8-2005

Aid Effectiveness, Policies and Reform

Elias Kedir Shukralla

Western Michigan University

Follow this and additional works at: http://scholarworks.wmich.edu/dissertations
Part of the Economics Commons

Recommended Citation
http://scholarworks.wmich.edu/dissertations/1061

This Dissertation-Open Access is brought to you for free and open access
by the Graduate College at ScholarWorks at WMU. It has been accepted for
inclusion in Dissertations by an authorized administrator of ScholarWorks
at WMU. For more information, please contact maira.bundza@wmich.edu.
AID EFFECTIVENESS, POLICIES AND REFORM

by

Elias Kedir Shukralla

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Philosophy
Department of Economics
Dr. Erkandeel Alvi, Advisor

Western Michigan University
Kalamazoo, Michigan
August 2005
The effectiveness of foreign aid in developing countries is one of the most controversial topics in the development literature. In particular, issues relating to the link between aid and growth, and whether aid works better when good policies and reforms are undertaken, and how aid should be allocated have been hotly debated by economists and policy makers. As a matter of fact, developing countries continue to receive large amounts of foreign aid every year, and the controversies surrounding aid also remain strong. This dissertation reexamines the links between aid, growth, policies and economic reforms in aid recipient countries and sheds light on some prevailing controversies.

The first chapter develops a simple model of asymmetric information and compares two aid allocation rules: need-based and performance-based. While need-based allocation is efficient, it is not incentive compatible and hurts the donor's budget. It turns out that state independent (equal aid) and performance-based allocations solve the incentive problem but unfortunately create an efficiency problem. With respect to the role of policies, it is seen that the premise 'aid is more effective in the presence of good policies' holds up better in a model of asymmetric information.

In the second chapter an empirical model is developed to test the effectiveness of aid and the role of policies. Using currently popular policy measures and a semiparametric empirical model that addresses nonlinearity and misspecification bias, we
show that good policy always helps economic growth. Additionally, when non-linearity in both aid and the interaction between aid and policy are properly addressed, the empirics also support the claim that aid works in a good policy environment.

The third chapter deals with one major deficiency in the aid-growth literature — the use of aggregate data that do not distinguish between emergency and developmental aid, which presumably have different effects on growth. By using aid that goes only to social and economic infrastructure and production sectors, we find improvement in the relevant estimates (though not sizeable), especially with regard to the aid-policy interaction term.

The last chapter examines the aid-growth relationship in the context of economic reform. We do find policy to be more effective in facilitating growth in the post reform period. However, there is no evidence that reform itself makes aid more effective. Therefore, the finding is that reform shapes policies and thus helps growth indirectly, rather than reform directly contributing to growth. Finally, on the question: do reform and good policies attract aid? This study does not find empirical affirmation of that link.
INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

UMI®

UMI Microform 3188452
Copyright 2006 by ProQuest Information and Learning Company.
All rights reserved. This microform edition is protected against unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
ACKNOWLEDGMENTS

First of all, I would like to express my heartfelt gratitude to two people who have so much contributed to this dissertation: Dr. Eskander Alvi and Dr. Debasri Mukherjee. I am very much indebted to both for lending me valuable ideas, insightful suggestions and comments. They have always been available to help me, not only during the dissertation process, but also in all dimensions of my graduate career. I am also thankful to Dr. Ahmed Hussen for agreeing to serve as a committee member and taking the time to read the manuscript.

I am grateful and indebted to my wife Hani Kemer Abubaker for her unreserved love and care. Words cannot express what she means to me. My mother, brothers and sister deserve special thanks for their support in every aspect of my life. Dedication of this dissertation is to my father who was here when I started it but could not see its completion.

I would also like to thank several fellow students for making the graduate life at Western a memorable experience. A special thanks goes to Mesfin Abhra Redda who has extended his unreserved help whenever I needed it. I got a great lesson from my senior and friend, Bedassa Tadesse Ayele, as to how valuable perseverance is.

Elias Kedir Shukralla
# TABLE OF CONTENTS

**ACKNOWLEDGMENTS** ........................................................................................................... ii

**LIST OF TABLES** .................................................................................................................... v

**LIST OF FIGURES** .................................................................................................................. vii

**CHAPTER**

I. **INTRODUCTION** ..................................................................................................................... 1

   Aid Allocation, Incentives, Policies and Growth - A Theory ................................................. 8

   A Simple Model ................................................................................................................... 12

II. **AID, POLICIES, AND GROWTH IN DEVELOPING COUNTRIES: A NEW LOOK AT THE EMPIRICS** ............................................................................................................. 18

   Related Literature .............................................................................................................. 19

   Econometric Model ........................................................................................................... 22

   Data and Results ................................................................................................................ 24

      Data .................................................................................................................................. 24

      Results ............................................................................................................................. 26

   Conclusion .......................................................................................................................... 35

III. **AID, POLICIES, AND GROWTH IN DEVELOPING COUNTRIES: EVIDENCE FROM DISAGGREGATED AID DATA** ........................................................................................................... 36

   Econometric Model ........................................................................................................... 41

   Data and Results ................................................................................................................ 44

      Construction of Disaggregated Aid Data Sets ............................................................... 44

      Results ............................................................................................................................. 45
LIST OF TABLES

2.1. Some Notes on the Variables ................................................................. 25

2.2. Descriptive Statistics of Variables in the Empirical Models ................. 26

2.3. Parametric and Semiparametric Results, 1970-2001 ............................ 27

2.4. Semiparametric Results when Two Variables are Nonlinear, 1970-2001 ............................................................... 33

3.1. Disaggregated Aid (All Donors, 3 Sectors): Parametric and Semiparametric Results .......................................................... 46

3.2. Checking with Dummy 86 and Dummy 126 for the Negative Bumps Based on Plots when Policy and Aid*Policy are Nonlinear ................. 52

3.3. Results Using Multilateral Aid (3 Sectors) ........................................... 54

3.4. Parametric and Semiparametric Results Using Disaggregated Aid (All Donors, Two Sectors) ..................................................... 56

3.5. Semiparametric Pooled Results with Policy Lag ................................. 61

4.1. Aggregate Aid with Reform: Parametric Results ................................ 72

4.2. Aggregate Aid when Reform is Included in Policy Index: Parametric Results ............................................................................. 74

4.3. Aggregate Aid in Pre-Reform Period: OLS Results ............................ 76

4.4. Aggregate Aid in Post-Reform Period: OLS Results ........................... 77

4.5. Disaggregated Aid with Reform: Parametric Results .......................... 79

4.6. Disaggregated Aid when Reform is Included in Policy Index: Parametric Results ................................................................. 80

4.7. Disaggregated Aid in Pre-Reform Period: OLS Results ..................... 81

4.8. Disaggregated Aid in Post-Reform Period: OLS Results .................... 82
List of Tables—continued

4.9. Aid Allocation: OLS Results ................................................................. 84
4.10. Aid Allocation in Pre- and Post-Reform Periods: OLS Results ........... 86
LIST OF FIGURES

1.1. Aid Flows to Developing Countries ............................................................. 2
1.2. Aid Flows to Different Sectors ..................................................................... 3
1.3. Partial Scatter Plot of Aid and Growth......................................................... 5
1.4. Partial Scatter Plot of Policy and Growth....................................................... 5
1.5. Partial Scatter Plot of Aid*Policy and Growth ............................................. 6
2.1. The Effect of Aid on Growth ......................................................................... 28
2.2. The Effect of Policy on Growth .................................................................... 29
2.3. The Effect of Aid*Policy on Growth ............................................................. 29
2.4. The Effect of Aid on Growth when Aid, Policy, and Aid*Policy are Nonlinear ...................................................................................................... 31
2.5. The Effect of Policy on Growth when Aid, Policy and Aid*Policy are Nonlinear ...................................................................................................... 31
2.6. The Effect of Aid*Policy on Growth when Aid, Policy and Aid*Policy are Nonlinear ...................................................................................................... 32
2.7. The Effect of Aid*Policy on Growth when Aid and Aid*Policy are Nonlinear ...................................................................................................... 34
2.8. The Effect of Aid*Policy on Growth with Policy Lag when Aid and Aid*Policy are Nonlinear ...................................................................................................... 34
3.1. The Effect of Aid on Growth ......................................................................... 48
3.2. The Effect of Policy on Growth .................................................................... 48
3.3. The Effect of Aid*Policy on Growth ............................................................. 49
3.4. The Effect of Aid on Growth when Aid, Policy, and Aid*Policy are Nonlinear ...................................................................................................... 50
3.5. The Effect of Policy on Growth when Aid, Policy, and Aid*Policy are Nonlinear ................................................................. 50
3.6. The Effect of Aid*Policy on Growth when Aid, Policy and Aid*Policy are Nonlinear ................................................................. 51
3.7. The Effect of Aid on Growth ......................................................................................................................................................... 57
3.8. The Effect of Policy on Growth ............................................................................................................................................... 57
3.9. The Effect of Aid*Policy on Growth ...................................................................................................................................... 58
3.10. The Effect of Aid on Growth .................................................................................................................................................... 58
3.11. The Effect of Policy on Growth .............................................................................................................................................. 59
3.12. The Effect of Aid*Policy on Growth .................................................................................................................................... 59
3.13. The Effect of Aid*Policy on Growth with Policy Lag .................................................................................................................. 62
CHAPTER I

INTRODUCTION

We live in a world that is characterized by vast differences in income and wealth among its richer and poorer inhabitants. Their achievements in terms of per capita income, health, education and other development indicators lie in sharp contrast. Compared to developed countries, many developing countries have not managed to achieve sustained growth and have remained poor by any measure of development. This is especially true in Africa, where there is extreme impoverishment. Some effort has been exerted by wealthy nations to lift the poor ones by providing them with resources in the form of aid. Examining whether foreign aid has been successful in facilitating growth is the subject of this dissertation.

The issue of whether aid helps growth in poor countries is very controversial. While aid to developing countries flows in large quantities, the debate and controversies surrounding aid effectiveness rages on. We first consider some facts about aid giving. Figure 1.1 shows that the total flow of aid to developing countries has been rising over time, increasing from nearly USD 10 billion in 1974 to around USD 90 billion in 2003.¹ This might imply that these poor countries have become even poorer such that their dependence on foreign aid has been rising over time. But, it could also imply that the

---

¹ OECD, Development Assistance Committee (DAC) Statistics online database http://www.oecd.org/dataoecd.htm

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
level of political or strategic partnership between poor and rich countries has been increasing, an argument that is in line with political and strategic motive in aid giving.

Figure 1.1. Aid Flows to Developing Countries

Another important fact shown in figure 1.1 is that total aid to developing countries has been decreasing during the 1990s. This might be a reflection of the significance of political considerations in aid giving. That is, the end of the cold war might have reduced the amount of aid that donors give in exchange for strategic partnership. Also, the share of multilateral aid from the total aid has always been relatively small; for example, it constitutes only 22 percent of the total aid in 2003. Both factors seem to suggest that aid was not primarily given for economic reasons. A clearer picture of this reality can be seen by disaggregating aid into its bilateral and multilateral components. As can be seen from figure 1.1, the flow of multilateral aid has been stable and that the trend in total aid flows reflects the trend in bilateral aid. The decrease in bilateral aid in early 1990s may be
explained by the end of the cold war and the consequent “expiration” of many strategic partnerships around the globe. Former Soviet Union’s bilateral aid to socialist countries just stopped when communism collapsed. The more recent dramatic increase in bilateral aid may also be caused by the need to find strategic allies in the war on terrorism. These imply the significance of political and strategic motives or colonial legacies in explaining the flow of aid.

Figure 1.2 disaggregates total aid into two different categories. The first category refers to aid that goes to production sectors, economic infrastructure and social infrastructure and the second one refers to aid that goes to environmental protection, emergency relief, supporting NGOs and others. It shows that the portion of aid that flows to these three sectors has always been greater than that of other sectors. The flow of economic aid has been steadily increasing while aid to the other sectors displays wild fluctuations during some periods, establishing the growing importance of economic motivation in aid giving.

![Aid Flows to Different Sectors](image)

Figure 1.2. Aid Flows to Different Sectors
But, is there any causal relationship between aid to developing countries and their growth experience? Earlier studies have come up with mixed results on aid effectiveness. And, recently, there has been a major shift of emphasis – extending aid that is conditional on quality of policies and institutions in the aid recipient countries. Marking this new approach is an influential paper by Burnside and Dollar (2000), which has had tremendous impact on donor policies. The Burnside and Dollar conclusion that aid works in a good policy environment has also resulted in a number of empirical papers, supporting as well as refuting their key conclusion. One notable critique came from Easterly et al (2004) who simply extend the original sample used by Burnside and Dollar but stick to Burnside and Dollar’s methodology. Easterly et al (2004) conclude that the result regarding the interaction of aid and good policies is not robust to the addition of new data. Their partial scatter plot of growth against interactive aid and policy term, for example, turns out to be negative, which contradicts Burnside and Dollar. Another important criticism is by Hansen and Tarp (2001) who argue that aid works on average unconditionally though with diminishing returns.

Based on a sample of 48 developing countries, we depict scatter plots of aid and growth, policy and growth, as well as the interaction of aid with policy and growth. These scatter plots (depicted below)\(^2\) show a negative aid-growth relationship, a strong positive relationship between policy and growth, and a weak positive relationship between the interaction between aid and policy (aid*policy) and growth.

