (3 - \gamma) (X - 2\theta) W + X (X - 3\theta) = 0$$

(4.16)

Solving the above equation yields a solution for W:

$$W = \frac{1}{2} \left\{ \frac{(3 - \gamma)(X - 2\theta)}{(2 - \gamma)} \pm \left[\left(\frac{(3 - \gamma)(X - 2\theta)}{(2 - \gamma)} \right)^2 - \frac{4X (X - 3\theta)}{(2 - \gamma)} \right]^{\frac{1}{2}} \right\}$$

(4.17)

in which the smaller root is chosen. When examined near $\theta = 0$, solution becomes the Cobb-Douglas solution where an increase in γ increases conflict. This holds for the smaller root, thus making its choice consistent with the framework. It is clear that we must assume that $(X - W - 3\theta) > 0$ as prices cannot be

negative. From (4.15) it can be seen that if $\theta = 0$, the solution becomes the same as in the symmetric Cobb-Douglas case, i.e. $\frac{X-W}{W} = 1 - \gamma$. On the other hand, in autarky when $\gamma = 0$ we find that $W = X/2$ which is the minimum level of conflict, as we can see from equation (4.15) that the level of conflict is increasing with γ. An increase in γ decreases the right hand side (RHS hereafter), which clearly means that the left hand side (LHS) must decrease as well, implying an increase in conflict investment W. Relevant range for W is therefore $W > X/2$, which means that $X > 6\theta$ must be assumed. If this does not hold, then $W = 0$. Also, the term in square brackets must be non-negative for a (real) solution, i.e. $\left(\frac{(3-\gamma)(X-2\theta)}{(2-\gamma)} \right)^2 - \frac{4X(X-3\theta)}{(2-\gamma)} \geq 0$.

Let us first focus on equation (4.15). It is easy to capture the intuition by examining the equation by looking at right and left hand sides separately. First, since $(X-W-2\theta) > (X-W-3\theta)$ we know that $\frac{\gamma(X-W-2\theta)}{(X-W-3\theta)} > \gamma$. This implies that the level of military investment with Stone-Geary preferences must be above the level of investment with Cobb-Douglas preferences. Clearly, the RHS of equation (4.15) decreases when θ is increased. For given X this means that W must increase, indicating an increase in conflict. Thus, the larger the subsistence consumption, the more intensive conflict $(\partial W/\partial \theta > 0)$. Respectively, an increase in γ (decrease in RHS) indicates that the new equilibrium with higher γ has a higher investment in conflict for given initial endowment X $(\partial W/\partial \gamma > 0)$. It is also important to note that income in potential conflict countries has to be high enough for conflict to emerge, i.e. $X > 6\theta$. For very poor countries all the income is used to subsistence consumption. Collecting the preceding discussion we are able to state:

Proposition 15   *For given initial endowments, provided that $X > 6\theta$, invest-*

ment in conflict is increasing in the level of subsistence consumption (θ) and in

the importance of imported good z in consumer preferences (γ). Furthermore,

the investment in conflict is higher with Stone-Geary preferences than with Cobb-

Douglas preferences.

It turns out that investment in conflict increases with the level of subsistence consumption. The higher the amount that must be consumed, the greater the struggle that emerges. Paradoxically, this of course leads to smaller welfare for both conflict countries.

It is interesting to look at what happens to conflict investment when income changes. As we know, within the Cobb-Douglas framework it is noted that con-flict is increasing in income. By differentiating equation (4.17) with respect to X (choosing the smaller root as explained) we get the following form:

$$\frac{dW}{dX} = \frac{3-\gamma}{2-\gamma} - \frac{\frac{\left[(3-\gamma)^2-4(2-\gamma)\right]X+\left[6(2-\gamma)-2(3-\gamma)^2\right]\theta}{(2-\gamma)^2}}{\sqrt[2]{\left(\frac{3-\gamma}{2-\gamma}\right)^2(X-2\theta)^2-\frac{4X(X-3\theta)}{2-\gamma}}} \qquad (4.18)$$

Unfortunately, the sign of the above derivative is not obvious. Clearly, the term under square root must be positive, but the term $\frac{\left[(3-\gamma)^2-4(2-\gamma)\right]X+\left[6(2-\gamma)-2(3-\gamma)^2\right]\theta}{(2-\gamma)^2}$ can be positive or negative depending on the parameter values. For small X and large γ it is negative. In this case, the whole derivative $\frac{dW}{dX}$ becomes positive meaning that an increase in income mag-nifies conflict. For example, if $\gamma = 1$, the term becomes -2θ. If we set $\gamma = 0.5$, the term becomes $0.25X - 3.5\theta$. Naturally, for the latter case, it is required that

$(X > 14\theta)$ for the term to become positive. The term is largest when $\gamma = 0$, in this case it becomes $(X - 6\theta)$, which we have assumed to be positive. As we can see, as γ grows, the value of X that is required for the term to be positive becomes larger. As X grows, ceteris paribus, the term can become positive meaning that the whole derivative can be negative (of course depending on the size of the second term compared to the first one). As a special case we find that as the value of X is close the solution to the equation $\left(\frac{3-\gamma}{2-\gamma}\right)^2 (X - 2\theta)^2 - \frac{4X(X-3\theta)}{2-\gamma} = 0$, then $\frac{dW}{dX} \to -\infty$ (see details in *Appendix to section 4.4*). In this case, investment in conflict definitely decreases with the increase in income.

In conclusion, derivative (4.18) implies that investment in conflict declines if the income level is high enough but at low income levels, increases in income induce higher conflict investments. The result is important as it is in accordance with empirical evidence (Collier and Hoeffler, 1998 and Collier, 2000). The result is easy to understand: at low income levels people are close to the subsistence levels of consumption and marginal utility of consumption is high. Hence, investment in conflict is relatively unproductive. An increase in income adds to the profitability of conflict both in terms of higher capture and in reduced marginal utility of consumption. Further increases in income that raise the country clearly above the subsistence level reduce the rate of the decline of marginal utility of consumption. Accordingly, it again becomes more productive to trade and consume rather than invest further in conflict.

Proposition 16   *With Stone-Geary utility function, an increase in income increases conflicts at low income levels, but at higher incomes an increase in income may reduce conflicts, which is consistent with empirical evidence. With higher γ, a higher original level of income is required for the income increase to mitigate conflict.*

The above result is important, as it shows that increases in income can reduce conflicts, provided that incomes are initially high enough. This, however, requires the assumption that preferences are non-homothetic; with Cobb-Douglas preferences an increase in income always makes a country more aggressive. As incomes increase, countries become more interested in the commodity offered by the third country (a manufacturing product), and respectively less interested in acquiring the commodity offered by the nearby region. The condition that incomes have to be high enough is of crucial importance. The countries must be above the level of subsistence consumption income. This seems intuitively reasonable; as long as countries are extremely poor, they are only concerned with the consumption of necessity commodities. This, in fact, offers one potential explanation for the fact that conflicts occur in countries suffering from extreme poverty. Thus, it is possible that in principle an increase in income leads to a more peaceful state, but this effect fails to emerge for poorest countries.

4.5   Conflicts and Trade Restrictions by Non-Conflict countries

Previously it was assumed that trade between developing countries and Western world is unrestricted, and that there are no costs from trading. In reality, the situation is quite different. Despite efforts to liberalize international trade, tariffs

and quotas are still widely used both by industrialized and developing countries. Trade restrictions imposed by the Western world on exports from developing countries can be seen as a third world discrimination. Furthermore, by reducing trade and thus reducing the extent of interdependence, trade restrictions can possibly delay the peaceful development of the third world. On the other hand, we already know that some studies have suggested that trade restrictions, specifically trade barriers, could in fact promote peace. By imposing restrictions on conflict countries, or by refusing to trade with these countries altogether, hostile nations could be forced towards a more peaceful state, as possibilities to finance the conflict become limited.

In this section we discuss the implications of a tariff imposed by the third country, i.e. the Western world, on its imports from developing countries. Specifically, we ask what kind of effect, if any, do tariffs have on conflict between developing countries.

4.5.1   Cobb-Douglas -case

Let us model tariffs by assuming that country 3 sets an *ad valorem* tariff τ on its imports from developing countries. Accordingly, the effect of tariffs (if any) comes through the tariff income for country 3, $T_3 = \tau(p_x C_{x3} + p_y C_{y3})$. Because conflict decreases the amount of goods x and y available, it changes the tariff income and this can affect the terms of trade. Now the prices of imports in country 3 are $(1 + \tau)p_x$ and $(1 + \tau)p_y$ and the tariff income can be rewritten (using the Cobb-Douglas demand functions) as:

$$T_3 = \frac{(\alpha + \beta)\frac{\tau}{(1+\tau)}}{1 - \frac{(\alpha+\beta)\tau}{(1+\tau)}} p_z Z \tag{4.19}$$

From (4.19) it follows that total revenue for country 3 is:

$$R_3 = \frac{1}{1 - \frac{(\alpha+\beta)\tau}{(1+\tau)}} p_z Z \tag{4.20}$$

which may, through world market equilibrium conditions, affect conflict decisions in countries 1 and 2.