\(^2\) Three letters country codes by World Bank are used and the numbers show the different periods (e.g., 1 is 1970-1973 and 8 represents 1998-2001).
Figure 1.3. Partial Scatter Plot of Aid and Growth

Figure 1.4. Partial Scatter Plot of Policy and Growth

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Figure 1.5. Partial Scatter Plot of Aid*Policy and Growth

The lack of a clear relationship between aid and growth may be due to the fact that not all components of aid are channeled to areas that have similar multiplier effects. In as much as aid giving has different motivations, it is not unreasonable to think that its effect on growth may not be homogenous. That is, not all types of aid affect growth in the same manner. Recently, researchers have started examining the issue of aid effectiveness by disaggregating aid into its various components (see Clemens, et al, 2004).

The dissertation is organized as follows. In the remainder of this chapter, we motivate a discussion on the links between aid, incentives, policies and growth by way of developing a simple model of asymmetric information. We distinguish between two different rules of aid allocation – need based and performance based. We also examine
the effect of policy on the marginal contribution of aid to growth under both allocation rules. This is of interest because it provides a theoretical justification for the influential story that aid works in good policy environment.

In the second chapter, we examine the links between foreign aid and economic growth in 48 developing countries. As in earlier empirical studies on the link between aid and growth we use aggregate aid in all our regressions. This chapter aims at testing competing hypotheses on whether or not, how and under what circumstances aid influences growth. Specific to this chapter, and most of the dissertation, is the use of semi-parametric estimation technique that addresses the Nonlinearity problem without imposing any functional form restrictions.

The more recent trend of examining the aid-growth nexus by disaggregating aid is the subject of the third chapter. We disaggregate aid on the basis that different categories of aid affect growth differently. The motives behind aid giving and the sectors to which aid flows, among others, explain why different aid categories have different effects on growth. We disaggregate total aid into two broad categories: those that are growth oriented and those that are not. Unlike the second chapter, we examine the aid-growth relationship by focusing on that category which we believe is growth enhancing.

The fourth chapter deals with foreign aid and economic reform. In this chapter, we assess the aid-growth relationship when economic reform matters. Most importantly, we test if reform makes aid more effective. We also test for the existence of any systematic relationship between aid allocation and economic reform in developing countries. Due to the lack of complete information on reform dates and the resulting observation constraint, this chapter does not employ a semi-parametric estimation.
technique. We, therefore, base our analyses on OLS and GMM regressions by using both aggregate and disaggregated aid.

Aid Allocation, Incentives, Policies and Growth – A Theory

The recent literature suggests that allocating aid has evolved from equity to selectivity, particularly policy selectivity (Wane 2004; Dollar and Levin 2004; Burnside and Dollar 2004). A recent paper by Burnside and Dollar (2000) has had a tremendous impact on policymaking in donor countries (Easterly, 2003). Their main finding is that aid helps growth only in a conducive macroeconomic policy environment. Their paper subsequently initiated a number of empirical studies (see for example, Collier and Dehn 2001; Collier and Dollar 2002; Hansen and Tarp 2000, 2001; Dalgaard et al 2004; and Easterly et al 2004) examining the relationship between aid effectiveness and good policy.

In this section, we do not intend to analyze political or strategic motives for aid giving. Rather, we examine need-based aid allocation and show why such an allocation may not be incentive compatible. This helps to motivate why incentives are important in allocating aid. We then illustrate that solving the incentive problem gives rise to a very different allocation mechanism that is based on performance, not need. Thus, incentive compatible aid giving is diametrically opposed to the need-based rule. We focus on the conflict between the two approaches to better understand the motivations and tensions underlying them. This should help our understanding of how aid is actually disbursed in the real world where both “need” and “incentive” issues figure prominently.
In the need-based rule aid is distributed on the basis of needs of recipients. Accordingly, in a needy state a recipient gets more aid than in a better state, where output or available resources could represent states. In so doing, the donor's objective could be to maintain a certain level of investment, consumption, or future output. While such a goal might be achieved in a full information environment, we argue that the need-based allocation rule breaks down in the presence of asymmetric information where the donor does not observe need. The information asymmetry, we show, creates an incentive problem because recipients have a motivation to misrepresent – falsely claim that they are in a needy state – to receive more aid. This would also adversely affect donors' budget. Confronted with the incentive problem, donors presumably look for mechanisms that ensure truthful representation. In that vein, we examine the main features of incentive compatible aid. The resulting rule is either state independent (equal aid) or performance based. We show that the performance-based allocation arises if the probability distribution of states is not entirely exogenous, in which case the donor may additionally wish to reward good outcomes. If this holds, more aid is given in the better state, which is the exact opposite of what occurs under need-based allocation. In either case – equal or performance based aid – the new rule solves the incentive problem but creates an efficiency problem in that aid is not given where its marginal productivity is the highest.

In light of the current debate in policymaking circles and the accompanying literature on effectiveness of aid in the presence of good policies, we also examine the role of policies under the two approaches. A prominent view in the literature is that aid has a positive impact on growth only in countries that have good policies (Burnside and
Dollar 2000). On the question “does aid buy good policies or reforms?” the evidence has been mostly negative, though a more recent study by Burnside and Dollar (2004) suggests that aid does positively impact policies. In this paper we show that the answer to the question – does good policy help? – depends on which aid allocation rule is used. It is seen that policies matter most in the performance-based model. This happens due to complementarity between aid and policy.

The theoretical literature on aid and incentives is somewhat limited. A different sort of incentive problem is emphasized which is typically dealt within a principal-agent framework (e.g., Murshed and Sen, 1995; Martens et al, 2002; Svensson 2000a, 2003; Calmette and Kilkenny, 2001). In many cases the problem involves recipients’ having an incentive to use aid money for purposes other than what is intended by donors. Svensson (2000a), for example, argues that recipient governments will exert low effort in alleviating poverty, given that aid is allocated based on need. To resolve the problem, Svensson suggests tied aid and delegation of part of the aid budget to an (international) agency with less aversion to poverty. Svensson (2003) argues that the incentive from the donor’s side (low opportunity cost of committed fund) explains why foreign aid has not been systematically channeled to countries with better policies. He suggests that instead of committing aid to recipients ex ante and making aid conditional on reform, the donor should disburse aid to a group of countries in a centralized manner. Such an arrangement,

---

3 The fact that aid is fungible is well documented (see for example, Tsikata 1998; Feyzioglu et al 1998).
according to Svensson (2003), makes the donor reward good policies and give aid more efficiently.

Murshed and Sen (1995) show the problem of conditioning aid on non-economic (military) criteria in the presence of asymmetric information. While pooling resources by donors is suggested as a solution in multilateral aid, double moral hazard is believed to introduce sub-optimal action by donors and recipients. Economides et al (2004) look at the aid allocation problem as a typical rent seeking behavior and argue that this behavior can outweigh any possible positive gains from aid and ultimately hurt growth.

The closest paper to the model we develop is that of Calmette and Kilkenny (2001). They argue that information asymmetry in international charity gives rise to moral hazard and adverse selection problems. They show that the cost associated with asymmetric information is borne by most needy countries, which should ideally be receiving the bulk of international charity. That is, less needy countries are able to extract rents, thereby inducing a decrease in the flow of international charity that goes to the more needy ones. Their results reflect how incentive problems change the way in which international charity flows. This is similar to the performance-based rule that we discuss.

The incentive problem we explore in this section is similar in motivation but is more basic than the fungibility literature. In that literature aid is used for “other” purposes, which is the source of misallocation in the recipient country. In our paper there is similar misallocation (aid is used more for current consumption than the donor desires). Also, whereas unwarranted redirection of aid can be resolved by delegating aid to another

---

4 Such a common pool approach is also discussed by Murshed (2003).
5 A similar treatment can also be found in Svensson (2000b).
agency (as in Svensson 2000), the inability to observe or assess needs is a more fundamental problem, which is often resolved by reversing how aid is given — less, not more, in the needy state.

A Simple Model

Consider a representative household with utility given below.\(^6\)

\[ U_t = \ln C_t + \delta \ln C_{t+1} \]  
\[ (1.1) \]

Where \( C_t \) and \( C_{t+1} \) are consumption in time \( t \) and \( t+1 \) respectively, \( \delta \) is the discount factor.

We assume a closed economy except for the flow of foreign aid. In this set up aid is given only in the first period and can be either consumed \((C_t)\) or invested \((I_t)\) at time \( t \).

That is, in the first period

\[ C_t \leq \tilde{y}_t + x_t - I_t, \]  
\[ (1.2) \]

and in the second period

\[ C_{t+1} \leq I_t (1 + r_{t+1}), \]  
\[ (1.3) \]

where \( \tilde{y} \) denotes random output that can take values \( y^h_t \) or \( y^l_t \), with \( y^h_t > y^l_t \); and \( r_{t+1} \) is the interest rate at \( t+1 \).

If the household chooses consumption after the realization of \( \tilde{y} \), the solution to the maximization problem \((\text{Max } U)\) gives

\[ \frac{C_{t+1}}{C_t} = \delta (1 + r). \]  
\[ (1.4) \]

Equation (1.4) is the usual consumption smoothing expression, which says that the ratio of future to current consumption equals the discounted gross rate of return. Substituting for \( C_{t+1} \) and \( C_t \) and rearranging, we get

---

\(^6\) This can also be thought of as a planner who acts on behalf of households.
\[ I_t = (\bar{y} + x_t) [\delta(1+\delta)]. \] (1.5)

Since \( \bar{y} \) equals \( y^h \) or \( y^l \), we can define investment in the high and low states, respectively, as

\[ I^h_t = (y^h + x^h_t) [\delta(1+\delta)], \] \hspace{1cm} (1.6)

\[ I^l_t = (y^l + x^l_t) [\delta(1+\delta)]. \] \hspace{1cm} (1.7)

where \( x^h_t \geq 0 \) and \( x^l_t \geq 0 \) denote aid in the high and low states respectively (and are yet to be determined). One additional assumption is that the donor knows the utility function but does not observe consumption or investment. This is not the basic information problem we wish to address, however. The reason we need this assumption is that if the donor observes consumption or investment, the donor can correctly infer the income realization. This happens because the donor knows (1.4) and can easily identify \( C_t \) or \( C_{t+1} \), given that either is known. Then the donor can figure out \( I_t \) from (1.2) and thus the income realization. If the donor observes \( I_t \) instead, it can easily know the income shock from (1.6) and (1.7) which follow from (1.4). Of course, the assumption that the donor does not observe either consumption or investment is also a realistic one.

We begin our analysis by assuming perfect information about \( \bar{y} \). Consider the following motivation for an aid allocation rule: the donor observes \( \bar{y} \) and gives aid so that the recipient is able to maintain investment or future consumption (output) across states. That is, the donor does not like reductions in current investment of a recipient when \( y^l \) occurs. This would represent a commonly held view that aid helps maintain investment and future income. Accordingly, the donor gives more aid in the low state and less aid in the high state. From (1.6) and (1.7) it is seen that the donor can help maintain \( I^h_t = I^l_t = I \) by setting \( x^l_t > x^h_t \). This depicts need-based aid.
The solution, $x_l > x_h$, cannot be supported when information about $\tilde{y}$ is private to the recipient country. This information asymmetry creates an incentive for recipients to misreport by claiming that they are in the low state while they are actually in the high state so as to receive a higher amount of aid. Motivation to misreport can be seen from the following inequality.

$$I_{l/h} = (y^h + x^l)[\delta/(1 + \delta)] \geq I_{h/h} = (y^h + x^h)[\delta/(1 + \delta)] \quad \text{given } x^l > x^h,$$

where $I_{l/h}$ denotes investment in state $h$ when $l$ is reported.

Using (1.4), equation (1.8) can also be stated as

$$C_{t+l/h} > C_{t+h/h} \quad \text{and} \quad C_{t+l} > C_{t+l/h}.$$

(1.9)

By misrepresenting states the recipient gets more aid than under honest reporting, and the extra resources are devoted to investment as well as consumption. Of course, if $\delta$ is small, the benefit of misreporting is largely in terms of enhanced current consumption which the donor may strongly dislike. In addition, the donor's budget suffers because the donor always pays $x_l$, given the incentive of the recipient to understate. That is, $x_l > q^l x^l + q^h x^h$, where the $q^l$ and $q^h$ denote probability of the two states; a recipient always reports low and costs the donor $x_l$ which is larger than the donor's cost when $\tilde{y}$ is observed.

Confronted with such a situation, the donor would want aid giving to be incentive compatible. We consider the following incentive compatibility constraints.

$$C_{t+h/h} \geq C_{t+l/h} \quad \text{and}$$

$$C_{t+l+h/h} \geq C_{t+l+l/h}$$

(1.10)

That the recipient increases current consumption at the expense of investment is similar to the fungibility literature.

14

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
From (1.10) it follows that the aid allocation rule is reversed. Substituting for $C_t^{h^h}$ and $C_t^{l^l}$ in the first part of (1.10), using (1.2) and rearranging, we get $I^h - I^{l^h} \leq x^h - x^l$. Since the second part of (1.10) implies $I^h - I^{l^h}$ is positive, we have
\[
x^h \geq x^l.
\]
Expression (1.11) captures incentive compatible aid. However, a special case is
\[
x^h = x^l = x_0,
\]
which prevails if the probability distribution of states is exogenous. This equal aid rule resolves the revelation problem but sacrifices the need-based postulates, and the resulting investments vary as in the case without any aid.

In the more general case where the occurrence of states is not entirely exogenous or the donor wants the recipient to be self-supporting in the long run, the equal aid rule gives way to the strict inequality in (1.11'). When the probability distribution of states is partly endogenous, the donor would want to induce the recipient country to undertake actions that shift the distribution to the right. Economic policies and institutions would fit that description well. In particular, good policies would raise the probability of the better state occurring in the sense of first-order stochastic dominance. This would be the analogue of an outward shift of the production possibility frontier. Also, a donor would be interested in the recipient pursuing good policies because that could obviate the need for aid in the long run.\(^8\) That is, the donor may also want the recipient to be self-reliant. Once this specific motivation is included, the aid rule is given by
\[
x^h > x^l.
\]

\(^8\) The implicit understanding could be that once a certain income level is achieved in the long run the donor would not provide further aid.
We can write (11) as $x^h (1-\alpha) = x^l$; where $\alpha$ is the percentage mark up by which $x^h$ exceeds $x^l$.

From (1.11), (1.6), and 1.(7) we find that $I^h > I^l$; the exact difference between $I^h$ and $I^l$ is found by plugging $x^h (1-\alpha) = x^l$ in (1.6) and (1.7) for $x^l$. This yields

$$I^h = I^l + (\alpha x^h + \theta) [\delta(1+\delta)],$$

(1.12)

where $\theta$ is the output gap between the two states.

Equation (1.11) is the basic reason why aid may not be effective. It says that more aid flows to the high state rather than the needy state. While this solves the incentive problem, there is now an efficiency loss due to the fact that more aid is not going where it is most needed. Comparing the two allocation rules, therefore, we find a tradeoff between incentive compatibility and efficiency. The need-based allocation rule is efficient in the sense that more aid is allocated in the bad state, but it is not incentive compatible as there is an incentive to misreport. The performance-based allocation is incentive compatible since recipients reveal truthfully, but it is inefficient as more aid is given in the high state.

It is precisely because of this tradeoff, we argue, that good policies matter in making aid more effective. In the empirical aid effectiveness literature a common premise is aid works in a good policy environment, but aid does not buy policies or reform (Burnside and Dollar, 2000; Collier and Dollar, 2002). Only recent studies began to document that more aid has started to flow to countries with better policies (e.g., Burnside and Dollar 2004). Our analysis here suggests a possible explanation for this current trend.
Good policies, we argue, positively shift the distribution of output by making the occurrence of the good state more likely, as would be the case with an outward shift of the production possibility curve. In an ideal situation where need is observed, aid is given on the basis of need. In that situation good policies are not particularly appealing to a recipient because they receive less aid when the higher state is realized.\textsuperscript{9} In the performance-based allocation, which prevails when need is not observed, the effect of good policies is pronounced. This occurs because better outcomes are rewarded, making the choice of better policies more likely. There is thus an incentive for recipient countries to fix their policies and come up with better ones. In other words, even if donors do not condition aid on policies, recipients have the incentive to come up with appropriate policies to raise output as a means of getting more aid. Thus, whatever marginal contribution aid makes to growth, we find that aid is more effective and the policy impact on aid is higher when the allocation rule is performance based (this is formally shown in appendix A).

\textsuperscript{9} Despite the recipient’s lack of motivation to adopt good policies it is still true that good policies shift the probability distribution to the right.
CHAPTER II

AID, POLICIES, AND GROWTH IN DEVELOPING COUNTRIES: A NEW LOOK AT THE EMPIRICS

The link between foreign aid and economic growth has been a subject of controversy for many years and there is no clear consensus about the effectiveness of aid. Recently, the conclusion by Burnside and Dollar (2000) that aid helps growth but only if the macroeconomic policy environment is conducive has had tremendous impact on donor policies (Easterly, 2003). Not only was the Burnside and Dollar result influential in donor and policy circles, it also initiated a number of empirical studies reexamining the aid-growth relationship (for example, Collier and Dehn, 2001; Collier and Dollar, 2002; Hansen and Tarp, 2001; Easterly et al, 2004, and Dalgaard et al, 2004 to name a few).

A number of issues have been raised in the existing empirical literature of which non-linearity and endogeneity are major concerns. Previous papers tried to take care of non-linearity in the aid variable by imposing a certain functional form restriction in the traditional parametric aid regressions. This paper uses a semiparametric model that does not impose any restriction on the functional form, hence avoids the misspecification bias problem. The issue of endogeneity of aid was typically addressed using a two stage least square method (as in Burnside and Dollar, 2000) and more recently by using Generalized Method of Moments (GMM) estimations (as in Dalgaard et al, 2004). We use GMM to make our results comparable to the existing literature, but for semiparametric estimations

---

10 See, for example, Hansen and Tarp (2001).
we use lagged aid as an explanatory variable along with a set of control variables. Moreover, we test for the sensitivity of our results by using different data sets, different definitions of the aid variable and various model specifications. We find that policy is always an important determinant of growth. We also find that the Burnside and Dollar story, aid spurs growth in a good policy environment, has some support when non-linearity in the variables of interest is properly addressed.

This chapter is organized as follows. Section 2 reviews the relevant literature and highlights the paper's contributions. Section 3 discusses the econometric model. The data and the empirical results are discussed in section 4, and section 5 concludes.

Related Literature

Throughout the 70s and 80s the two gap model of Chenery and Strout (1966) provided the main framework that was used to rationalize the links between aid and growth. Subsequently Bacha (1990) incorporated government's fiscal behavior and extended it to a three-gap model. Because developing countries often lack resources to fill these gaps – required investment, foreign exchange and government revenue, aid is perceived to fill those that are the most pressing. The currently popular view is that developing countries suffer more from an "institutions gap" and a "policy gap" than a financing gap. In this regard, the usual empirical framework for testing the aid-growth relationship augments aid and aid-policy interaction with some measure of institution, policy and/or governance and political stability (see, for example, Burnside and Dollar, 2000; Daalgard et al., 2004; and Easterly et al, 2004).
Hansen and Tarp (2000) classified the empirical literature on aid and growth into three generations. The first generation papers (early 1970s) were motivated by the investment gap idea where aid-induced savings would foster investment. Hence the focus of the first generation papers was on testing the impact of aid on savings. That aid could have negative impact on investment and ultimately on growth was ignored in that literature. The second-generation papers (the early 1970s to the early 1990s) recognized that aid could conceivably partly substitute or complement investment and the focus shifted to directly testing the impact of aid on growth or, at least, the impact of aid on investment.

The third generation papers that followed addressed the role of macro policies, the influence of new growth theory, potential endogeneity in aid and policy, and non-linearity in the aid-growth relationship.

Boone (1996) concluded that aid does not have an impact on growth—aid is associated with increase consumption, but not growth.

Burnside and Dollar (2000; henceforth BD) investigate whether macro policy matters for aid effectiveness and find that aid has a positive impact on growth only in the presence of good economic policy. They observe that it is not aid but the interaction term (aid * policy) that is consistently significant, where the policy index is constructed by taking a linear combination of three well documented policy variables in the growth literature (budget deficit, openness and inflation).\(^\text{11}\)


\(^{11}\) Burnside and Dollar recognize the role of non-linearity in the aid-growth relation but do not address it in their paper.
exact same specification and methodology as in BD (2000) fail to support BD’s conclusion when they expand the data set to include more countries and more years.

Lensink and White (1999) argue that the BD specification could also be viewed as testing whether policies work better in the presence of aid flows. Hansen and Tarp (2001) address the issue of non-linearity in aid by including an aid square (aid $^2$) term. They find that squared aid drives out the significance of the aid * policy term and conclude that aid, on average, works although with diminishing returns. Hadjimichael et al (1995) and Durbarry et al (1998) also support the conclusion of Hansen and Tarp (2001). Roodman (2004) performs a series of robustness checks and concludes that most of his findings support Hansen and Tarp (2001) as opposed to BD (2000).

Because of our specific interest in non-linearity in the aid-growth relationship, we perform some linearity tests (to be discussed later) all of which confirm the presence of non-linearity. It is however almost impossible to pinpoint the exact functional form in the aforementioned relation that will be consistent with all data sets. A misspecification of the functional form (linear as well as non-linear) may lead to misleading econometric conclusions if it is not consistent with the data. A nonparametric model that does not impose any a priori restriction on the functional form of the regression model is therefore called for. Given the limitation on the size of the available data set, we use a

---

12 BD used the following empirical model:

$$
\text{GDP}_{it} = a_0 + a_1 \text{GDP}_{it-1} + a_2 \text{Ethnic}_{it} + a_3 \text{ASSAS}_{it} + a_4 (\text{ETHNIC} \times \text{ASSAS})_{it} + a_5 \text{ICRGE}_{it} + a_6 (\text{M2/GDP})_{i,t-1} + a_7 \text{SSA}_{it} + a_8 \text{EASIA}_{it} + a_9 \text{POLICY}_{it} + a_{10} (\text{AID} \times \text{POLICY})_{it} + a_{11} (\text{AID}^2 \times \text{POLICY})_{it} + \epsilon_{it}
$$

Where GDP$_{it}$ is the growth of per capita income GDP; GDP$_{it-1}$ is the initial GDP; Ethnic$_{it}$ stands for ethnic fractionalization; ASSAS$_{it}$ represents assassinations; (ETHNIC $\times$ ASSAS)$_{it}$ is the interaction term between Ethnic$_{it}$ and ASSAS$_{it}$; ICRGE$_{it}$ presents institutional quality; M2/GDP$_{i,t-1}$ is money supply as a share of GDP lagged one period; SSA$_{it}$ and EASIA$_{it}$ are dummy variables for Sub-Saharan Africa and East Asia respectively; POLICY$_{it}$ is an index constructed as a linear combination of budget deficit, openness and inflation; AID$_{it}$ is effective development assistance; AID$^2 \times $POLICY$_{it}$ is an interaction term between aid and policy; and (AID$^2 \times $POLICY)$_{it}$ is the product of the square of aid and policy. In all the above $i$ indexes country and $t$ indexes time.
semiparametric (taking non-linearity in the variables of interest only) rather than a pure nonparametric model in order to avoid the ‘dimensionality’ problem (see Pagan and Ullah, 1999; Robinson, 1988). We also use a new extended data set that is made available to the public by the Center for Global Development. And we check for sensitivity of the results by using two popular measures of aid - Official Development Assistance (ODA) and Effective Development Assistance (EDA).

**Econometric Model**

We start with linear parametric specifications (OLS and GMM) to enable us compare our results with the existing literature. The GMM framework helps address endogeneity between aid and growth, which is also handled by using lagged aid in our OLS estimations. Next, we consider the following semiparametric model.

**Model I.**

\[
Y_i = \beta X_i + m(Z_i) + U_i
\]

(2.1)

Where:

- \( Y \) is the dependent variable (per capita growth rate of real GDP averaged over four years);
- \( X_i \) is the vector of regressors (control variables) captured through linear functional form;
- \( Z_i \) is the vector of regressors affecting \( Y \) through an unknown functional form \( m(.) \) and
- \( U_i \) is the random i.i.d error.

This is a typical partially linear model as in Robinson (1988). We use Kernel weighted local linear estimation technique (see, Pagan and Ullah, 1999, for details). Taking a Taylor series expansion of (2.1) around a fixed point \( z \) we get:

\[
Y_i = m(z) + \beta X_i + \gamma(z)(Z_i - z) + R_i(z) + U_i
\]

(2.2)
where $m(z)$ is the constant and $\gamma(z)$ is the point wise slope coefficient that captures the effect of $Z$ on $Y$ at point $z$. $R_i(z)$ is the higher order terms of the Taylor series expansion.\textsuperscript{13}

Due to the well known 'curse of dimensionality (sample size limitation), we first consider non-linearity in a single variable.\textsuperscript{14} For example, while considering non-linearity in aid, we treat policy and aid*policy (along with other variables) as linear. We then consider non-linearity in policy only and, finally, non-linearity in aid*policy only.

For Robustness check, we also consider non-linearity in all three variables (aid, policy, aid*policy) simultaneously in which case the model is specified as:

\[
Model II
\]

\[
Y_i = \beta X_i + m(Z_{i1}, Z_{i2}, Z_{i3}) + U_i
\]

(2.3)

The belief that growth may also be explained by country specific factors ideally requires the use of panel data techniques to account for potential heterogeneity. And the presence of lagged dependent variable as a regressor warrants a dynamic panel data framework.\textsuperscript{15} There is no formal paper with established properties on Fixed Effect Semiparametric dynamic panel data model using smoothing technique. Li and Stengos (1996) provide instrumental variable (IV) semiparametric dynamic panel estimator for pooled model. In a recent comprehensive paper, Baltagi and Li (2002) improved on Li and Stengos’s semiparametric IV estimator and came up with an IV estimator that allows

\textsuperscript{13} See Robinson (1988) and Pagan and Ullah (1999) for details. Standard normal Kernel and optimal bandwidth are considered in our estimations

\textsuperscript{14} It is well known that nonparametric/semiparametric approach suffers from “dimensionality” problem, i.e., it needs very large sample size and the size of the sample required increases with the number of regressors involved nonparametrically.

\textsuperscript{15} We have initial income for each period (lagged income) as an explanatory variable where the growth of income is the dependent variable.

23
for lagged dependent variable as well as for other weekly exogenous variables. We tried their pooled IV estimator, Random effects IV estimator, and within IV estimator but unfortunately for the data set we are using there is clear evidence of weak instrument problem. For example, the correlation between the lagged dependent variable and its instruments (as proposed by Baltagi and Li (2002)) is around 0.12, an obvious case of weak instrument. The coefficients obtained by using these instruments are also very counter-intuitive as would be expected.

Given the shortcomings of the existing methodology available, we choose not to use panel data framework. Rather, we use a pooled framework that is common in the existing literature. Additionally, we use Sub-Saharan African and East Asian dummies to take care of region specific effects. Also, we use lagged aid to take care of possible endogeneity. Our conclusions, therefore, are based on a semiparametric-pooled model as in (2.1) and (2.3) with lagged aid and regional dummies. This takes care of non-linearity, endogeneity bias, and region specific heterogeneity.