We proceed with similar calculations as in the previous cases, but this time we set p_x as a numeraire so that the tariff effect can be collected in a single term. Thus, we obtain the prices:

$$\begin{aligned} p_y &= \frac{\beta}{\alpha}\frac{(X - W_1)}{(Y - W_2)} \\ p_z &= \frac{\gamma(1 + \gamma\tau)}{\alpha}\frac{(X - W_1)}{Z} \end{aligned} \tag{4.21}$$

After calculations analogous to those conducted in the previous section it turns out that the impact of a tariff disappears from the first order conditions for countries 1 and 2. The impact of tariff on the prices of goods x and y and the impact on the income of country 3 cancel out each other. Thus tariffs by the third country do not have any impact on conflict between countries $i = 1, 2$.

Proposition 17 *Trade restrictions imposed by outside countries have no effect on conflict if consumers have Cobb-Douglas preferences.*

This result, however, is presumably caused by the properties of Cobb-Douglas function. The result holds since the Cobb-Douglas demand functions have unit elasticity of demand with respect to prices and income. Therefore, basically all the value terms are unaffected by tariffs.

4.5.2   Stone-Geary -case

The situation is potentially different and quite complex when examining tariffs with Stone-Geary utility functions. We again use p_x as a numeraire to collect the effects of the tariff into a single term.

The other prices are now:

$$p_y = \frac{\beta\,(X - W_1 - 3\theta)}{\alpha\,(Y - W_2 - 3\eta)} \tag{4.22}$$

$$p_z = \frac{\gamma\,(1 + \gamma\tau)\,(X - W_1 - 3\theta)}{\alpha Z} - \frac{\beta\gamma\eta\tau\,(X - W_1 - 3\theta)}{\alpha Z\,(Y - W_2 - 3\eta)} - \frac{\alpha\gamma\theta\tau}{\alpha Z}$$

Naturally, we must have $p_z > 0$. Using (4.22) the equilibrium condition for W in the symmetric equilibrium can be written as:

$$\frac{X - W}{W} = 1 + \frac{\gamma(X - W - 2\theta)}{(X - W - 3\theta)} + \tag{4.23}$$

$$\frac{2\gamma}{\alpha}\left[\frac{\alpha\theta\tau}{(X - W - 3\theta)} - \frac{1}{(1 + \gamma\tau)}\right] \times \left[\frac{(X - W - 2\theta)}{\frac{(1+\gamma\tau)}{\alpha}(X - W - 3\theta) - 2\theta\tau}\right]$$

where $\alpha = \frac{1-\gamma}{2}$. It is easy to verify that by setting $\tau = 0$ we get the result in equation (4.15), i.e. the ordinary Stone-Geary solution.

Before proceeding with the analysis it is useful to go through the effects of tariffs on conflict investment intuitively. We already know from previous discussion that conflict causes an improvement in the terms-of-trade, as there are less goods available for trade. As tariffs are imposed, they yield tariff income to the people of country 3. Now, an increase in conflict between countries 1 and 2 decreases the quantities exported and correspondingly tariff income. Presumably, as income of country 3 decreases because of conflict, it can lead to lesser demand for the products from the conflict countries thereby eroding

the terms-of-trade improvement. When countries 1 and 2 are deciding on their conflict investments, they take this effect into account and it may lead to smaller conflict investment. Clearly the result depends on the effect that dominates: the terms-of-trade improvement caused by reduction in supply or the terms-of-trade deterioration resulting from decreased tariff income for the people of country 3.

Let us next focus on the analytical examination. We start by looking at the terms of trade effect. Directly differentiating (4.22) and evaluating at the symmetric equilibrium gives:

$$\frac{\partial p_z}{\partial W_1} = \frac{\gamma}{\alpha Z}\left[\frac{\alpha\theta\tau}{(X - W - 3\theta)} - (1 + \gamma\tau)\right] \qquad (4.24)$$

from which we can see that terms of trade of the conflict countries improve (deteriorate) when $\frac{\partial p_z}{\partial W_1} < (>) \, 0$. Taking into account that in the symmetric case $\alpha = \frac{(1-\gamma)}{2}$ we can state that terms of trade improve (deteriorate) if:

$$(1 + \gamma\tau) \begin{array}{c} > \\ (<) \end{array} \frac{(1 - \gamma)\,\theta\tau}{2\,(X - W - 3\theta)} \qquad (4.25)$$

The first result is that with tariffs, under certain circumstances, conflict can actually deteriorate the terms of trade of the hostile countries. From the above condition it can be inferred that terms of trade deterioration is more likely the poorer the conflicting countries are (the smaller is X), and the larger the share of subsistence consumption (θ) is in total expenditure. Clearly, γ must be low. This is to say that the consumption of products from the conflict zone has to be high. The deterioration in the terms-of-trade is possible, because conflict reduces exports to the non-conflict country and this leads to a loss of tariff revenue there. If a large share of income is spent on conflict country goods (($1 - \gamma$) is high), then the loss of tariff revenue reduces, ceteris paribus, demand for those goods

causing their relative price to fall. Therefore, the terms-of-trade deteriorate for belligerent countries. In addition, the higher the original tariff, the deeper the decline in the terms-of-trade. In conclusion, the presence of tariffs can cause the increase in conflict investment to worsen the terms of trade for conflict countries, which weakens their incentive to invest in arms.

It is important to note that tariffs can still reduce the impact of the military investment on terms-of-trade (price of good z)[117] even when the terms-of-trade improve (as a result of increase in conflict). In other words, we can note that although conflict improves the terms-of-trade ($\frac{\partial p_z}{\partial W_1} > 0$), this effect is mitigated as tariff increases, i.e. $\frac{\partial}{\partial \tau}\left(\frac{\partial p_z}{\partial W_1}\right) < 0$. We know that with very small tariffs ($\tau \approx 0$), we get $\frac{X-W}{W} \approx 1 - \frac{\gamma(X-W-2\theta)}{(X-W-3\theta)}$ (the Stone-Geary solution without tariffs), i.e. $\frac{X-W}{W} < 1$, which is equivalent to saying that $W > \frac{X}{2}$. Thus, we are able to observe the sufficient condition for a tariff to reduce the impact of conflict on market price:

$$X - 6\theta < \frac{(1-\gamma)\,\theta}{\gamma} \tag{4.26}$$

A low enough share of the third country's good in consumption (high consumption share for the hostile countries' products) and a sufficiently high required consumption of the good originating from the conflict regions guarantee that the above condition holds. Trade restrictions by outside countries reduce the impact of military investment on the terms-of- trade thereby reducing incentives for a military buildup.

In some cases it is possible that the positive terms-of-trade effect is actually stronger with tariffs. This may happen when γ is large and the consumption

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[117]   The restriction that prices must be positive rules out the possibility that the sign of the-terms of-trade effect changes.

of imported goods from countries 1 and 2 is small and close to the subsistence level, which also needs to be quite small. Similarly as in the previous cases, tariff income for country 3 decreases as a result of conflict. Now, however, demand decreases more significantly for z than for x and y, as their consumption is already very small and because of the subsistence consumption requirement cannot reduced much further. So the relative prices of goods 1 and 2 with respect to 3 actually increase more, meaning that the terms of trade improves more than in a non-conflict environment.

The previous analysis clearly shows that tariffs have a conflict reducing feature, provided that condition (4.26) holds. However, this does not in itself mean that an increase in tariffs will reduce investment in arms. To check the total effect we must compare equation (4.23) to the equivalent Stone-Geary solution without tariffs (4.15). It is easy to see that with $\tau = 0$, in equation (4.23) the term $\left[\frac{\alpha\theta\tau}{(X-W-3\theta)} - \frac{1}{(1+\gamma\tau)} \right] = -1$ and in this case we obtain the ordinary Stone-Geary solution.

Let us focus on the case of small tariffs by differentiating the RHS of equation (4.23) and evaluating that at $\tau = 0$. Assuming that initially $\tau = 0$, a small tariff decreases (increases) conflict if the RHS increases (decreases), i.e. whether the following term is positive (negative):

$$\alpha\theta\left(\alpha - 2\right) + \gamma\left(\alpha + 1\right)\left(X - W - 3\theta\right) \overset{>}{\underset{(<)}{}} 0 \qquad (4.27)$$

where $\alpha = \frac{1-\gamma}{2}$. If the expression is negative, then W must be larger with small tariffs, if it is positive, then small tariffs reduce conflict investment. It is easy to see that the second term of the condition is always bigger or equal to zero (provided that $(X - W - 3\theta) > 0$, which has been assumed all the way) and

it is increasing in γ. On the other hand, the first term is always negative but is decreasing in γ. Thus, if γ is large, the first term becomes more negative, but as the second term grows it is impossible to determine what happens to the whole term. However, as the second term grows, i.e. the country becomes richer, it is more likely that the derivative becomes positive as γ grows.

It is possible to show with numerical simulations that tariffs can have either impact. That is to say that with Stone-Geary preferences conflicts can either increase or decrease as a result of an increase in tariffs, depending on the value of γ. For the numerical analysis one must plug the solution from equation (4.17) to the above condition (4.27) to get the final answer. As is shown in *Appendix to section 4.5*, the impact of tariff can be positive or negative, depending on the level of income and on γ.