Data and Results

Data

A new data set is used in this study that was made available for public use by the Center for Global Development. The data is based on Easterly et al (2004), which Roodman (2004) extends to include more observations. We have a total of 384 balanced observations covering 1970-2001 and like most papers in the literature we use four-year averages. Some notes on variables and descriptive statistics are presented in Table 2.1 and 2.2 respectively.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Capita GDP growth (GDPG)</td>
<td></td>
</tr>
<tr>
<td>Initial GDP per capita (LGDP)</td>
<td>Natural logarithm of GDP/capita for first year of period; constant 1985 dollars</td>
</tr>
<tr>
<td>Ethnic fractionalization (ETHNF)</td>
<td>Probability that two individuals belong to different ethnic groups</td>
</tr>
<tr>
<td>Assassinations (ASSAS)</td>
<td>Assassinations per capita</td>
</tr>
<tr>
<td>Institutional quality (ICRGE)</td>
<td>Revised version of variable and is computed as the average of corruption, bureaucratic quality, and rule of law.</td>
</tr>
<tr>
<td>M2/GDP, lagged one period</td>
<td></td>
</tr>
<tr>
<td>Sub-Saharan Africa (SSA)</td>
<td>Dummy for Saharan as Sub-Saharan</td>
</tr>
<tr>
<td>East Asia (EASIA)</td>
<td>Dummy for fast growing Asian countries following BD</td>
</tr>
<tr>
<td>Inflation (INFL)</td>
<td>Natural logarithm of 1+inflation rate. World Bank primary data source. Wholesale price inflation from IMF used where consumer price data unavailable</td>
</tr>
<tr>
<td>Effective development Assistance/real GDP (EDA)</td>
<td>Available values for 1975-95 from Chang et al. Missing values extrapolated by Roodman (2004) based on Net ODA. Converted to 1985 dollars with World Import Unit Value index from IMF, series 75. GDP computed like LGDP above.</td>
</tr>
</tbody>
</table>

Note: Detailed description on more variables along with original sources can be obtained from Roodman (2004).
Table 2.2

Descriptive Statistics of Variables in the Empirical Models

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPG</td>
<td>384</td>
<td>1.15</td>
<td>3.40</td>
<td>-12.74</td>
<td>16.49</td>
</tr>
<tr>
<td>LGDP</td>
<td>384</td>
<td>7.57</td>
<td>0.73</td>
<td>5.22</td>
<td>9.34</td>
</tr>
<tr>
<td>ETHNF</td>
<td>384</td>
<td>0.45</td>
<td>0.31</td>
<td>0</td>
<td>0.9</td>
</tr>
<tr>
<td>ASSAS</td>
<td>384</td>
<td>0.47</td>
<td>1.22</td>
<td>0</td>
<td>11.5</td>
</tr>
<tr>
<td>ETHASSAS</td>
<td>384</td>
<td>0.17</td>
<td>0.55</td>
<td>0</td>
<td>7.36</td>
</tr>
<tr>
<td>SSA</td>
<td>384</td>
<td>0.29</td>
<td>0.46</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>EASIA</td>
<td>384</td>
<td>0.10</td>
<td>0.31</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>ICRGE</td>
<td>384</td>
<td>4.23</td>
<td>1.62</td>
<td>0</td>
<td>8.33</td>
</tr>
<tr>
<td>M21</td>
<td>384</td>
<td>26.71</td>
<td>13.57</td>
<td>4.18</td>
<td>81.64</td>
</tr>
<tr>
<td>AID</td>
<td>384</td>
<td>1.70</td>
<td>2.22</td>
<td>-0.06</td>
<td>15.30</td>
</tr>
<tr>
<td>Policy</td>
<td>384</td>
<td>0.95</td>
<td>1.18</td>
<td>-6.78</td>
<td>2.41</td>
</tr>
<tr>
<td>AID*POLICY</td>
<td>384</td>
<td>1.41</td>
<td>3.95</td>
<td>-34.13</td>
<td>24.53</td>
</tr>
</tbody>
</table>

Note: The variable names are given in the footnote on page 21.

Results

Our OLS and GMM results show that policy is positive and highly significant while neither aid nor aid*policy is found to be significant. The fact that the interaction term is not significant (actually has a negative sign) is in line with Easterly et al (2004)\textsuperscript{16} and the results are summarized in the first two columns of Table 2.3. The institution variable is the only control variable that is found to be positive and significant in both OLS and GMM regressions.

\textsuperscript{16} Since our robustness checks regarding the alternative definitions of aid give very similar results, we only report the results where ODA is used
### Table 2.3

Parametric and Semiparametric Results, 1970-2001

<table>
<thead>
<tr>
<th>Variable</th>
<th>OLS</th>
<th>GMM</th>
<th>Semi-parametric (Pooled)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aid is Non</td>
<td>Policy is Nonlinear</td>
<td>Aid*Policy is Nonlinear</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>-----------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>LGDP</td>
<td>-0.09</td>
<td>-0.05</td>
<td>-0.02</td>
</tr>
<tr>
<td></td>
<td>(0.52)</td>
<td>(0.07)</td>
<td>(0.55)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>0.04</td>
<td>0.15</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>(0.60)</td>
<td>(0.62)</td>
<td>(0.61)</td>
</tr>
<tr>
<td>ASSASINATION</td>
<td>-0.45**</td>
<td>-0.05</td>
<td>-0.44**</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.17)</td>
<td>(0.22)</td>
</tr>
<tr>
<td>ETHNIC*ASSASIN</td>
<td>0.51</td>
<td>0.53</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>(0.37)</td>
<td>(0.39)</td>
<td>(0.41)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.26**</td>
<td>0.77***</td>
<td>0.27**</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.24)</td>
<td>(0.13)</td>
</tr>
<tr>
<td>M21</td>
<td>-0.02*</td>
<td>-0.05</td>
<td>-0.02*</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.03)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.21***</td>
<td>-2.39***</td>
<td>-2.40***</td>
</tr>
<tr>
<td></td>
<td>(0.60)</td>
<td>(0.62)</td>
<td>(0.59)</td>
</tr>
<tr>
<td>EASIA</td>
<td>1.33***</td>
<td>1.51***</td>
<td>1.52***</td>
</tr>
<tr>
<td></td>
<td>(0.50)</td>
<td>(0.51)</td>
<td>(0.54)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.93***</td>
<td>0.72***</td>
<td>0.85***</td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td>(0.28)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>AID</td>
<td>0.01</td>
<td>-0.23</td>
<td>-0.37**</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.16)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>Aid * POLICY</td>
<td>-0.03</td>
<td>-1.44</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(1.40)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>384</td>
<td>288</td>
<td>384</td>
</tr>
<tr>
<td>R²</td>
<td>0.26</td>
<td>0.28</td>
<td>0.31</td>
</tr>
<tr>
<td>Sargan test (P-Value)</td>
<td>0.1369</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arellano-Bond test (P-Value)</td>
<td>0.6312</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Dependent variable is per capita GDP growth (GDPG); *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses. The semiparametric model gives pointwise estimates that can be represented in a plot. Here we report the average of the pointwise slope coefficients only when optimal h is used. In the GMM regression, endogenizing aid only or both aid and policy or all the three variables including the interaction term gives very similar results. In the GMM regression differencing removes the impact of ethnic and other time invariant factors. The Sargan test shows the validity of the instruments used and there is also no second order serial correlation in the differenced error terms in accordance with Arellano and Bond (1991).
We perform tests of non-linearity in aid, aid * policy, and policy variables by using Ramsey RESET and Li and Ullah (1998) type tests and the hypothesis of linearity is rejected in all specifications. In Figure 2.1 we plot the point wise regression coefficients of aid on growth. Similar plots for the regression coefficients of policy on growth and aid * policy on growth are presented in Figures 2.2 and 2.3 respectively. In all these figures there is clear evidence of non-linearity where the functional form is not simply quadratic.
Figure 2.2. The Effect of Policy on Growth

Figure 2.3. The Effect of Aid*Policy on Growth
For our semiparametric results, in all cases the optimal bandwidth (h) that minimizes the mean square error (MSE)\textsuperscript{17} and the standard normal Kernel are used. The results are summarized in Table 2.3. For the nonparametric part, the average of the pointwise regression coefficients are reported. The detailed plots of the regression coefficients i.e., $\gamma(z)$ against $z$ are given in Figures 2.1 through 2.3 where only one variable is non-linear and all other variables enter linearly. The 5% confidence bands are also shown in each figure.

The semiparametric results indicate that in all the three cases policy is highly significant, whereas neither aid nor aid $\times$ policy stands out to be significant uniformly. We actually observe some interesting changes. When non-linearity in aid$\times$policy is addressed, the interaction term is positive and significant (in line with BD). However, when we take care of the non-linearity in aid, we find aid to be significant and negative (in line with Boone). When non-linearity in all the three variables is simultaneously considered, policy is still positive and significant\textsuperscript{18} but both aid and aid$\times$ policies are found to be insignificant (see Table 2.3 and Figures 2.4-2.6).\textsuperscript{19} The institutional variable has consistently been positive and significant (as in most empirical work), and we do not find evidence of convergence in our sample of countries.

\textsuperscript{17} We have tried one half and twice of the optimal band width and the results that are qualitatively similar. \textsuperscript{18} The significance of policy is reduced to 10% in this case. \textsuperscript{19} Both regional dummies are found to be significant in all the semiparametric regressions: EASIA with positive coefficient and SSA with negative coefficient. M21 is also found to be consistently significant with small negative coefficient.
The Effect of Aid on Growth
(When Aid, Policy, and Aid*Policy are Nonlinear)

Figure 2.4. The Effect of Aid on Growth when Aid, Policy, and Aid*Policy are Nonlinear

The Effect of Policy on Growth
(When Aid, Policy, and Aid*Policy are Nonlinear)

Figure 2.5. The Effect of Policy on Growth when Aid, Policy, and Aid*Policy are Nonlinear

31
Given the data limitation in addressing non-linearity in all the three variables together, we address non-linearity in two variables at a time (aid and aid*policy & policy and aid*policy). In this case, we find the aid policy interaction term to be positive and significant when non-linearity in aid and aid*policy is simultaneously taken care of. This result remains when lagged policy is used (see, table 2.4 and figures 2.7 and 2.8).
Table 2.4

Semiparametric Results when Two Variables are Nonlinear, 1970-2001

<table>
<thead>
<tr>
<th>Variable</th>
<th>Aid and Aid* policy are Nonlinear</th>
<th>Aid and Aid* policy are Nonlinear (With Policy Lag)</th>
<th>Policy and Aid* policy are Nonlinear</th>
<th>Policy and Aid* policy are Nonlinear (With Policy Lag)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-0.24 (0.50)</td>
<td>-0.22 (0.55)</td>
<td>-0.08 (0.60)</td>
<td>-0.09 (0.58)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>0.30 (0.65)</td>
<td>0.31 (0.68)</td>
<td>0.51 (0.64)</td>
<td>0.27 (0.65)</td>
</tr>
<tr>
<td>ASSASINATION</td>
<td>-0.46* (0.23)</td>
<td>-0.53** (0.23)</td>
<td>-0.43* (0.24)</td>
<td>-0.51 (0.22)</td>
</tr>
<tr>
<td>ETHNIC*ASSASIN</td>
<td>0.56 (0.40)</td>
<td>0.70* (0.42)</td>
<td>0.49 (0.42)</td>
<td>0.69* (0.39)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.31** (0.12)</td>
<td>0.26* (0.13)</td>
<td>0.28** (0.13)</td>
<td>0.28** (0.13)</td>
</tr>
<tr>
<td>M21</td>
<td>-0.02** (0.01)</td>
<td>-0.01 (0.01)</td>
<td>-0.02** (0.01)</td>
<td>-0.01 (0.01)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.76*** (0.60)</td>
<td>-2.51*** (0.64)</td>
<td>-2.64*** (0.64)</td>
<td>-2.56*** (0.61)</td>
</tr>
<tr>
<td>EASIA</td>
<td>1.59** (0.52)</td>
<td>1.53** (0.63)</td>
<td>1.45** (0.59)</td>
<td>1.55** (0.64)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.73*** (0.17)</td>
<td>0.06 (0.15)</td>
<td>1.23** (0.51)</td>
<td>1.11** (0.55)</td>
</tr>
<tr>
<td>AID</td>
<td>-0.48* (0.28)</td>
<td>-1.14** (0.29)</td>
<td>0.13 (0.33)</td>
<td>-0.13 (0.22)</td>
</tr>
<tr>
<td>Aid * POLICY</td>
<td>0.31** (0.16)</td>
<td>0.83** (0.16)</td>
<td>0.03 (0.16)</td>
<td>0.11 (0.16)</td>
</tr>
</tbody>
</table>

No. of Observations | 384 | 384 | 384 | 384
R²                   | 0.36 | 0.23 | 0.36 | 0.28

Note: Dependent variable is per capita GDP growth (GDPG); *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses.
The Effect of Aid*Policy on Growth
(When Aid and Aid*Policy are Nonlinear)

Figure 2.7. The Effect of Aid*Policy on Growth when Aid and Aid*Policy are Nonlinear

The Effect of Aid*Policy on Growth With Policy Lag
(When Aid and Aid*Policy are Nonlinear)

Figure 2.8. The Effect of Aid*Policy on Growth with Policy Lag when Aid and Aid*Policy are Nonlinear
Our semiparametric estimations provide evidence that the BD postulate – aid is effective in a good policy environment – is sometimes true when non-linearity in the variables of interest is properly addressed. However, the other view forwarded by Hansen and Tarp (2001), that aid works on average, is difficult to support. We simply do not find a positive and significant aid coefficient. Our results are robust to the use of different model specifications (using different combinations of control variables), different definitions of aid, and varying countries in the sample.