In the general case we can state that a tariff decreases (increases) conflict investment, when:

$$\frac{(X-W-2\theta)}{(X-W-3\theta)} + \frac{1}{\alpha}\left[\frac{\alpha\theta\tau}{(X-W-3\theta)} - \frac{1}{(1+\gamma\tau)}\right] \times \quad (4.28)$$

$$\left[\frac{(X-W-2\theta)}{\frac{(1+\gamma\tau)}{\alpha}(X-W-3\theta)-2\theta\tau}\right] \begin{matrix} > \\ (<) \end{matrix} 0$$

It is straightforward to see that the first term is always positive while the second term must be negative (because in equation (4.23) the RHS cannot be larger than 1). This indicates that also in the general case, tariffs can either increase of decrease investment in conflict.

Proposition 18 *Tariffs reduce the impact of conflict on market price, provided that $X - 6\theta < \frac{(1-\gamma)\theta}{\gamma}$, but this does not necessarily mean that the introduction of tariffs decreases conflicts. The total effect is ambiguous; tariffs can either reduce or decrease military investment.*

According to the former discussion reduced market access can increase the intensity of conflict. In other words, globalization (meaning reduced trade barriers) can help to mitigate conflicts. Trade barriers by outside countries impose a double burden on the discriminated regions. Barriers reduce incomes both directly by lowering prices and indirectly by increasing the benefits from investment in conflict. However, because of the ambiguity of the results, more analysis is certainly warranted on the relationship between tariffs and conflict. Finally, it is important to point out that although tariffs in some circumstances may actually decrease conflict, the use of this tool is quite problematic, as it also generates about many adverse effects.

4.6   Conflicts and Market Power by Non-Conflict Countries

The last issue taken up in this paper is the asymmetry in market power between developed and developing countries. It is often claimed that developed countries exploit poorer nations by paying too low a price for imports (see e.g. Bhagwati, 2000). Clearly there is an imbalance between these parties and developing countries are likely to be weaker in terms of negotiating power. In the current setting the asymmetry is reflected in the price determination process and our purpose is to find out whether this affects the intensity of conflicts. Like tariffs, this could be expected to have an effect on military investment.

To model the market power we assume that individual sellers act as price

takers. Instead, the importers of goods x and y in country 3 have formed an organization to negotiate prices with the sales organizations of countries 1 and 2. We assume that prices of goods x and y are determined in a standard Nash bargaining process and developed countries (country 3) have greater bargaining power.

The analysis of bargaining is conducted in Cobb-Douglas and in Stone-Geary framework. The threat point of the importer organization is assumed to be the competitive price and the threat point of the sales organization for countries 1 and 2 the point of no sale. The actual price for good x (and similarly for y) is now determined by maximizing the following Nash-product:

$$\max_{P_x} \; \left[-P_x - P_x^C\right]^\rho \left[P_x\right]^{1-\rho} \tag{4.29}$$

where ρ is the market power of country 3 in price negotiation and P_x^C is competitive price (solved above). Accordingly, prices for x and y are $P_x = (1-\rho)P_x^C$ and $P_y = (1-\rho)P_y^C$.

The aim is to determine at how market power is reflected in conflict equilibrium. It turns out, surprisingly, that either with Cobb-Douglas or with Stone-Geary utility functions price determination by bargaining has no effect on conflict between developing countries.

Proposition 19   *If prices of goods exported from the conflict regions are determined in a bargaining process, the resulting levels of investment in conflict are the same as when the prices are market determined.*

The reason for this is that in the current setting, bargaining changes prices, but there is no interaction with conflict decisions. In contrast, in the former example with tariffs, tariffs also change the income in country 3, the amount of which was affected by conflicts.

4.7   Conclusions

This paper has focused on the question how trade possibilities with the rest of the world affect local conflicts in developing countries. It has been shown that the possibility to trade with outside countries increases the intensity of conflict in the case with Cobb-Douglas, as well as with Stone-Geary utilities. Thus, the observation that globalization increases peace does not emerge within this framework. It must be noted, though, that the choice of specific utility functions may also affect the results. The key argument of this paper is that the intensity of conflicts can decline when the income in the conflicting country increases, provided that we assume non-homothetic preferences. This effect is consistent with empirical evidence. As for trade restrictions, trade barriers by outside countries can intensify conflict, although a conflict-reducing element is also involved.

The model we have used is an extension to a three-country world of the basic model of international trade and conflicts. This way of modelling can and should be extended in various directions. One is the intertemporal international trade. Another is to modify the model (include more structure in it) to get a better understanding of the internal conflict as has been done e.g. by Collier and Hoeffler (2001).

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Appendices

Appendix to section 4.2

The first order condition is generated by maximizing the indirect utility function $V(p_i, R_i)$ where $i = 1, 2$. We obtain this function by maximizing $u = u(C_{xi}, C_{yi}, C_{zi})$ with respect to budget constraint (4.4). From this problem we get the consumption levels C_{ji} as a function of prices and incomes. C_{ji} denotes the consumption of good j in country i. Next, we maximize the indirect utility function with respect to arming decisions W_i taking into account the success function (4.1), budget equation (4.4) and prices (4.7). The problem for country 1 is:

$$\max_{W_1} V(p_y, p_z, R_1)$$

$$s.t. \tag{4.30}$$

$$\phi\left[p_x(X - W_1) + p_y(Y - W_2)\right] - p_x C_{x1} - p_y C_{y1} - C_{z1} = 0$$

Using the envelope theorem the first order condition for this problems can be written as in the text.

The problem with Cobb-Douglas utilities is solved in an identical manner as the above general case. First we maximize the utility function $u_i = C_{xi}^{\alpha} C_{yi}^{\beta} C_{zi}^{\gamma}$, $\alpha + \beta + \gamma = 1$, taking into account the budget constraint (4.4). We obtain consumption levels for country i.

$$
\begin{aligned}
C_{xi} &= \alpha R_i \\
C_{yi} &= \frac{\beta R_i}{P_y} \\
C_{zi} &= \gamma R_i
\end{aligned}
\tag{4.31}
$$

Assuming the world market to be in equilibrium it is possible to calculate the prices

$$
p_x = \frac{\alpha}{\gamma} \frac{Z}{(X - W_1)}, \ p_y = \frac{\beta}{\gamma} \frac{Z}{(Y - W_2)}
$$

By plugging the consumption levels back to the utility function we obtain the indirect utility function for countries 1 and 2, which is then maximized with respect to arming decisions W_i taking into account the success function (4.1), budget equation (4.4) and prices (4.7). This gives us the reaction functions in (4.11).

Appendix to section 4.4

The derivative of W with respect to X is

$$
\frac{3-\gamma}{2-\gamma} - \frac{2\left(\frac{3-\gamma}{2-\gamma}\right)^2 (X - 2\theta) - 8X + 12\theta}{2\sqrt{\left(\frac{3-\gamma}{2-\gamma}\right)^2 (X - 2\theta)^2 - \frac{4X(X-3\theta)}{2-\gamma}}} = \frac{3-\gamma}{2-\gamma} - \frac{\frac{\left[(3-\gamma)^2 - 4(2-\gamma)\right]X + \left[6(2-\gamma) - 2(3-\gamma)^2\right]\theta}{(2-\gamma)^2}}{\sqrt[2]{\left(\frac{3-\gamma}{2-\gamma}\right)^2 (X - 2\theta)^2 - \frac{4X(X-3\theta)}{2-\gamma}}}
$$

Consider now the solutions to $\left(\frac{3-\gamma}{2-\gamma}\right)^2 (X - 2\theta)^2 - \frac{4X(X-3\theta)}{2-\gamma} = 0$. There are two solutions, neither of which can be 2θ.

$$
\left(\frac{3-\gamma}{2-\gamma}\right)^2 (X - 2\theta)^2 - \frac{4X(X-3\theta)}{2-\gamma} = 0.
$$

Solution is:

$$\mathbb{C}$$

if $\theta = 0 \wedge \gamma = 1$

$$\left\{ -\frac{1}{-12\theta + 12\theta\gamma - 4\theta\gamma^2} \left(36\theta^2 - 24\theta^2\gamma + 4\theta^2\gamma^2 \right) \right\}$$

if $\gamma = 1 \wedge \theta \neq 0$

$$\left\{ \begin{array}{l} \frac{1}{-2\gamma + \gamma^2 + 1} \left(6\theta - 6\theta\gamma + 2\theta\gamma^2 - 2\sqrt{6\theta^2\gamma - 7\theta^2\gamma^2 + 2\theta^2\gamma^3} \right), \\ \frac{1}{-2\gamma + \gamma^2 + 1} \left(6\theta - 6\theta\gamma + 2\theta\gamma^2 + 2\sqrt{6\theta^2\gamma - 7\theta^2\gamma^2 + 2\theta^2\gamma^3} \right) \end{array} \right\}$$

if $\gamma \neq 1 \wedge \gamma \neq 2$

Take e.g. the larger of these solutions which is larger than 3θ (as is also the smaller). If X is close to it then the derivative is close to $-\infty$.

Appendix to section 4.5

The numerical analysis requires that the solution for W from equation (4.17),
$W = \frac{1}{2} \left\{ \frac{(3-\gamma)(X-2\theta)}{(2-\gamma)} \pm \left[\left(\frac{(3-\gamma)(X-2\theta)}{(2-\gamma)} \right)^2 - \frac{4X(X-3\theta)}{(2-\gamma)} \right]^{\frac{1}{2}} \right\}$ is plugged into the
expression for the derivative of the RHS of the equation (4.23) $\alpha\theta(\alpha - 2) + \gamma(\alpha + 1)(X - W - 3\theta)$ (expression (4.27) in the text), which can be rewritten as $(\frac{1-\gamma}{2})\theta(\frac{1-\gamma}{2} - 2) + \gamma(\frac{1-\gamma}{2} + 1)(X - W - 3\theta)$ taking into account that $\alpha = \frac{1-\gamma}{2}$. If that is positive, it means that the RHS increases, which is equivalent to saying that a small tariff decreases conflict. Respectively, a negative figure means that the RHS of equation (4.23) decreases, implying an increase in conflict.

As an example of the property that increase in tariffs may either increase of decrease conflicts we may look at the following equation where we have set para-

meter values $X = 20, \theta = 1$. These values mean that the required consumption is rather small compared to the total income, i.e. countries are not extremely poor. With these parameter values we get that

$$[(\tfrac{1-\gamma}{2})\theta\left(\tfrac{-3-\gamma}{2}\right) + \gamma\left(\tfrac{3-\gamma}{2}\right)$$
$$\times\left(X - (\tfrac{1}{2}(\tfrac{(3-\gamma)(X-2\theta)}{(2-\gamma)} + (\left(\tfrac{(3-\gamma)(X-2\theta)}{(2-\gamma)}\right)^2 - \tfrac{4X(X-3\theta)}{(2-\gamma)})^{\frac{1}{2}})) - 3\theta\right)]_{X=20,\theta=1} =$$
$$\left(\tfrac{1}{2} - \tfrac{1}{2}\gamma\right)\left(-\tfrac{1}{2}\gamma - \tfrac{3}{2}\right) + \gamma\left(\tfrac{3}{2} - \tfrac{1}{2}\gamma\right) \times$$
$$\left(17 - \tfrac{1}{2}\sqrt{\tfrac{324}{(2-\gamma)^2}(3-\gamma)^2 - \tfrac{1360}{2-\gamma}} - \tfrac{9}{2-\gamma}(3-\gamma)\right). \text{ Plotting this we obtain}$$

the figure below where y-axis represents the derivative equation (4.27) and x-axis the values of γ.
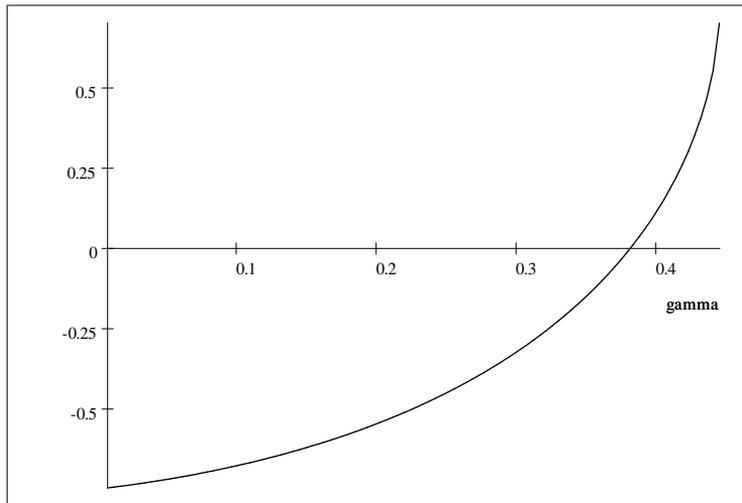
As we can see, an increase in tariffs (that are originally zero) may either increase or decrease conflict investment. For small values of γ, an increase in tariffs increases conflict investment and for larger values the opposite is true.

Chapter 5
Peace-building and Local Conflicts in Developing Countries

5.1   Introduction

This paper extends the basic international trade and conflict model by Haaparanta and Kuisma (2005, previous chapter) to analyze the role of peace-building by outside countries in local conflicts in developing countries[118]. In this paper we find that if peace-building is taken into account, the intensity of conflicts can decline when the conflict country's income increases (which is consistent with empirical evidence). This paper also argues that incomplete pre-conflict peace-building operations will in fact increase military buildup. In contrast, successful pre-conflict peace-building requires that the outside countries are sufficiently rich, and that the conflicting countries have a high enough income as well (which conforms with the existing empirical evidence). Finally, it turns out that post-conflict operations are time-consistent only if the outside country is sufficiently rich. On the other hand, repairing war damages is counterproductive, because it increases military investments. To the best of our knowledge these results are new in the economic research of conflicts.

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[118]   See also Skaperdas and Syropoulos (1996; 2001)

Traditionally, conflicts and civil wars have been assumed to have their roots in political, geographical or religious issues and/or inequality between different groups, i.e. the so called 'grievance-approach'[119]. Recently, however, a growing interest has emerged to also examine the economic aspects of conflicts. It is clear that conflicts have enormous economic consequences, in particular for countries already poor, as hostilities destroy scarce resources and convert funding away from productive uses[120].Conflicts also have many other indirect channels through which they significantly reduce growth prospects. For example, conflicts have negative effects on financial development (Addison et al., 2004), they destroy social capital (Colletta and Cullen, 2000) and significantly reduce tourism (Dhariwal, 2004) to mention only a few.

The literature on the economics of conflict has proposed that in addition to their economic consequences, conflicts can have economic causes, and that conflicts may at least partly be a result of greed instead of grievances[121]. It is noteworthy that grievances have an economic dimension too. For example, we can think of the economic consequences of discrimination and inter-group inequalities. Furthermore, the role of trade in conflicts[122] has received attention. While it is an accepted fact that conflicts do have economic aspects, the importance of these is a matter of debate. In a nutshell, economists tend to emphasize

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[119]   See for example Collier and Hoeffler (2001) for discussion of the different motives for rebellion. On the implications of inequality, see also Stewart (2002), who focuses on horizontal inequality as a source of political instability. Yet another view of inequality is presented by Dutta and Mischra (2003) who propose that anticipated future inequality (which has to be significant) is an important factor in generating conflict.

[120]   On the costs of conflicts see for example new results by Pottebaum and Kanbur (2004). See also Collier et al. (2003).

[121]   On the economics of conflict in developing countries, see for example Collier and Hoeffler (2001), Collier (2000) and Collier et al. (2003). On the economics of conflict in general, see example Sandler and Hartley (1995) for a thorough survey and Grossman (1991) as an introduction of modelling conflicts in economics.

[122]   See e.g. Polachek (1997), Skaperdas and Syropoulos (2001), Mc Donald (2004) and Haaparanta and Kuisma (2005)

the role of economic factors, while other scholars focus more on sociological, religious and other non-economic aspects[123]. In the economics literature a high incidence of conflicts has been associated with low income and slow growth rate, and heavy reliance on primary commodities. The latter effect emerges as nonlinear, first increasing and peaking when the share of primary commodity exports approaches to 30 percent of GDP. (Collier et al. 2003)[124].

Even though the fundamental causes for conflicts are somewhat debatable, it is a fact that conflicts and civil wars are extremely detrimental for development. The consequences of a (often long lasting) civil war can be disastrous both to the population of the country in war and internationally. It is clear that a civil war not only affects the countries at war, but also has serious spillover effects on neighboring countries and to the international community[125]. It is becoming increasingly recognized that intrastate wars demand action from outside countries. As has been proposed in research, trade can be an indirect means of affecting the situation in conflict-prone countries, even though the role of trade in mitigating conflicts is somewhat controversial[126]. A direct means of influencing the incidence and duration of conflict is peace-building, which is the main focus of this paper. We use the same framework as in our paper "Trade, war, and peace" (Haaparanta and Kuisma 2005), which analyzes how the possibility of

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[123] The ongoing discussion is reviewed in Malone and Nitzschke (2004)

[124] Nafziger (2004) lists the following factors (that partly coincide with the findings of Collier) as the root causes of war: stagnation and decline in real (inflation-adjusted GDP), slow growth in food production, high income inequality, failure to adjust to chronic international balance of goods and services deficits, a high ratio of military expenditure to national income, competition for control of mineral exports, and a tradition of violent conflict.

[125] These spillover effects may include, for example, excessive flow of refugees, civil war contagion to nearby areas or international terrorism (Collier et al., 2003)

[126] According to the interdependence argument, trade decreases the motivation for conflict. On the other hand, trade may facilitate the financing of conflict, thus increasing the likelihood of conflict.

trade with outside countries affects the intensity of civil conflicts in developing countries. In the current paper the framework is extended to include intervention of a third country (interpreted as the rest of the world) to a local conflict between two countries/regions. This paper is organized such that section 5.2 begins by presenting the framework, section 5.3 examines pre-conflict peace-building and section 5.4 focuses on post-conflict peace-building. Section 5.5 concludes.

5.2   Model of conflicts and peace-building

The model analyzes the motives and actions of an outside country (countries) engaging in peace-keeping operations in the conflict zones. As in Collier (2000), we distinguish between ex ante (pre-conflict) and ex post (post-conflict) measures. Ex ante measures refer to actions taken before the conflict. These can include measures to reduce the efficiency of resources devoted to conflict, or the formation of safe zones by sending in peace-keeping forces when the conflict begins to intensify. Respectively, ex post measures, such as rebuilding the country or repairing war damages, take place after the conflict has ceased.