Conclusion

The effectiveness of aid in helping growth has been a subject of considerable debate for the last several years. Conflicting results are found in the existing empirical literature as to the presence of non-linearity and potential endogeneity in aid, as well as the role of policy in the aid-growth relationship. With the help of a new extended data set, this paper contributes to the empirical literature by using a semiparametric model. We conclusively observe that good policy is always an important determinant of economic growth in developing countries. Also, the finding of BD that aid spurs growth in a good policy environment has some support when non-linearity in the variables of interest is properly addressed. We also find the hypothesis that aid has a positive impact on growth regardless of the policy environment of recipients to be a tough sell.

20 Of course, it ought to be noted that we do not find in favor of the BD postulate when all three relations are simultaneously estimated given the dimensionality problem. Future research with access to larger data may shed more light in this regard.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
CHAPTER III

AID, POLICIES, AND GROWTH IN DEVELOPING COUNTRIES: EVIDENCE FROM DISAGGREGATED AID DATA

The major contentions in the extensive aid literature can be put under three broad categories:

(1) Aid does not have any impact on growth or hurts growth (e.g., Boone 1996);

(2) Aid works only under some conditions (e.g., good policies/institutions (Burnside and Dollar, 2000; 2004), outside the tropics (Dalgaard et al, 2004), and in the face of export shocks (Collier and Dehn, 2001)). Perhaps the most prominent and influential story is the one by Burnside and Dollar; and

(3) Aid is effective everywhere (without some specific conditions being satisfied) but with diminishing returns (e.g. Hansen and Tarp, 2001).

But, most of these studies, including the most influential ones, have one important limitation – use of aggregate aid data, which can be criticized on two important grounds. First, different components of aid have different impacts on growth. For example, emergency aid is likely to have different effect on growth than economic infrastructure aid. The heterogeneity of end use is often based on the recipient’s needs and budgets. Also, they may be tied to the donor’s motivation, which could be different from the recipient’s domestic priorities. In either case, the growth effects of different aid categories are not likely to be similar. Second, aggregate aid contains components whose effect on growth may not be visible within a four-year period, which is usually the time
period considered in most aid-growth regressions. Particularly, aid related to public health and primary education may have longer gestation period compared to public works or infrastructure projects. Therefore, when the various types of aid are pooled together the aggregate effect on growth may be much diluted, especially if emergency and health related aid amounts are sizeable. For example, using an aggregate aid that includes emergency relief, in aid-growth regressions, may introduce a negative bias since it is not given for the purpose of growth and is usually given when income or its growth has fallen due to some natural disaster. To avoid this problem, we assess the impact of aid by disaggregating it.

In the empirical aid literature, aid disaggregation has taken different forms. Some studies, such as Ram (2003), disaggregate aid into bilateral and multilateral components based on differences in the motivations for giving, the donor-recipient relationship, and types of conditionalities associated with aid. For example, bilateral aid may have a political/strategic motive and its effect on growth may be different from that of multilateral aid. Mavrotas and Ouattara (2003), on the other hand, distinguish between project aid, program aid, technical assistance, and food aid and argue that their growth impact differs in as much as they differently influence the fiscal behavior of governments in recipient countries.

Clemens, et al (2004) argue that the existing disaggregated studies classify aid by purpose but do not examine the efficacy of aid within the “appropriate time horizon”. Put another way, these studies do not disaggregate aid in terms of the expected number of years that each aid category is likely to affect growth. Clemens, et al disaggregate aid by taking a reasonably complete account of motives for aid-giving, the conditionalities that
come with it, and the sectors to which it flows. They distinguish between three “mutually 
exclusive and collectively exhaustive” categories of aid: short-impact aid, long-impact 
aid and humanitarian aid. They convincingly argue that humanitarian aid may be 
negatively correlated with growth as this type of aid is given in the event of a disaster, 
drought or famine. The more recent Tsunami aid, for example, aims at saving lives rather 
than facilitating growth. Long-impact aid, in their classification, refers to that portion of 
aid that goes to social infrastructure such as education, health, population control, water 
resources and any kind of technical assistance. This component of aid, they contend, 
affects growth in the long run as it takes a long time for people to make use of the 
services of, say, a new aid-financed school to get the required training and join the labor 
force.21

Clemens et al (2004) define aid that goes to economic infrastructure, production 
sectors and budget support programs as short-impact aid. This allows them to single out 
the short-impact aid and examine its effect on growth within the commonly used period 
of analysis – four years. They use the usual four-year average data in examining the 
growth effect of a short-impact aid, from which they exclude humanitarian and long-
impact aid because their effects may not be realized in the four-year regressions. Their 
results show that aid (specifically short-impact aid) works on average. They stress the

21 No matter what is intended to serve, any aid given in the form of a budget support is regarded short-
impact while any aid provided as a technical assistance is considered a long-impact. For example, the 
portion of aid that goes to road construction in the form of a budget support constitutes a short-impact 
while the portion of road aid, which is given in the form of technical assistance, is a long-impact aid. 
Similarly, aid allocated to education may be labeled as short or long-impact aid depending on whether it is 
given as a budget support or a technical assistance. That part of aid which goes to investment projects and 
other resource provision is classified by purpose; it is short-impact if it goes to economic infrastructure and 
the production sector and long-impact if it goes to social infrastructure such as education, health, etc. For 
details on their disaggregation, see Clemens et al (2004).
point that aid is unconditionally effective in facilitating growth and that good policies and institutions only make this effect larger.

Another approach to dealing with this problem is to increase the time period within which to analyze the effect of aid on growth without having to disaggregate aid. Easterly (2003), for example, estimates the usual aid-growth model by increasing the time period to account for the long-term effect of aid. He finds the Burnside and Dollar conclusion that aid works in a good policy environment to be fragile by using data constructed as 8, 12 and 24-year averages. Although this approach accounts for the growth impacts of both short and long impact aid components, it nevertheless, has one important limitation: it does not correctly attribute the resultant growth to each of the aid components, as long-term growth may result from a variety of changes in the economy. This is what Clemens, et al refer to as the attribution problem.

An alternative way of resolving the problem is to disaggregate the data and examine the separate effects of the different components of aid. Ouattara (2003) estimates a time-series savings model by using data from Cote d'Ivoire, disaggregated into program and project aid. He shows that program aid increases domestic savings both in the short and long run, and project aid lowers savings in the short-run with no significant impact in the long run. Mavrotas and Ouattara (2003) examine the sensitivity of the government's fiscal behavior to different categories of foreign aid in Cote d'Ivoire. By using a time-series data for the period 1975-99, they show that government reveals different fiscal reactions to different types of aid, namely program aid, project aid, technical assistance and food aid. They view this result as motivation to disaggregate aid so as to better understand the aid-growth nexus.
As with aggregate aid, the few empirical studies that use disaggregated aid also provide mixed results on aid effectiveness. By using the same disaggregation (as in Mavrotas and Ouattara, 2003) for Ugandan data, Mavrotas (2003) finds a negative relationship between growth and two components of aid, namely technical assistance and food aid. He finds the other two categories, especially program aid, to be growth promoting. A similar study by Mavrotas (2002) shows that growth in India is negatively correlated to all categories of aid that he uses in his analysis.

Owens and Hodinnott (1999) find that much of the improvement in household welfare in Zimbabwe is due to development aid as opposed to humanitarian aid. A more recent study by Cordella and dell’ Ariccia (2003) specifically tests for the presence of the Burnside and Dollar (2000) type conditional aid effectiveness. They find different estimates for conditional aid efficacy for different categories of aid, namely project and program aid.

Our paper is closest to Clemens, et al (2004). But there are two main differences. First, Clemens, et al (2004) address the issue of non-linearity by including the square of aid as an explanatory variable and they find that aid works with diminishing returns. This specification is restrictive, however. We try to fix this problem by using a semi-parametric estimation technique that allows for non-linearity without specifying a functional form in the variables of interest. Second, we use different disaggregation of aid. In fact, we use two different sets of disaggregated data. The first one is similar but not identical to Clemens, et al’s short-impact aid. It consists of aid allocated to economic infrastructure and production sectors. The second is more comprehensive and adds social infrastructure and services to the first. Our inclusion of social infrastructure reflects our
belief that some aid in the social services and infrastructure area yield fairly quick returns in developing economies. Adult education, vaccines, clean water and basic health services may produce non-trivial gains well within a four-year period, especially if initial literacy and health conditions are rather poor. For example, many poor countries have a large rural population with little education. Here the marginal productivity of basic education could be large: two or three years of education could significantly change the illiterate farmers’ attitude towards the adoption of say agricultural technologies such as fertilizers and irrigation practices. Likewise, the construction of a new clinic (health sector investment) in the rural areas may influence short-term outcomes significantly by providing medical services without requiring them to go to distant cities. Availability of vaccines could effectively and cheaply keep workers healthy and productively engaged, thereby quickly contributing to output and growth.22

The remaining of the chapter is organized as follows. The next section describes the econometric model that we use in the paper. Section three discusses the way we disaggregate the aid data and the results obtained using our two sets of disaggregated aid data. We conclude the paper in section four.

**Econometric Model**

We do both parametric (OLS and GMM) and semiparametric estimations. The Generalized Method of Moments (GMM) estimator of Arellano and Bond (1991) helps

---

22 Some may insist that not all types of aid to social infrastructure are short-impact. Because we consider lagged aid, however, it extends the time horizon to eight years, making it longer than the four-year window. For instance, construction of a new hospital in year one can accommodate growth effects over the next eight years.
us address potential endogeneity between aid and growth as well as that between policy and growth. In all the OLS estimations we use lagged aid, which is useful for both capturing lag effects as well as dealing with endogeneity. The semiparametric model is similar to what we consider in the second chapter and is given by:

\[ Y_i = \beta X_i + m(Z_i) + U_i \]

This is a typical partially linear model as in Robinson (1988)

Where:

- \( Y \) is the dependent variable (per capita growth rate of real GDP averaged over four years);
- \( X_i \) is the vector of regressors (control variables) captured through linear functional form;
- \( Z_i \) is the vector of regressor(s) affecting \( Y \) through an unknown functional form \( m(\cdot) \); and
- \( U_i \) is the random i.i.d error.

As in chapter two, we use Kernel weighted local linear estimation technique.

Taking a Taylor series expansion of (1) around a fixed-point \( z \) we get:

\[ Y_i = m(z) + \beta X_i + \gamma(z)(Z_i - z) + R_i(z), U_i \]

where \( m(z) \) is the constant and \( \gamma(z) \) is the point wise slope coefficient that captures the effect of \( Z \) on \( Y \) at point \( z \). \( R_i(z) \) is the higher order terms of the Taylor series expansion.\(^{23}\)

\(^{23}\) See Robinson (1988) and Pagan and Ullah (1999) for details. Standard normal Kernel and optimal bandwidth are considered in our estimations.
Due to sample size limitation (the so called ‘curse of dimensionality’), we first consider non-linearity in a single variable. For example, while considering non-linearity in disaggregated aid (three or two sectors), we treat policy and aid*policy (along with other variables) as linear. We then consider non-linearity in policy only and, non-linearity in aid*policy only. We also consider non-linearity in two variables together (aid and aid*policy & policy and aid*policy) as well as all three variables simultaneously (aid, policy, aid*policy).

Cases of simultaneous non-linearity in two variables and three variables are given in equations (3.3) and (3.4), respectively:

\[ Y_i = \beta X_i + m(Z_{1i}, Z_{2i}) + U_i \]  
\[ Y_i = \beta X_i + m(Z_{1i}, Z_{2i}, Z_{3i}) + U_i \]

We recognize the heterogeneity among the countries in our sample and the need for using a panel data technique such as fixed effects estimation. Moreover, in the presence of lagged dependent variable as an explanatory variable, an Instrumental variable (IV) dynamic panel data framework that addresses non-linearity might be an ideal choice. There is, however, no formal paper with established properties on fixed effect semiparametric dynamic panel data model using smoothing technique.

Baltagi and Li’s (2002) “Efficient instrumental variable estimator of semiparametric dynamic panel data models” which improves on Li and Stengo’s (1996) semiparametric IV estimator, turns to have a weak instrument problem\(^{24}\). Because of this problem, we could not use the panel data framework and focus on a pooled framework.

\(^{24}\) This is similar to what we describe in chapter two.
that is common in the existing literature. We use Sub-Saharan African and East Asian dummies to take care of region specific effects. Our conclusions, therefore, are based on a semiparametric-pooled model as in (3.1) through (3.4) with lagged aid and regional dummies. This takes care of non-linearity, endogeneity bias, and region specific heterogeneities. Given the trade off between data requirement and addressing non-linearity of our focus variables simultaneously, a specification that treats non-linearity in two variables together sounds a better choice to base our analysis.

Data and Results

Construction of Disaggregated Aid Data sets

Creditor Reporting System (CRS) and Donor Assistance Committee (DAC) databases of the Organization for Economic Cooperation and Development (OECD) provide a detailed aid data allocated to various sectors since 1973. The basic components of aid include:

(a) Social Infrastructure and Services (education, health, population programs, water supply and sanitation, etc);

(b) Economic Infrastructure (transport and storage, communications, energy, banking and financial services, etc);

(c) Production Sectors (agriculture, industry, mining construction, trade and industry, etc);

(d) Multi Sector (general environmental protection, etc);
(e) Commodity Aid/ General Program Assistance (food aid excluding relief food aid, etc);

(f) Action Related to Debt;

(g) Emergency Assistance (Relief food aid, non food emergency and Distress Relief, etc);

(h) Administrative Costs of Donors;

(i) Support to NGO’s; and

(j) Unallocated/Unspecified

Broadly speaking, our major argument is that the different categories of aid do not have the same impact on growth. Among the above components, we focus on the first three (social infrastructure and services, economic infrastructure, and production sectors), which presumably are more related to growth in developing countries. These three are added to get a new aid variable (disaggregated aid that comes from all donor types). In line with Clemens et al (2004), we also consider another disaggregated aid variable which includes aid to economic infrastructure and production sectors only, whose impact on growth may materialize in a relatively shorter period than sectors like education, health, or population programs. All the other variables used in this chapter are the same as those used in the previous chapter.