The economic research on peace-building and external intervention in civil conflicts has recently received increasing attention. For example, World Bank's research program "Economics of civil war, conflict and violence" and UNU-Wider Research Project on humanitarian emergencies (in collaboration with Queen Elizabeth House, Oxford) have contributed to the understanding of the effectiveness of international peace-building[127]. The findings of these studies seem, however, quite contradictory. Doyle and Sambanis (2000) conclude that UN peace-keeping is positively correlated with democratization following a civil war, and that multilateral operations are often successful in ending the violence. On

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[127]   See e.g. Elbadawi and Sambanis (2000), Doyle and Sambanis (2000) for results from the World Bank Program and Nafziger (2004) for the UNU-Wider Program. See also Regan (2001).

the other hand, Regan (2002) finds that neutral third party interventions tend to lenghten the duration of civil war. According to that study, intervention will work to shorten the duration only if it is biased in favour of one party. Similarly, Elbadawi and Sambanis (2000) conclude that external intervention is positively associated with the duration of conflict. Finally, Addison and Murshed (2002) point out that when war provides economic gains, peace is not necessarily incentive compatible and peace agreements can become time inconsistent. The role of outside agents is to enhance conflict parties' commitment to peace. Outside countries' policies (commitment technologies) can thus lower the risk of civil war reigniting.

The results from the above mentioned UNU-Wider research project indicate that ex post interventions are generally less efficient than ex ante actions. According to the cited study, ex ante measures, however, should extend to long term strategies (such as macroeconomic stabilization, structural adjustment programs and reduction in trade barriers against low income countries) to reduce the risk of conflicts[128]. In general, short term strategies (e.g. military and diplomatic operations) are not that successful, as the willingness of third parties to participate is often poor and/or their policies ineffectual. (Nafziger, 2004). It is important to note that a third country's willingness to participate is by no means certain; they must derive some utility from their involvement. This framework assumes that the utility of a third country depends on national income and relative prices and the motivation for peace keeping comes through the positive effects of peace on these. However, it is important to note that there may be other arguments for peace-building abroad. For example, Western countries may engage in peace-building perceiving peace to be an international public good. It is important to

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[128]   Note that the relation between trade barriers and conflict is not necessarily a straightforward one. See Haaparanta and Kuisma (2005).

understand, however, that in that case the familiar collective action problems are present.

Recent research by Gershenson (2002) also relates to our work. He examines the implications of sanctions imposed by outside parties on civil war contestants. Sanctions are seen as a one measure of pre-conflict peace-building, even though the explicit goal of sanctions is somewhat different[129]. Gershenson studies the specific kind of sanctions whose purpose is to influence the outcome of civil conflict in favor of the challenger (against the incumbent). Possible outcomes include deterrence, engagement and surrender (in case the challenger is powerful enough). In short, it is found that strong sanctions benefit the challenger, but weak sanctions can actually hurt them. Sanctions are more likely to work when income for the incumbent in case of defeat is large. This could explain why sanctions were effective in the case of South Africa and Rhodesia but ineffective in Cuba. Our ex ante peace-building framework is to some extent analogous to Gershenson's work.

The general framework we adopt is the following[130]. Let us assume that the world comprises 3 countries/regions of which countries 1 and 2 engage into a mutual conflict. It must be noted that the model applies to regional, i.e. intranational conflicts as well, because the countries can be interpreted to represent regions of a single country. Country 3, representing the rest of the world, has made a credible commitment of non-hostility against countries 1 and 2. We assume that countries 1 and 2 are developing countries/regions while country 3 represents the

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[129]   The aim of sanctions is to support the challenger and to force the incumbent to surrender. In our model the third country tries to prevent conflict i.e. discourage military investment by establishing non-conflict zones or protecting existing property rights.

[130]   The framework is similar as in our paper "Trade, War, and Peace" (Haaparanta and Kuisma, 2005)

developed world. Since nowadays almost all conflicts take place in developing regions, we postulate that the developed world does not initiate conflict against developing regions[131].

The timing in the model is following: First, countries 1 and 2 invest in arms and a war erupts. After the cease of hostilities, goods will be exchanged in the world market with country 3 participating in the exchange. Peace-keeping actions by the third country can take place either in the pre-conflict phase (before the decision how much to arm), or in the post-conflict era (when arms investments by countries 1 and 2 are already made). For analytical simplicity we abstain from production considerations and study exchange economies only.

It is also assumed that all countries initially own only one type of endowment. Hence, there are three commodities: x, y, and z. The total world endowment of x is X and is initially owned by country 1. Respectively, the total world endowment of y is Y and of z is Z and the first is owned by country 2 and the latter by country 3. All sellers and buyers in the world markets act competitively and take the world market prices as given. Let us denote the world market price for good j by p_j, where $j = x, y, z$. Clearly, countries 1 and 2 engaging in conflict must devote resources to the war. We assume that x and y are perfect substitutes in the production of arms. The investment in conflict by country i is W_i, $i = 1, 2$. Accordingly, the endowments available after arms investment are $X - W_1$ in country 1 and $Y - W_2$ in country 2[132]. For simplicity's sake, we are ignoring the destruction of resources during the fighting, although we acknowledge that it evidently does occur and can rise up to significant levels.

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[131]   It must be noted, though, that even today the developed countries may become heavily involved in third world conflicts, as was the recent case between Iraq and the US.

[132]   The military build-up is assumed be financed by a lump sum tax on endowment.

As the war breaks out, the investments in arms result in success. War success is determined by the following success function ϕ, which determines the success of country 1. The success of country 2 is determined by the success function $1 - \phi$. We refrain from offence/defence considerations and assume that military success depends only on investments in arms as follows:

$$\phi = \phi\left(W_1, W_2\right), \ 0 \leq \phi \leq 1, \ \phi_{W_1} > 0, \ \phi_{W_2} < 0 \qquad (5.1)$$

The success function can be interpreted as the probability of winning the war and capturing the existing endowment of the other country. Equivalently, as we assume that the countries decide on war investment to maximize the welfare of the representative agent, we simplify the analysis by omitting all the issues related to risk aversion. Thus, assuming risk neutrality, the success function can be interpreted to give the available shares of total endowments available accruing to each participant[133]. In our model, after conflict the relative commodity endowments of countries 1 and 2 are identical, post conflict endowments for country $i = 1, 2$ are given by $\hat{x}_i, \hat{y}_i$ and are: $\widehat{x}_1 = \phi(X - W_1)$, $\widehat{y}_1 = \phi(Y - W_2)$, $\hat{x}_2 = (1 - \phi)(X - W_1)$ and $\widehat{y}_2 = (1 - \phi)(Y - W_2)$. The aggregate welfare levels of countries 1 and 2 are determined by the following equations[134]:

$$
\begin{aligned}
e\left(p_x, p_y, p_z, u_1\right) &= \phi\left[p_x\left(X - W_1\right) + p_y\left(Y - W_2\right)\right], \qquad (5.2) \\
e\left(p_x, p_y, p_z, u_2\right) &= (1 - \phi)\left[p_x\left(X - W_1\right) + p_y\left(Y - W_2\right)\right]
\end{aligned}
$$

where $e\left(p_x, p_y, p_z, u_i\right)$ denotes the expenditure function having the usual properties (see e.g. Jehle and Reny 2001), u_i = aggregate welfare in country i. It is straightforward to see that welfare is increasing in the national share in endow-

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[133]   This form of contest success function is widely used in the conflict literature. The risk neutrality assumption is also standard, see e.g. Hirshleifer (1995; 2000).

[134]   It is easy to note that as $\frac{\widehat{x}_1}{\widehat{y}_1} = \frac{\widehat{x}_2}{\widehat{y}_2}$, prospects for trade among countries 1 and 2 have disappeared.

ments, in net endowments and in p_x and p_y while decreasing in p_z. Country 3 welfare is similarly given by

$$e\left(p_x, p_y, p_z, u_3\right) = p_z Z \tag{5.3}$$

and is increasing in p_z while it decreases with p_x and p_y.

Now we are ready to consider the peace-keeping process. Let us first consider country 1 and determine aggregate income $\psi \equiv \phi\left[p_x\left(X - W_1\right) + p_y\left(Y - W_2\right)\right]$. Country 3, i.e. the rest of the world, engages in peace-building operations, either ex ante or ex post. Let S denote the measure taken by country 3. Country 3 is assumed to act selfishly and to maximize u_3 when deciding on S. This approach seems appropriate given e.g. the attention paid to the Middle East to ensure that energy markets remain stable and oil prices do not increase. Accordingly, we are able to define $\psi = \psi\left(W_1, W_2, S\right)$, i.e. the aggregate income of country 1 depends on the peace-building operations of the third country. If S is an ex ante measure, then also W_i depends on S.