Results

Using the framework in the aid-growth literature, as in chapter two, we first substitute the aggregate aid variable by a disaggregated aid measure that consists of aid
allocated to social infrastructure and services, economic infrastructure, and production sectors. We then estimate our growth model parametrically using OLS and GMM. The results are presented in columns 2 and 3 of Table 3.1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>OLS (Pooled)</th>
<th>GMM</th>
<th>Semi-Parametric (Pooled)</th>
<th>All Aid, Policy, and Aid*Policy Nonlinear</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-0.47</td>
<td>-0.06</td>
<td>-0.47</td>
<td>-0.38</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>-0.001</td>
<td>0.11</td>
<td>0.26</td>
<td>0.05</td>
</tr>
<tr>
<td>ASSASINATION</td>
<td>-0.36*</td>
<td>0.16</td>
<td>-0.41*</td>
<td>-0.34</td>
</tr>
<tr>
<td>ETHNIC*ASSASIN</td>
<td>0.49</td>
<td>0.61</td>
<td>0.41</td>
<td>0.47</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.52***</td>
<td>0.48**</td>
<td>0.53***</td>
<td>0.51***</td>
</tr>
<tr>
<td>M21</td>
<td>-0.01</td>
<td>-0.06**</td>
<td>-0.01</td>
<td>-0.01</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.53***</td>
<td>-2.72***</td>
<td>-2.60***</td>
<td>-2.57***</td>
</tr>
<tr>
<td>EASIA</td>
<td>1.35**</td>
<td>1.47**</td>
<td>1.30**</td>
<td>1.50**</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.83***</td>
<td>0.65**</td>
<td>0.81***</td>
<td>1.44***</td>
</tr>
<tr>
<td>AID</td>
<td>-0.06</td>
<td>0.08</td>
<td>-0.39</td>
<td>-0.005</td>
</tr>
<tr>
<td>Aid * POLICY</td>
<td>0.001</td>
<td>-0.002</td>
<td>0.02</td>
<td>-0.02</td>
</tr>
<tr>
<td>No. of observations</td>
<td>282  235</td>
<td>282  282</td>
<td>282  282</td>
<td>282  282</td>
</tr>
<tr>
<td>Sargan test (P-Value)</td>
<td>0.1384</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arellano-Bond test (P-Value)</td>
<td>0.9079</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The dependent variable is growth of real GDP per capita. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses. The Sargan shows the validity of the instruments used and there is also no second order serial correlation in the differenced error terms based on Arellano and Bond (1991).
While both policy and the institutions are found to be positive and significant in both OLS and GMM regressions, neither aid nor the interaction of aid and policy is found to be significant. These results remain qualitatively the same when the interaction of aid and institution is used in place of aid*policy. These results should be seen in light of the fact that both OLS and GMM estimations do not correctly address the issue of non-linearity.

We then use the semiparametric model to address the non-linearity issue. We first test the potential non-linearity in aid, aid*policy, and policy using the Ramsey RESET and Li and Ullah (1998) type tests and find non-linearity in all the variables. The point wise regression coefficients of aid on growth, policy on growth, and aid*policy on growth are plotted in figures 3.1 to 3.3, respectively. In all cases, we find non-linearity that is not simply quadratic.\textsuperscript{25} This result is in contrast with Clemens, et al (2004) who, by specification, restricted aid to enter the model as a quadratic term.

\textsuperscript{25} The optimal band width (h) that minimizes the mean square error (MSE) and the standard normal Kernel are used in our semiparametric estimations.
Figure 3.1. The Effect of Aid on Growth

Figure 3.2. The Effect of Policy on Growth
According to the semiparametric results that are presented in the last four columns of table 3.1\textsuperscript{26}, neither aid nor aid*policy is found to be significant when non-linearity in each variable is addressed separately. This is also true when non-linearity in all the three variables is addressed simultaneously (plots are given in figures 3.4 to 3.6). As is the case with OLS and GMM, the policy variable is found to be consistently positive and significant. The institutional variable is also found to be positive and significant in all cases. The regional dummies for Sub Saharan Africa and East Asia are both significant in all the semiparametric regressions with negative and positive signs respectively.

\textsuperscript{26} The average of the point-wise regression coefficients are reported in table 3.1 and the point wise plots are shown in figures 3.1 to 3.3. Figures 3.4 to 3.6 plot the point wise regression coefficients when non-linearity in all the three variables are considered simultaneously.
The Effect of Aid on Growth (Three Sectors) when Aid, Policy and Aid*Policy are Nonlinear

Figure 3.4. The Effect of Aid on Growth when Aid, Policy and Aid*Policy are Nonlinear

The Effect of Policy on Growth (Three Sectors) when Aid, Policy and Aid*Policy are Nonlinear

Figure 3.5. The Effect of Policy on Growth when Aid, Policy and Aid*Policy are Nonlinear

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
A careful look at the plots of the semiparametric results indicate that the aid*policy interaction term is positive for some observations and negative for the others. As mentioned earlier, what we report in table 3.1 is the average of the point wise regression coefficients and that may not tell us the detailed (point-by-point) impact of aid*policy on growth. Based on the plots (shown in figure 3.3), we tried to identify observations in the negative range that pull the average down to be insignificant. Our first intention was to identify countries or periods that fall into the negative range to see if there is any pattern. Unfortunately, there seems to be no pattern that helps us identify those countries or periods with unique features. We, therefore, construct two dummy
variables for the observations in the negative bump.\textsuperscript{27} Our results regarding aid and aid*policy remain the same (see table 3.2).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Policy is Nonlinear (with Dummy86)</th>
<th>Policy is Nonlinear (with Dummy126)</th>
<th>Aid*Policy is Nonlinear (with Dummy86)</th>
<th>Aid*Policy is Nonlinear (with Dummy126)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-0.37 (0.38)</td>
<td>-0.40 (0.38)</td>
<td>-0.33 (0.39)</td>
<td>-0.34 (0.39)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>0.94 (0.69)</td>
<td>0.98 (0.69)</td>
<td>0.81 (0.73)</td>
<td>0.80 (0.73)</td>
</tr>
<tr>
<td>ASSASINATION</td>
<td>-0.29 (0.23)</td>
<td>-0.29 (0.23)</td>
<td>-0.27 (0.22)</td>
<td>-0.27 (0.22)</td>
</tr>
<tr>
<td>ETHNIC*ASSASIN</td>
<td>0.26 (0.41)</td>
<td>0.28 (0.42)</td>
<td>0.31 (0.39)</td>
<td>0.30 (0.39)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.51*** (0.13)</td>
<td>0.51*** (0.13)</td>
<td>0.50*** (0.14)</td>
<td>0.51*** (0.14)</td>
</tr>
<tr>
<td>M21</td>
<td>-0.01 (0.01)</td>
<td>-0.01 (0.01)</td>
<td>-0.01 (0.01)</td>
<td>-0.01 (0.01)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.91*** (0.52)</td>
<td>-2.97*** (0.53)</td>
<td>-2.78*** (0.55)</td>
<td>-2.79*** (0.55)</td>
</tr>
<tr>
<td>EASIA</td>
<td>0.66 (0.69)</td>
<td>0.62 (0.71)</td>
<td>0.67 (0.70)</td>
<td>0.71 (0.71)</td>
</tr>
<tr>
<td>POLICY</td>
<td>1.05 (0.69)</td>
<td>1.11 (0.69)</td>
<td>0.69*** (0.15)</td>
<td>0.70*** (0.15)</td>
</tr>
<tr>
<td>AID</td>
<td>0.01 (0.12)</td>
<td>-0.01 (0.11)</td>
<td>0.06 (0.15)</td>
<td>0.05 (0.15)</td>
</tr>
<tr>
<td>Aid * POLICY</td>
<td>-0.02 (0.06)</td>
<td>-0.02 (0.05)</td>
<td>0.04 (0.18)</td>
<td>0.03 (0.18)</td>
</tr>
<tr>
<td>Dummy86</td>
<td>0.46 (0.67)</td>
<td>-0.05 (0.37)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dummy126</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Observations</td>
<td>276</td>
<td>276</td>
<td>276</td>
<td>276</td>
</tr>
<tr>
<td>R\textsuperscript{2}</td>
<td>0.45</td>
<td>0.46</td>
<td>0.44</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Note: The dependent variable is growth of real GDP per capita. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses.

\textsuperscript{27} One dummy is strictly for the negative portion of the bump and the other for the portion that includes the negative as well as the declining part (although not strictly negative).
We then focus on multilateral aid that presumably is allocated with little political/strategic motive as compared to bilateral aid. Our results, presented in table 3.3 remain qualitatively the same although aid turns out to be negative and significant in two cases (GMM and when non-linearity in all the three variables is addressed simultaneously) and aid*policy becomes positive and significant in the GMM regression.
### Table 3.3

**Results Using Multilateral Aid (3 Sectors)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>OLS</th>
<th>GMM</th>
<th>Semi-parametric (Pooled)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aid is Nonlinear</td>
</tr>
<tr>
<td>LGDP</td>
<td>-0.48</td>
<td>-0.04</td>
<td>-0.20</td>
</tr>
<tr>
<td></td>
<td>(0.44)</td>
<td>(0.15)</td>
<td>(0.49)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>0.79</td>
<td>1.05</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>(0.97)</td>
<td>(0.77)</td>
<td>(0.78)</td>
</tr>
<tr>
<td>ASSASINATION</td>
<td>-0.12</td>
<td>0.29</td>
<td>-0.07</td>
</tr>
<tr>
<td></td>
<td>(0.27)</td>
<td>(0.30)</td>
<td>(0.18)</td>
</tr>
<tr>
<td>ETHNIC*ASSASIN</td>
<td>0.18</td>
<td>0.09</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>(0.62)</td>
<td>(0.47)</td>
<td>(0.48)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.39**</td>
<td>0.82**</td>
<td>0.35*</td>
</tr>
<tr>
<td></td>
<td>(0.18)</td>
<td>(0.32)</td>
<td>(0.18)</td>
</tr>
<tr>
<td>M21</td>
<td>0.02</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.02)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.24***</td>
<td>-2.22***</td>
<td>-2.31***</td>
</tr>
<tr>
<td></td>
<td>(0.73)</td>
<td>(0.62)</td>
<td>(0.60)</td>
</tr>
<tr>
<td>EASIA</td>
<td>-0.21</td>
<td>0.08</td>
<td>-0.33</td>
</tr>
<tr>
<td></td>
<td>(0.95)</td>
<td>(1.14)</td>
<td>(1.10)</td>
</tr>
<tr>
<td>POLICY</td>
<td>1.05***</td>
<td>1.01*</td>
<td>0.85***</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td>(0.52)</td>
<td>(0.28)</td>
</tr>
<tr>
<td>AID</td>
<td>-0.12</td>
<td>-1.25*</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>(0.23)</td>
<td>(0.46)</td>
<td>(0.51)</td>
</tr>
<tr>
<td>Aid * POLICY</td>
<td>-0.05</td>
<td>0.46*</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td>(0.24)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>155</td>
<td>93</td>
<td>155</td>
</tr>
<tr>
<td>R²</td>
<td>0.37</td>
<td>0.49</td>
<td>0.50</td>
</tr>
<tr>
<td>Sargan test (P-Value)</td>
<td>0.1101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arellano-Bond test (P-Value)</td>
<td>0.6926</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The dependent variable is growth of real GDP per capita. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses. The Sargan shows the validity of the instruments used and there is also no second order serial correlation in the differenced error terms in accordance with Arellano and Bond (1991).
We next turn to the disaggregated aid data that only include economic infrastructure and production sectors. This is due to the belief that aid to economic infrastructure and production sectors is likely to be growth promoting and that its effect on growth can be seen within four years. Doing so does not change the results on our variables of interest – while policy is highly significant, neither aid nor aid * policy is found to be significant. The results are reported in table 3.4 and plots for point wise regression coefficients are given in figures 3.7 to 3.12.
### Table 3.4