To take action S country 3 has to spend its own resources. We assume that the resource cost of action S is S. The ex ante action is always taken before the markets open, leaving $(Z - S)$ as the marketable endowment of country 3. Thus, the peace-building operation will also have an effect on world market prices. If S is an ex ante peace-building measure, then country 3 is a Stackelberg leader vis a vis countries 1 and 2, i.e. takes into account the responses of the conflict parties. On the other hand, if S is a post-conflict action, country 3 takes the military investments as given. In this case countries 1 and 2 act as Stackelberg leaders towards country 3. Finally, to keep the analytics as simple as possible (since we are now studying a game with a sequence of moves) we assume throughout that citizens everywhere have Cobb-Douglas utility functions, i.e. country i,

$i = 1, 2, 3$ maximizes

$$u_i = C_{xi}^{\alpha} C_{yi}^{\beta} C_{zi}^{\gamma}, \; \alpha + \beta + \gamma = 1 \tag{5.4}$$

The Cobb-Douglas specification, despite its obvious shortcomings, is widely used in conflict literature and serves well in the current context, as the main point is to highlight the incentives for various types of actions and this assumption helps to fix the focal point. In order to obtain specific results we also use the following form of the success function:

$$\phi = \frac{W_1}{W_1 + W_2} \tag{5.5}$$

This form of utility function implies that there is always some military buildup, but with diminishing returns (with buildup). The above form is also widely used in the literature, usually having parameters representing the technology of insurgents[135]. These are left out in the current context, however, as the main interest is in peace-keeping operations and because the differences in military technology are not usually decisive in intrastate conflicts in developing countries .

5.3   Pre-conflict peace-building

Let us first consider ex ante measures. The main focus is on measures that (partially) protect existing property rights or establish non-conflict zones. We postulate that the measure S taken by country 3 helps to put a share $\xi_i S$, $\xi_i \geq 0$, of country i's endowment beyond the conflict, $i = 1, 2$. Thus, this share is not available for contention between countries 1 and 2. We assume that this secure

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[135]   This form of success function is typically used in conflict models. For example, Hirshleifer (1995) uses contest success function of type $p_1 = \frac{F_1^m}{F_1^m + F_2^m}$, where p_1 is the success ratio for party 1, F_1 and F_2 are the fighting efforts and m is a decisiveness parameter. The decisiveness parameter has been excluded from the current discussion for analytical simplicity.

endowment cannot be used for military investment either. Accordingly, the post-conflict income for country 1 is:

$$\psi_1 = p_x \left[\xi_1 S + \phi \left(X - \xi_1 S - W_1 \right) \right] + p_y \phi \left(Y - \xi_2 S - W_2 \right) \qquad (5.6)$$

which leaves $(X - W_1)$ as the total supply of commodity x in the post-conflict exchange. Analogous expressions hold for country/region 2 and commodity y. Due to the peace-keeping investment, the total supply of commodity z is $(Z - S)$. This implies that the world market prices for the conflict countries' commodities are:

$$p_x = \frac{\alpha \left(Z - S \right)}{\gamma \left(X - W_1 \right)}, \; p_y = \frac{\beta \left(Z - S \right)}{\gamma \left(Y - W_2 \right)}. \qquad (5.7)$$

Country 1's optimal arms building can be calculated using (5.6) and (5.7). We start by maximizing $u_i = C_{xi}^\alpha C_{yi}^\beta C_{zi}^\gamma$, with respect to budget constraint (5.2). From this problem we get the consumption levels C_{ji} as a function of prices and incomes. C_{ji} denotes the consumption of good j in country i. Next, we maximize the indirect utility function with respect to decisions to arm W_i taking into account the success function (5.1), budget equation (5.2) and prices (5.7). The problem for country 1 is:

$$\max_{W_1} \; V \left(p_y, p_z \Psi_1 \right)$$

$$s.t. \qquad\qquad\qquad\qquad (5.8)$$

$$p_x \left[\xi_1 S + \phi \left(X - \xi_1 S - W_1 \right) \right] + p_y \phi \left(Y - \xi_2 S - W_2 \right) - p_x C_{x1} - p_y C_{y1} - C_{z1} = 0$$

From the above problem we get the following first order condition for country 1:

$$\frac{\partial \phi}{\partial W_1} \frac{\alpha \left(Z - S\right)}{\gamma \left(X - W_1\right)} \left[\widetilde{X} + \frac{\beta \left(X - W_1\right)}{\alpha \left(Y - W_2\right)} \widetilde{Y}\right] - \frac{\alpha \left(Z - S\right)}{\gamma \left(X - W_1\right)} \phi + \qquad (5.9)$$

$$\left\{\left(1 - \alpha\right) \xi_1 S + \phi \left[\left(1 - \alpha\right) \widetilde{X} - \beta \frac{X - W_1}{Y - W_2} \widetilde{Y}\right]\right\} \frac{\alpha \left(Z - S\right)}{\gamma \left(X - W_1\right)^2} = 0$$

where $\widetilde{X} \equiv \left(X - \xi_1 S - W_1\right)$ and $\widetilde{Y} \equiv \left(Y - \xi_2 S - W_2\right)$. (See details in *Appendix*). Focusing on symmetric equilibrium, i.e. setting $X = Y$, $W_1 = W_2$, condition (5.9) simplifies to:

$$\frac{\partial \phi / \partial W_1}{\phi} \frac{\left(1 - \gamma\right) \left(X - W\right)}{\alpha} = \frac{X - W}{\widetilde{X}} - \frac{\left[\left(1 - \alpha\right) \left(\xi S / \phi\right) + \gamma \widetilde{X}\right]}{\widetilde{X}} \qquad (5.10)$$

Taking into account that due to symmetry $\alpha = \left(1 - \gamma\right) / 2$ and $\phi = 1/2$, equation (5.10) can be expressed in following relatively simple form:

$$\frac{X - W}{W} = \frac{\left(1 - \gamma\right) \left(X - W\right) - \xi S}{X - W - \xi S} \qquad (5.11)$$

Since this is a quadratic equation it has, in general, two solutions. We can also note that in case of no peace-building (with $S = 0$), the solution becomes $\frac{X - W}{W} = \left(1 - \gamma\right)$. It is straightforward to calculate that a solution with positive level of investment in conflict exists only if

$$S < \frac{3 - \gamma - 2 \sqrt[2]{2 - \gamma}}{2 \xi} \qquad (5.12)$$

The upper bound is decreasing in γ. We call these levels of peace-building *imperfect,* as $W > 0$. In other words, conflict is mitigated but not prevented. The solution we look at is the smaller root[136].

To evaluate the consequences of the peace-building action let us note that the LHS of (5.11) does not depend on S. It is straightforward to see that the

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[136]   Since it satisfies the condition that arms building increases with γ which is the ordinary Cobb-Douglas solution when S = 0.

RHS is smaller than $(1 - \gamma)$ when S > 0. This means that military buildup is always higher with pre-conflict peace-keeping than without it. Furthermore, the RHS decreases with S, implying that the more extensive the pre-conflict peace-keeping operation is, the larger will be the military buildup. Since S and ξ have a symmetric effect, we also now know that the more intensive the peace-keeping operation is (bigger ξ), the larger will be the investment in arms. This gives us the first proposition.

Proposition 20   *Incomplete pre-conflict peace-building operations, i.e. opera-tions with $S < \frac{3-\gamma-2\sqrt[3]{2-\gamma}}{2\xi}$ and $W > 0$, will increase military buildup.*

Thus, interestingly enough, ex ante peace-building operations can have a perverse effect by increasing rather than reducing the buildup of military strength. To find out the intuition we need to examine the four effects that are present, all of which are not pointing in the same direction. First, peace-building reduces the direct marginal benefit of the increased military investment

$$\left[p_x \left(X - \xi_1 S - W_1 \right) + p_y \left(Y - \xi_2 S - W_2 \right) \right] \frac{\partial \phi}{\partial W_1},$$

because the amount of 'lootable' resources as well as their prices (see price equations in (5.7)) are reduced. It is easy to see that prices in Cobb-Douglas model without peace-building would be $p_x = \frac{\alpha Z}{\gamma (X - W_1)}$, $p_y = \frac{\beta Z}{\gamma (Y - W_2)}$, which are clearly higher. Second, peace-building simultaneously reduces the direct cost of looting $p_x \phi$. Third, peace-building reduces the terms-of-trade gain from the buildup of arms by reducing the responsiveness of prices $\frac{\alpha (Z - S)}{\gamma (X - W_1)^2}$ to it. Lastly, it increases the base on which the gain from higher world market price (because of the positive terms-of-trade effect of conflict) applies. Peace-building operation increases the amount of available goods, ceteris paribus, of which only

a proportion is spent in the home country and thus more is exported to world markets. With Cobb-Douglas preferences the impacts increasing incentives for arms investment are greater than the impacts working in the opposite direction.

It must be noted that the result in Proposition 20 is only local. This is to say that if the peace-building operation is massive enough (or efficient enough), no incentive for investing in conflict remains. To state it analytically, if $S = \frac{X}{\xi}$, then property rights are perfectly protected and looting is not profitable[137], for the simple reason that there is nothing to loot. In fact, as can be derived from condition (5.12), conflict can be made unprofitable provided that the following condition holds:

$$S > \frac{3 - \gamma - 2\sqrt[2]{2 - \gamma}}{2\xi} \qquad (5.13)$$

We call these peace-keeping operations *perfect*, because they completely prevent conflicts. The right hand side of the above condition is decreasing in γ. This implies that the larger the share of goods from the non-conflict region is (in the conflicting countries), the smaller the peace-keeping operation needed to ensure peace. This leads to an important conclusion: peace-building is less costly in an open world.