**Parametric and Semiparametric Results Using Disaggregated Aid**

*(All Donors, Two Sectors)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>OLS (Pooled)</th>
<th>GMM</th>
<th>Semi-parametric (Pooled)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Aid is Nonlinear</td>
<td>Policy is Nonlinear</td>
</tr>
<tr>
<td>LGDP</td>
<td>-0.48</td>
<td>-0.34</td>
<td>-0.39</td>
</tr>
<tr>
<td></td>
<td>(0.36)</td>
<td>(0.40)</td>
<td>(0.38)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>0.67</td>
<td>0.71</td>
<td>0.96</td>
</tr>
<tr>
<td></td>
<td>(0.36)</td>
<td>(0.71)</td>
<td>(0.69)</td>
</tr>
<tr>
<td>ASSASINATION</td>
<td>-0.30</td>
<td>-0.34</td>
<td>-0.28</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.21)</td>
<td>(0.23)</td>
</tr>
<tr>
<td>ETHNIC*ASSASIN</td>
<td>0.36</td>
<td>0.48</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>(0.38)</td>
<td>(0.38)</td>
<td>(0.41)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.53***</td>
<td>0.56***</td>
<td>0.51***</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.14)</td>
<td>(0.13)</td>
</tr>
<tr>
<td>M21</td>
<td>-0.005</td>
<td>-0.01</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.83***</td>
<td>-2.86***</td>
<td>-2.92***</td>
</tr>
<tr>
<td></td>
<td>(0.52)</td>
<td>(0.53)</td>
<td>(0.52)</td>
</tr>
<tr>
<td>EASIA</td>
<td>0.71</td>
<td>0.96</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>(0.69)</td>
<td>(0.70)</td>
<td>(0.70)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.79***</td>
<td>0.79***</td>
<td>1.17***</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.14)</td>
<td>(0.69)</td>
</tr>
<tr>
<td>AID</td>
<td>-0.08</td>
<td>-0.24</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td>(0.46)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Aid*POLICY</td>
<td>0.02</td>
<td>0.02</td>
<td>-0.02</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>No. of Observations</td>
<td>276 184 276 276 276 276</td>
<td>276 276 276 276 276 276</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.34</td>
<td>0.41</td>
<td>0.44</td>
</tr>
<tr>
<td>Sargan test</td>
<td>68.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arellano-Bond test (P-Value)</td>
<td>0.1862</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The dependent variable is growth of real GDP per capita. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses. The Sargan shows the validity of the instruments used and there is also no second order serial correlation in the differenced error terms in accordance with Arellano and Bond (1991).
Figure 3.7. The Effect of Aid on Growth

Figure 3.8. The Effect of Policy on Growth
The Effect of Aid*Policy on Growth (Two Sectors)

Figure 3.9. The Effect of Aid*Policy on Growth

Effect of Aid On Growth (Two Sectors when Aid, Policy, and Aid*Policy are Nonlinear)

Figure 3.10. The Effect of Aid on Growth
The Effect of Policy on Growth (Two Sectors) when Aid, Policy, and Aid*Policy are Nonlinear

Figure 3.11 The Effect of Policy on Growth

The Effect of Aid*Policy on Growth (Two Sectors) when Aid, Policy, and Aid*Policy are Nonlinear

Figure 3.12. The Effect of Aid*Policy on Growth

59

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Two points are in order here. First, although policies by themselves are important in impacting growth, there might be a lag before policies have desired effect on growth. Second, given the estimation trade off – data limitation on the one hand, and the large sample requirement for addressing non-linearity in all the three variables simultaneously, on the other hand – it may make more sense to address non-linearity in two variables at a time (aid and aid*policy & policy and aid*policy).28

When we address these two points, we get an interesting finding. The aid-policy interaction term becomes positive and significant in three out of five cases and all the three cases involve non-linearity in aid, which is the focus of the empirical aid literature (see table 3.5 and also figures 3.13 and 3.14). This result is in line with Burnside and Dollar (2000) where aid is believed to work better in a good policy environment.

---

28 The specific type of non-linearity in aid * policy may be affected either due to aid (which the empirical aid literature tries to address using an aid² term) or policy (which is not at all addressed in the literature).
Table 3.5
Semiparametric Pooled Results with Policy Lag

<table>
<thead>
<tr>
<th>Variable</th>
<th>Aid is Nonlinear</th>
<th>Policy is Nonlinear</th>
<th>Aid*Policy is Nonlinear</th>
<th>Aid and Policy Are Nonlinear</th>
<th>Policy, and Aid*Policy Are Nonlinear</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-0.27 (0.41)</td>
<td>-0.46 (0.40)</td>
<td>-0.19 (0.41)</td>
<td>-0.26 (0.43)</td>
<td>-0.45 (0.44)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>0.59 (0.79)</td>
<td>0.59 (0.74)</td>
<td>0.88 (0.80)</td>
<td>0.83 (0.83)</td>
<td>0.85 (0.79)</td>
</tr>
<tr>
<td>ASSASINATION</td>
<td>-0.25 (0.23)</td>
<td>-0.22 (0.23)</td>
<td>-0.15 (0.23)</td>
<td>-0.24 (0.23)</td>
<td>-0.22 (0.24)</td>
</tr>
<tr>
<td>ETHNIC*ASSASIN</td>
<td>0.33 (0.42)</td>
<td>0.33 (0.40)</td>
<td>0.17 (0.41)</td>
<td>0.32 (0.42)</td>
<td>0.34 (0.40)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.62*** (0.14)</td>
<td>0.57*** (0.14)</td>
<td>0.58*** (0.14)</td>
<td>0.59*** (0.15)</td>
<td>0.57*** (0.14)</td>
</tr>
<tr>
<td>M21</td>
<td>-0.005 (0.01)</td>
<td>0.003 (0.01)</td>
<td>0.001 (0.01)</td>
<td>-0.005 (0.01)</td>
<td>0.01 (0.01)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.77*** (0.55)</td>
<td>-2.65*** (0.55)</td>
<td>-2.66*** (0.58)</td>
<td>-2.71*** (0.59)</td>
<td>-2.59*** (0.57)</td>
</tr>
<tr>
<td>EASIA</td>
<td>1.39* (0.73)</td>
<td>1.12 (0.74)</td>
<td>0.93 (0.75)</td>
<td>1.28* (0.76)</td>
<td>1.01 (0.79)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.31* (0.18)</td>
<td>1.07*** (0.25)</td>
<td>0.15 (0.20)</td>
<td>0.31 (0.21)</td>
<td>0.95** (0.48)</td>
</tr>
<tr>
<td>AID</td>
<td>-0.13 (0.15)</td>
<td>-0.07 (0.10)</td>
<td>-0.11 (0.17)</td>
<td>-0.48* (0.28)</td>
<td>-0.18 (0.26)</td>
</tr>
<tr>
<td>Aid * POLICY</td>
<td>0.08* (0.04)</td>
<td>0.06 (0.05)</td>
<td>0.35*** (0.06)</td>
<td>0.51*** (0.14)</td>
<td>0.21 (0.15)</td>
</tr>
</tbody>
</table>

No. of Observations | 276 | 276 | 276 | 276 | 276

R² | 0.31 | 0.31 | 0.30 | 0.33 | 0.34

Note: The dependent variable is growth of real GDP per capita. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Standard errors are in parentheses.
Figure 3.13. The Effect of Aid*Policy on Growth

Figure 3.14. The Effect of Aid*Policy on Growth with Policy Lag

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Conclusion

Earlier studies examine the aid-growth nexus by using aggregate aid data, an approach that has been criticized on many grounds. Most importantly, it overlooks the fact that different categories of aid have different effects on growth.

In this paper we examine the link between aid and growth by disaggregating aid into two broad categories: those that are growth oriented and those that are not. We only consider the components of aid that we believe are growth oriented: aid allocated to economic infrastructure, production sectors and social infrastructure. We test the efficacy of aid by performing two sets of regressions. The first uses all three components of "growth oriented" aid. In the second set, we only consider aid to economic infrastructure and production sectors, components of aid that are more directly related to economic performance and growth. This is based on the premise that aid to social infrastructure is productive but has a longer gestation period. Therefore, dropping this item should provide a larger estimate of the effect of aid (economic infrastructure and production sectors only) on growth. In addition to OLS and GMM, we use a semi-parametric approach that allows for non-linearity without specifying a functional form in the variables of interest.

It is seen that both aid and aid*policy variables are insignificant when the broader aid category is used. Particularly noteworthy, however, we find evidence supporting conditional aid effectiveness when the narrower aid category is used and allowance is made for non-linearity in aid and the aid-policy interaction term. As always, policy positively and significantly affects growth.
CHAPTER IV

FOREIGN AID AND ECONOMIC REFORM

The rationale behind economic reform is that it enhances economic performance by way of improving economic policy. That is, a successful reform program positively changes the policy environment and thereby facilitates economic growth. Owing to the close relationship between reform and policy, the aid-reform literature deals with issues similar to those of the aid-policy literature. Of particular interest are questions relating to aid effectiveness in the post-reform period and how reform affects policies. Additionally, the literature identifies a variety of reasons explaining the allocation of aid, prominent ones being humanitarian, economic, political and strategic (see Alesina and Dollar, 2003). In the economic arena, given our interest in reforms, we also examine if aid allocation is influenced by reforms (e.g., Devarajan, et al, 2000). Whereas the significance of political considerations for aid giving has been steadily decreasing since the end of the cold war (e.g., Boschini and Olofsgard, 2003, Collier and Dollar, 2001), the post-cold war era has seen growing emphasis on poverty reduction and economic growth considerations, especially to those in Africa. For example, aid flows to Africa since the early 1980s have been targeted at stimulating policy reforms with the ultimate goal of accelerating growth and reducing poverty (Devarajan, et al, 2000). Though there have been many studies dealing with aid and reform, we are not aware of any that examines whether reform makes aid more effective. This chapter assesses the aid-growth relationship when reform is relevant.
The aid-reform literature is not without controversy. While there is the belief that aid may facilitate reforms, some argue that aid hinders reforms by relieving governments in recipient countries of domestic economic and political pressures, which could possibly have triggered reforms from within. Of course, if aid buys reform, a traditional *ex ante* conditionality dictates aid allocation, in which case aid is given in lieu of the prospect of reform. However, it is possible that aid does not influence the reform process in recipient countries; instead aid is allocated by Burnside-Dollar (2000) type *ex post* conditionality.

Banerjee and Rondinelli (2003) argue that foreign aid has no direct influence on one key aspect of the reform process, namely privatization. However, they find aid, specifically technical assistance, facilitates reform by creating institutions that support the market system. As in Burnside and Dollar (2000), the implication of their study is that, ceteris paribus, more aid should be given to reforming than non-reforming countries. Kilby (2005) also favors the ‘aid buys reform’ argument. He finds aid (both financial and technical assistance) to be an important factor influencing the reform (deregulation) process and shows that more aid goes to highly regulated economies. Given Kilby’s result, it appears that donors give more aid to poor non-reforming economies than to poor reforming economies with the hope that the former undertake reforms.

In the contrary camp, Gunning (2000) and Devarajan, et al (2000) argue that aid does not cause reform on average. In their synthesis of ten case studies in Africa, Devarajan et al find no evidence for the existence of any systematic relationship between development aid and economic reform. Because aid to countries with bad policies usually sustains those bad policies, they do not find much support for the postulate that the lure of aid induces reform. Most importantly, they note that reforms are motivated by

65
domestic political economy considerations. Put another way, the need for reform arises from the need to address domestic political and economic crises, not from a need to obey donors' prescriptions. On the actual pattern of aid allocation, they argue that donors do not discriminate among countries – no *expost* or *exante* conditionality in aid giving.

The impact of reform on aid effectiveness can be addressed in light of the link between reform and policy. The common belief is that reform improves economic policies. Consequently, the effect of reform on the marginal contribution of aid to growth depends on the significance of the aid*policy term in the growth equation. A reforming country, however, may not benefit from aid if its reform has been a failure and if aid works in good policy environments. This variant of the Burnside and Dollar (2000) argument implies that a successful reformer makes the best use of the aid it receives.

To our knowledge there has not been any study in the literature that directly tests the impact of reform on aid effectiveness. In this chapter we intend to fill this gap. We first estimate a typical aid-growth regression that includes a reform dummy as one of the explanatory variables. Next, we construct new policy indices by broadening the Burnside and Dollar policy index to include more variables as well as the reform dimension. Doing so enables us to see the effect of reform on growth through its effect on policies. In the event that aid works in good policy environment, reform will make aid more effective on condition that it improves economic policy.

The next section describes the construction of new policy indices that we use in this paper. Section three discusses the empirical model, data and methodology. Our results are presented in section four and the final section concludes.
Construction of Four Policy Indices

The Burnside and Dollar (2000) policy index has been used in most of the empirical studies in recent years. This index is defined as a weighted sum of budget deficit/surplus, inflation rate and the Sachs-Warner openness index where each component is weighted by its coefficient in the growth regression. Although this index provides a good idea of a country's policy stance, we believe that it is not comprehensive enough for a typical developing economy. This index would, for example, imply that a developing country's policy is improving if the rate of inflation decreases, ceteris paribus. But, it could be that prices are disinflationary due to good harvest in an agrarian economy, which mainly reflects the availability of adequate rainfall. Furthermore, inflation and budget deficit are not strictly independent of economic performance. We, therefore, construct four relatively comprehensive policy indices by incorporating additional variables and/or making some changes on the existing one.

We broaden the dimension of our policy measure by adding credit to the private sector as a percentage of GDP (private), telephone main lines per 1000 people (referred to as 'telephone') and a reform dummy into the existing index. While credit to the private sector captures the financial depth or degree of financial liberalization, telephone main lines is used as an indicator of infrastructure policy. The reform dummy enters only in two of the four indices while the credit to the private sector and telephone mainlines are used in each index. Trade as a percentage of GDP (Trade) is used in place of the Sachs and Warner openness index (SACW) in two of the four indices. Some actually criticize SACW for being biased (e.g., Rodrik and Rodriguez (2000)) and use trade as a
percentage of GDP instead. It is useful to note that both are widely used measures of openness in the growth literature. The four indices are given below.\textsuperscript{29}

\begin{align*}
    \text{Policy1} &= f(Budget, Inflation, Trade, Private Credit, Telephone) \\
    \text{Policy2} &= f(Budget, Inflation, SACW, Private Credit, Telephone) \\
    \text{Policy3} &= f(Budget, Inflation, Trade, Private Credit, Telephone, Reform) \\
    \text{Policy4} &= f(Budget, Inflation, SACW, Private Credit, Telephone, Reform)
\end{align*}

In all cases, as in Burnside and Dollar (2000), weights are assigned based on the coefficients of the variables in a growth regression that does not include aid.