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[137]   Looting still has the terms-of-trade effect but it is not strong enough to make pure destruction ("mindless" looting) profitable.

Proposition 21   *Peace can be fully ensured even without complete enforcement of property rights provided that* $S > \frac{3-\gamma-2\sqrt[2]{2-\gamma}}{2\xi}$. *If peace-building operations make endowments safe enough (secure property rights almost in full), no conflicts arise. As S is decreasing in γ, peace-building is less costly in an open world.*

In addition to the effectiveness of peace-building, it is important to consider what are the incentives of country 3 to engage in peace-keeping , i.e. why should it become involved in these costly operations[138]. In this paper we exclude all altruistic considerations and assume that the third country maximizes its own welfare only. Let us begin by considering the welfare of country 3 by and focusing on the peace-building operation that has no effect on conflict, i.e. $\frac{\partial W_i}{\partial S} = 0$. In this case it is straightforward to calculate that $\frac{\partial u_3}{\partial S} = -\gamma$, which clearly is negative. This is to say that peace-building without any effect on conflict reduces the welfare of the peace-building country unambiguously[139]. Under the conditions of Proposition 20 we know that in this model $\frac{\partial W_i}{\partial S} > 0$, i.e. military build-up is increased by incomplete peace-building operations. This implies that small-scale peace-building operations (with $S < \frac{3-\gamma-2\sqrt[2]{2-\gamma}}{2\xi}$) will definitely reduce welfare even more than completely ineffective peace-building operations (those with $\xi = 0$), since they will also deteriorate the terms-of-trade of the peace-building country. Therefore, it is clear that there are no incentives for country 3 to engage in incomplete peace-building operations.

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[138]   This point was left out by Gershenson (2002) who does not consider motives of an outside for peace-keeping.

[139]   This also substantiates the claim made above that pure looting (destruction of one's own endowments without any gain) for manipulation of terms-of-trade is not beneficial for countries 1 and 2.

We are then left with perfect peace-building operations. We know that the indirect welfare of country 3 is proportional to $(p_x)^{-\alpha} (p_y)^{-\beta} Z$, which can in general be written as $\left(\frac{\alpha}{\gamma}\right)^{-\alpha} \left(\frac{\beta}{\gamma}\right)^{-\beta} \left(\frac{Z-S}{X-W_1}\right)^{-\alpha} \left(\frac{Z-S}{Y-W_2}\right)^{-\beta} Z$. In the symmetric case without peace-building this is equal to $\left(\frac{\alpha}{\gamma}\right)^{-2\alpha} \left[\frac{(1-\gamma)X}{2-\gamma}\right]^{2\alpha} Z^\gamma$ where $\alpha = \frac{1-\gamma}{2}$. With perfect peace-keeping in symmetric equilibrium, it equals $\left(\frac{\alpha}{\gamma}\right)^{-2\alpha} X^{2\alpha} (Z-S)^\gamma$. It is easy to see that perfect peace-building is beneficial if the resource requirement for it satisfies the condition:

$$S < \frac{[f(\gamma)-1]Z}{f(\gamma)}, \text{ where } f(\gamma) \equiv \left(\frac{2-\gamma}{1-\gamma}\right)^{\frac{1-\gamma}{\gamma}}. \tag{5.14}$$

Combining (5.12) and (5.14) and noticing also that the feasibility condition $S \leq \frac{X}{\xi}$ must hold, it turns out that perfect peace-building increases the welfare of country 3 if $\frac{3-\gamma-2\sqrt[2]{2-\gamma}}{2\xi} < S < \min\left\{\frac{X}{\xi}, \frac{[f(\gamma)-1]Z}{f(\gamma)}\right\}$

Proposition 22　*Outside countries are more likely to eliminate conflict perfectly the more efficient the peace-building operations are (ξ high), and the more dependent the consumer welfare is on goods supplied by the non-conflict countries (γ large). Perfect peace-building is also more likely the richer the non-conflict countries are. Poor non-conflict countries will not engage in pre-conflict peace-building. Perfect peace-building also requires that conflicting countries' income is high enough, i.e. $X > \xi S$.*

Proposition 22 can be used to highlight several issues. First, as such it provides an explanation for peace-building conducted by outside countries. This holds especially for wealthy outside countries. It also shows that the attempts of

poor outside countries to build peace are likely to fail, i.e. they cannot provide enough resources for the operations to be successful. This is the recent experience in Africa (Andreatta et al., 2000), where peace-building operations have been allocated to smaller countries without the burden not being shared by all African countries.

One must also consider the fact that in reality there is not only one single outside country but a large number of them. Proposition 22 indicates that as a group they have the incentive to engage in ex ante peace-building. However, due to the well-known Olsonian collective action problems, they may not be able to coordinate the process. One way of coordinating their decisions and committing to the peace-building process is to establish separate peace-keeping organizations with clearly defined national contributions to ensure their financial viability. Perhaps one way to understand UN role and current EU plans to establish joint peace-building forces is exactly this.

Another interesting implication of Proposition 22 is that perfect peace-building is not feasible in the poorest countries (i.e. if X is small). The intuition is that if conflict countries are very poor, there is not much resources for trade in any event, and thus no incentive for the third country to become involved. Referring again to African experience this may be a reason why conflicts there seem to be hard to prevent. Interestingly, Doyle and Sambanis (2000) find that the index of the level of development has a positive impact on the success of peace-building processes: The higher the index the higher the probability of success. Their index includes the level of GDP of the region in conflict as one factor. It is also important to note that unless pre-conflict peace-building operations are controlled for, an empirical study on conflicts shows that an increase in national income of the conflict country decreases the probability of conflict (Collier and Hoeffler,

2000). Since peace-building seems to be more effective the more developed the country is, it may be suggested that at least part of the effect that investment in conflict decreases as income increases, comes through peace-building[140].

There are many other means of pre-conflict peace-building than just establishing conflict-free zones or securing property rights (see Collier, 2000; Doyle and Sambanis, 2000, and Nafziger, 2004). For example, the efficiency of arms investment in conflict areas can be directly reduced by employing the peace-keeping forces with superior weaponry. This can be analyzed e.g. by specifying that the effective arms investment with a gross outlay of W_i is only $(1 - \nu_i S) W_i$. It is straightforward to see that this reduces the incentive to invest in arms, thus mitigating conflict even with small investment in peace-keeping. This effect also provides incentive for outside countries to actually engage in the operation. One interesting possibility is that arms investments require all the goods as inputs, but there is some substitutability. With this specification one can analyze arms embargoes and similar types of policies. This, however, requires some modifications to the model and is excluded from the present discussion.

5.4   Post-conflict peace-building

Let us next move to post-conflict peace-building. Although pre-conflict peace-keeping would be superior in avoiding both human casualties and material damage, unfortunately pre-conflict peace-keeping operations often fail and post-conflict measures are needed. We analyze two types of post-conflict peace-keeping operations. First we look at policies that try to re-establish the pre-conflict property rights on the endowments now partly destroyed by war. Second, we consider

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[140]   It must be noted that peace-building also makes the Cobb-Douglas function consistent with the empirical evidence in discussions on the problem how possibilities for international trade affect conflicts (see Haaparanta and Kuisma, 2005).

policies that repair war damages. Reconstruction could mean for example direct transfers to the people impoverished by the war or clearing up of mine-fields.

5.4.1 Reestablishment of property rights

Consider country 1 in the post-conflict situation. It now owns share ϕ of all the post-conflict resources in countries 1 and 2. In particular, in the post-conflict era it owns only share ϕ of the resource X it initially owned completely. Let us assume that a policy S chosen by country 3 re-distributes a share λS, $\lambda > 0$, back to country 1 from the resource looted by country 2. Country 1's post-conflict share of X thus becomes $\phi + \lambda S (1 - \phi)$ which is equivalent to $(1 - \lambda S) \phi + \lambda S$. Obviously, at the same time it loses part of its share in resource Y by getting to own only share $(1 - \lambda S) \phi$. Thus, country 1's total post-conflict income including the peace-keeping effect is:

$$\psi = p_x \left[(1 - \lambda S) \phi + \lambda S \right] (X - W_1) + p_y (1 - \lambda S) \phi (Y - W_2) \quad (5.15)$$

Since the total post-conflict endowments of x and y do not depend on the peace-keeping operation, the world market prices are given by (5.7). The first order condition for the military investment by country 1 can be written (after a slight manipulation) in the following simple form:

$$(1 - \lambda S)(1 - \gamma) \frac{\partial \phi}{\partial W_1} - \left[(1 - \gamma)(1 - \lambda S) \phi + \alpha \lambda S \right] \frac{\alpha}{X - W_1} = 0 \quad (5.16)$$

We focus again on the symmetric equilibrium assuming that $X = Y$ and $W_1 = W_2$. From (5.16) one can directly calculate that the investment in arms in symmetric case is:

$$W = \frac{X}{1 + g(S)}, g(S) \equiv (1 - \gamma) \left(1 + \frac{\lambda S}{1 + \lambda S} \right) \quad (5.17)$$

It is clear that investment is definitely smaller than it would be without the peace-keeping operation; recall that the solution in a symmetric Cobb-Douglas case

without peace-keeping operations is $W = \frac{X}{(2-\gamma)}$ which is always higher than the above solution. Arms investment decreases when the operation becomes more extensive, i.e. when S grows. The intuition is straightforward: the incentives for conflict diminish because the re-establishment of property rights reduces the benefit to be gained through conflict. This holds for one's own endowment as well as for the foreign endowment.

The problem with this policy is that country 3 does not have any incentive to adhere to it *ex post*. From country 3's point of view peace-keeping operation just exhausts its resources which are redistributed to conflict countries and does not change the amount (increase) them. Evidently, this improves its terms-of-trade, but as was argued above, terms-of-trade manipulation via the destruction of own resources is never beneficial. Hence, this policy is not credible in the post-conflict situation.

Viewed from the pre-conflict situation the policy may be beneficial because it increases the supply of x and y in the post-conflict exchange, as conflict invest-ment is decreased. It is easy to show that in the symmetric equilibrium:

$$\frac{\partial u_3}{\partial S} = -\gamma - 2\alpha \left(\frac{Z-S}{X-W} \right) \frac{\partial W}{\partial S}. \tag{5.18}$$

Evaluated at S = 0 the above equation becomes:

$$\frac{\partial u_3}{\partial S}\bigg|_{S=0} = -\gamma + \frac{\lambda \left(1-\gamma\right)\left(2-\gamma\right) Z}{X} \tag{5.19}$$

which is positive if

$$\frac{Z}{X} > \frac{\gamma}{\lambda \left(1-\gamma\right)\left(2-\gamma\right)} \tag{5.20}$$

We have now established the following result

Proposition 23 *Post-conflict restoration of property rights is not a time-consistent policy without pre-commmitment, because the third country has no incentive to exercise the policy ex post. However, by committing to the policy ex ante it is beneficial for third country if $\frac{Z}{X} > \frac{\gamma}{\lambda(1-\gamma)(2-\gamma)}$.*

Proposition 22 together with Proposition 23 highlights the importance of commitment to peace-keeping efforts if these actions protect property rights. They both underline the incentive of rich countries to provide efficient peace-keeping. Ex ante commitment to post-conflict peace-building is beneficial if the outside country (countries) is rich enough compared to the conflict countries, but it is important that these outside countries commit to the policy beforehand. This will enable them to increase the post-conflict amounts of x and y, as the commitment to restore property rights decreases the conflict investments of countries 1 and 2. It is important to note that ex post the restoration of property rights only utilizes outside country's resources and is not profitable. For poor outside countries there is no advantage at all to use their own resources to make more x and y available after conflict.

5.4.2 Reparation of war damages

Typically in civil conflicts damages can become severe while the resources available to consumption and production are low. The reparation of war damages can be one means of post-conflict peace-building. When damages are repaired, it effectively means that some of the resources that were destroyed during the war will become available again for market exchange after the conflict. There are two ways postulate this, both of which lead to equivalent formulations. Let us begin by assuming that the authorities of the conflict countries cannot use the anticipated future reparation payments to finance military investment. In other

words, they will get a share of the destroyed resources back only after the conflict. We also assume that countries receive war damages paid as a proportion of the post-conflict endowments, which means that country 1's post-conflict income is:

$$\phi \left[p_x \left((X - W_1) + \varphi_1 S W_1 \right) + p_y \left((Y - W_2) + \varphi_2 S W_2 \right) \right] \tag{5.21}$$

where $\varphi_i S$, is the share of repaired war damages so that $\varphi_i > 0, 0 \leq S \leq \frac{1}{\varphi}$. Similar expression holds for country 2.

The other possibility is to assume that the authorities can "borrow" against reparation payments. In this case we can capture the effects of peace-keeping action by setting $(1 - \varphi_i S) W_i$ to be the damage after reparation. Country 1's post-conflict income in this case is:

$$\phi \left[p_x \left(X - (1 - \varphi_1 S) W_1 \right) + p_y \left((Y - (1 - \varphi_2 S) W_2) \right) \right] \tag{5.22}$$

It is obvious that the two cases are identical. The first order condition for the military investment by country 1 is now:

$$\frac{\partial \phi}{\partial W_1} - \phi \alpha \left(\frac{1 - \varphi_1 S}{X - \widehat{W_1}} \right) = 0, \text{ where } \widehat{W_1} \equiv (1 - \varphi_1 S) W_1 \tag{5.23}$$

In the symmetric case this gives the solution:

$$W = \frac{X}{2 - \gamma - \varphi S} \tag{5.24}$$

This immediately implies that war reparations will increase the intensity of military conflict. The intuition is straightforward: war reparations, when anticipated, reduce the marginal cost of arms buildup, since the effective endowments are not reduced by the full amount of investment in arms[141]. One might expect that

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[141]   This is a somewhat similar problem that appears in allocating foreign aid to conflict countries. Due to the fungibility of aid, it can be used for peaceful or warlike purposes. Thus, foreign aid or debt relief to conflict countries may, in fact, increase military investments. See Addison and

country 3 would not want to commit to war reparations policy before the conflict. But, it turns out to be a time consistent policy. Country 3 has the incentive to war reparations after conflict, provided that it is rich enough. The impact of a marginal increase in peace-keeping expenditure on country 3 welfare can be expressed as:

$$\frac{\partial u_3}{\partial S} = -\gamma + \frac{2\alpha\,(Z-S)\,\varphi W}{X - (1-\varphi S)\,W}$$

When this is evaluated at S = 0, the condition for the incentive for peace-keeping to exist for country 3 becomes:

$$Z > \frac{\gamma}{\varphi}$$

Hence, once again, if the outside country is rich enough it has the incentive to secure peace in conflict countries. It is noteworthy that the above condition is more binding the smaller the size of the operation and the greater the importance of good z in consumption.

Proposition 24   *Repairing war damages is a time consistent policy for a rich enough non-conflict country. As a tool to mitigate conflicts it is counterproductive, since it increases military investments.*

The intuition is that war reparations increase the supply of goods imported by the non-conflict country. Thus, the policy improves its terms-of-trade both directly and indirectly. The problem with this policy is that if conflicting countries see that country 3 finds the post-conflict reparations advantageous, they will obviously increase their conflict investments. If a country 3 could credibly tie its

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Murshed (2003).

hands so that conflicting countries would not expect these kind of operations, the magnitude of conflict would be decreased.

Proposition 24 and Proposition 23 point out some difficulties in peace-keeping. Outside countries (if rich enough) have an incentive to secure peace by securing the conflict parties' initial property rights. Proposition 23 indicates that this works perfectly if it is the only policy used and if policy measures are announced ex ante. In contrast, according to Proposition 24, it is not the only policy that outside countries engage in, as the ex post reparation of war damages can be profitable for them too. However, as long as the initial endowments are not completely secured, conflict countries have an incentive to invest in arms, since war reparations expand the resources they can use in the conflict. Non-conflicting countries can prevent this by extending the protection of property rights before the conflict beyond those stated in Proposition 23.

5.5   Conclusions

This paper has focused on the peace-building by outside countries in local conflicts in the third world. The issue is very important, since at present almost all conflicts take place in developing countries and it is highly probable that conflicts are a significant factor retarding growth and development in these regions. Furthermore, the detrimental consequences of civil wars are not only restricted to the war zones, but conflicts often affect neighboring regions too. Our work aims to contribute from economic standpoint to the understanding of the role of the external countries. The model used in this paper is an extension of the basic model of international trade and conflicts to a three-country world. We have argued that the intensity of conflict can decline when the conflict country's income increases if peace-building is taken into account. We also find that in-

complete pre-conflict peace-building operations will increase military buildup. Successful pre-conflict peace-building requires that the outside countries are sufficiently rich, and that the conflicting countries also have a high enough income (which conforms with existing empirical evidence). Finally, it turns out that the post-conflict re-establishment of property rights is not time-consistent, unless the outside countries commit to the policy ex ante and are sufficiently rich. Repairing war damages is counterproductive as it increases military investments if announced in advance.

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Appendix

The first order condition (5.9) is generated by maximizing the indirect utility function $V(p_i, \Psi_i)$ where $i = 1, 2$. We obtain this function by maximizing $u_i = C_{xi}^{\alpha} C_{yi}^{\beta} C_{zi}^{\gamma}$, with respect to budget constraint. From this problem we get the consumption levels C_{ji} as a function of prices and incomes. C_{ji} denotes the consumption of good j in country i. Next, we maximize the indirect utility function with respect to arming decisions W_i taking into account the success function (5.1), budget equation (5.2) and prices (5.7). The problem for country 1 is:

$$\max_{W_1} V(p_y, p_z, \Psi_1)$$

$$s.t. \qquad\qquad\qquad (5.25)$$

$$p_x\left[\xi_1 S + \phi\left(X - \xi_1 S - W_1\right)\right] + p_y \phi\left(Y - \xi_2 S - W_2\right) - p_x C_{x1} - p_y C_{y1} - C_{z1} = 0$$

Using the envelope theorem the first order condition for this problems can be written as equation (5.9) in the text.

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