Although the new indices are not fully exhaustive, they include more aspects of policy reform than the Burnside and Dollar index. The components of the new indices reflect different policy aspects. For example, credit to the private sector as percent of GDP reflects the degree of financial liberalization and government budget surplus captures public sector reform. In two of the four policy indices, we allow for a shift in policy following the launching of a reform program. A large coefficient of the reform dummy in the policy index implies that reform does really improve economic policy.\textsuperscript{30} Perhaps this justifies our use of the new policy index as a proxy for reform in some of the regressions.

\textsuperscript{29} The Burnside-Dollar policy index is given by $f(Budget, Inflation, SACW)$

\textsuperscript{30} Treating reform as dummy does not distinguish between failed and successful reformers. Also, it does not take reform reversals into account. Formulating a reform index was not feasible due partly to data problems. We leave this for further research.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
The Empirical Model, Data, and Methodology

The empirical model used to test the impact of reform on the relationship between aid and growth can be specified as follows.

\[
GDP_{it} = a_0 + a_1 \text{LGDP}_{0it} + a_2 \text{ETHNIC}_{it} + a_3 \text{ASSASIN}_{it} + a_4 (\text{ETHNIC} \times \text{ASSASIN})_{it} \\
+ a_5 (\text{INSTITUTION})_{it} + a_6 \text{SSA}_{i} + a_7 \text{EASIA}_{i} + a_8 \text{REFORM}_{it} + a_9 \text{AID}_{it} + a_{10} (\text{AID} \times \text{REFORM})_{it} \\
+ a_{12} \text{POLICY}_{it} + U_{it}
\]  

(4.5)31

This is very similar to the specification used by Burnside and Dollar (2000) except that reform is included as one of the regressors.

We use two sets of data in this chapter. The first set uses aggregate aid data from 31 developing countries with reform dates for the period 1974-2001. The other data set uses disaggregated aid data from 25 developing countries with reform dates for the period 1978-2001.32 There is a significant reduction in the number of observations compared to the data sets used in the previous two chapters mainly due to lack of reform data. The list of countries included in our estimations is given in the appendix.

To the data that we used in the previous two chapters, we add reform data – a dummy variable defined to distinguish pre and post-reform periods in each country. This

31 GDP_{it} is the growth of Real GDP per capita, LGDP_{0it} is the real GDP per capita at the beginning of each period, ETHNIC stands for ethnic fractionalization; ASSASIN represents assassinations; (ETHNIC \times ASSASIN)_{it} is the interaction term between ETHNIC and ASSASIN; INSTITUTION presents institutional quality; SSA and EASIA are dummy variables for Sub-Saharan Africa and East Asia respectively; REFORM is a dummy variable that takes 1 in the post reform period and 0 otherwise, POLICY is an index constructed as described in the previous section; AID is Official Development Assistance (ODA), AID \times REFORM is an interaction term between aid and REFORM. In all the above \text{i indexes country and t indexes time.}

32 The growth equation we estimate is described in chapter two. The important differences are the inclusion of reform, the use of new policy indices, and the use of disaggregated aid data.
information is obtained from the IMF. Data on credit to the private sector as percent of GDP, and trade as percent of GDP are all obtained from World Bank, World Development Indicators (2004). As before, four-year averages are used.

Methodology

Besides the use of OLS with lagged aid,\textsuperscript{33} we employ the Generalized Method of Moments (GMM) estimator of Arellano and Bond (1991) in our growth regressions. This estimator removes country specific effects by taking first differences and makes use of lagged values of the dependent variable and the predetermined variables as instruments. The GMM estimator is consistent if there is no second-order serial correlation in the error term of the first differenced equation.

Results

We use both aggregate and disaggregated aid data to examine the significance of reform in influencing the aid-growth relationship. We employ two different models. The first model examines the direct effect of reform on growth in which case the policy index does not have a reform dimension. The second model treats reform as one dimension of policy and its effect on growth goes indirectly through its effect on policy.

Our results, presented in table 4.1, show that reform has a direct positive effect on growth. This is true in five out of six cases we consider.\textsuperscript{34} The new policy indices are positive and significant in all the cases. But, unlike the results in chapter two, the BD

\textsuperscript{33} Lagged policy is also used for robustness check
\textsuperscript{34} We perform a total of six (three OLS and three GMM) regressions. In both cases, each of the two policy indices (policy1 and policy2) is used one at a time.
policy appears to lose significance. This is probably due to the fact that the new policy
indices are more comprehensive than the BD policy index.\textsuperscript{35} The aid-policy interaction
term turns out to be significant in all OLS regressions when the new policy is used. Aid is
marginally significant in one out of a total of six cases. The SSA dummy is consistently
negative and significant in all the OLS regressions. Unlike our previous results with
larger data sets, the institution variable loses its significance in two of the GMM
regressions. In all GMM regressions, we report the second order correlation of the error
term test proposed by Arellano and Bond (1991). There is also a need for checking the
validity of the instruments and we use the Sargan test of over-identifying restrictions to
see if the instruments used are appropriate. The null hypothesis in the Sargan test is that
the instruments are valid in the sense that they are not correlated with the error term. The
results on these tests are reported in each table where GMM is used.

\textsuperscript{35} The insignificance of the BD policy index in this case may also imply that the results are sensitive to
changes in the data set. This explanation is in line with the argument about fragility of results in aid-growth
regressions.
### Table 4.1

Aggregate Aid with Reform: Parametric Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>OLS (BD Policy)</th>
<th>OLS (Policy 1)</th>
<th>OLS (Policy 2)</th>
<th>GMM (BD Policy)</th>
<th>GMM (Policy 1)</th>
<th>GMM (Policy 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-0.51</td>
<td>-0.10</td>
<td>-0.10</td>
<td>0.06</td>
<td>-0.03</td>
<td>-0.03</td>
</tr>
<tr>
<td></td>
<td>(0.51)</td>
<td>(0.55)</td>
<td>(0.55)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>-0.44</td>
<td>-0.75</td>
<td>-0.58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.86)</td>
<td>(0.74)</td>
<td>(0.75)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASSASIN</td>
<td>-0.38</td>
<td>-0.48</td>
<td>-0.45**</td>
<td>0.12</td>
<td>0.10</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(0.24)</td>
<td>(0.23)</td>
<td>(0.23)</td>
<td>(0.18)</td>
<td>(0.18)</td>
<td>(0.18)</td>
</tr>
<tr>
<td>ETHASSAS</td>
<td>0.66</td>
<td>0.68*</td>
<td>0.64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.39)</td>
<td>(0.40)</td>
<td>(0.40)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.56**</td>
<td>0.43**</td>
<td>0.40**</td>
<td>0.47*</td>
<td>0.21</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.16)</td>
<td>(0.16)</td>
<td>(0.28)</td>
<td>(0.28)</td>
<td>(0.28)</td>
</tr>
<tr>
<td>SSA</td>
<td>-1.21*</td>
<td>-1.57**</td>
<td>-1.62**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.68)</td>
<td>(0.60)</td>
<td>(0.59)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EASIA</td>
<td>-0.80</td>
<td>-0.44</td>
<td>-0.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.91)</td>
<td>(0.82)</td>
<td>(0.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REFORM</td>
<td>0.74</td>
<td>1.17**</td>
<td>1.25**</td>
<td>1.97**</td>
<td>2.03**</td>
<td>2.05**</td>
</tr>
<tr>
<td></td>
<td>(0.47)</td>
<td>(0.47)</td>
<td>(0.48)</td>
<td>(0.73)</td>
<td>(0.76)</td>
<td>(0.75)</td>
</tr>
<tr>
<td>AID</td>
<td>-0.06</td>
<td>0.47*</td>
<td>0.05</td>
<td>-0.59</td>
<td>0.37</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
<td>(0.27)</td>
<td>(0.10)</td>
<td>(0.20)</td>
<td>(0.38)</td>
<td>(0.49)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.72</td>
<td>0.57**</td>
<td>0.56**</td>
<td>0.20</td>
<td>0.84**</td>
<td>0.95**</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.23)</td>
<td>(0.22)</td>
<td>(0.32)</td>
<td>(0.39)</td>
<td>(0.41)</td>
</tr>
<tr>
<td>AID*POLICY</td>
<td>0.01</td>
<td>0.24**</td>
<td>0.27**</td>
<td>-0.07</td>
<td>-0.08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.12)</td>
<td>(0.13)</td>
<td>(0.18)</td>
<td>(0.19)</td>
<td></td>
</tr>
<tr>
<td>No. Of Observations</td>
<td>217</td>
<td>217</td>
<td>217</td>
<td>155</td>
<td>155</td>
<td>155</td>
</tr>
<tr>
<td>Sargan Test (P-Value)</td>
<td>0.5927</td>
<td>0.3224</td>
<td>0.4011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arellano-Bond Test (P-Value)</td>
<td>0.7789</td>
<td>0.2906</td>
<td>0.2841</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Dependent variable is GDPG. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses. The Sargan of Over-identifying Restrictions shows the validity of the instruments used and there is also no second order serial correlation in the differenced error terms in accordance with Arellano and Bond (1991).
One important problem with the specification in Table 4.1 may relate to the way the reform variable is defined. It is defined as a dummy variable that distinguishes periods of reform from periods of non-reform. As such, it does not distinguish a successful reform program from a failed one, not to mention its failure in capturing reform reversals. It regards all reformers as equally reforming while empirical evidence reveals that the pace and quality of reform programs differ among countries (see Devarajan et al, 2000). That is, it is possible for a reforming country not to come up with significant improvements in its policies. It also does not allow for reform to affect growth by affecting policy.

One-way of resolving this problem is to re-estimate the aid-growth equation using policy3 and policy4 that incorporate the reform dummy. This specification excludes reform from the model, as it is already included in the policy index. This change in specification is based on the assumption that reform facilitates growth by way of improving policies.\(^\text{36}\) The results are presented in table 4.2.

\(^{36}\) Most empirical aid papers do not even distinguish between policy and reform or they use them interchangeably.
<table>
<thead>
<tr>
<th>Variable</th>
<th>OLS (BD Policy)</th>
<th>OLS (Policy 3)</th>
<th>OLS (Policy 4)</th>
<th>GMM (BD Policy)</th>
<th>GMM (Policy 3)</th>
<th>GMM (Policy 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-0.24</td>
<td>-0.08</td>
<td>-0.08</td>
<td>0.06</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(0.47)</td>
<td>(0.48)</td>
<td>(0.47)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>-0.21</td>
<td>-0.63</td>
<td>-0.54</td>
<td>0.17</td>
<td>0.19</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>(0.79)</td>
<td>(0.75)</td>
<td>(0.76)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>ASSASIN</td>
<td>-0.45</td>
<td>-0.40</td>
<td>-0.41*</td>
<td>0.17</td>
<td>0.19</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.21)</td>
<td>(0.21)</td>
<td>(0.19)</td>
<td>(0.18)</td>
<td>(0.18)</td>
</tr>
<tr>
<td>ETHASSAS</td>
<td>0.76**</td>
<td>0.63</td>
<td>0.67*</td>
<td>0.49*</td>
<td>0.49*</td>
<td>0.47*</td>
</tr>
<tr>
<td></td>
<td>(0.36)</td>
<td>(0.37)</td>
<td>(0.37)</td>
<td>(0.28)</td>
<td>(0.26)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.40</td>
<td>0.44**</td>
<td>0.42**</td>
<td>0.49*</td>
<td>0.49*</td>
<td>0.47*</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.15)</td>
<td>(0.15)</td>
<td>(0.28)</td>
<td>(0.26)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>SSA</td>
<td>-1.37**</td>
<td>-1.38**</td>
<td>-1.38**</td>
<td>0.27</td>
<td>1.13**</td>
<td>1.12**</td>
</tr>
<tr>
<td></td>
<td>(0.62)</td>
<td>(0.60)</td>
<td>(0.60)</td>
<td>(0.32)</td>
<td>(0.40)</td>
<td>(0.38)</td>
</tr>
<tr>
<td>EASIA</td>
<td>-0.64</td>
<td>-0.57</td>
<td>-0.77</td>
<td>0.02</td>
<td>-0.08</td>
<td>-0.07</td>
</tr>
<tr>
<td></td>
<td>(0.84)</td>
<td>(0.80)</td>
<td>(0.83)</td>
<td>(0.06)</td>
<td>(0.08)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>AID</td>
<td>-0.03</td>
<td>-0.14</td>
<td>-0.18</td>
<td>-0.04</td>
<td>-0.19</td>
<td>-0.21</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td>(0.21)</td>
<td>(0.19)</td>
<td>(0.21)</td>
<td>(0.26)</td>
<td>(0.28)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.77***</td>
<td>1.05***</td>
<td>1.06***</td>
<td>0.27</td>
<td>1.13**</td>
<td>1.12**</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.21)</td>
<td>(0.21)</td>
<td>(0.32)</td>
<td>(0.40)</td>
<td>(0.38)</td>
</tr>
<tr>
<td>AID*POLICY</td>
<td>-0.003</td>
<td>-0.05</td>
<td>-0.05</td>
<td>0.02</td>
<td>-0.08</td>
<td>-0.07</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.10)</td>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.08)</td>
<td>(0.07)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. Of Observations</th>
<th>217 217 217</th>
<th>155 155 155</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sargan Test (P-Value)</td>
<td>0.4109 0.1340 0.1264</td>
<td></td>
</tr>
<tr>
<td>Arellano-Bond Test (P-Value)</td>
<td>0.5874 0.4957 0.5406</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.31 0.32 0.32</td>
<td></td>
</tr>
</tbody>
</table>

Note: Dependent variable is GDPG. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses. The Sargan of Over-identifying Restrictions shows the validity of the instruments used and there is also no second order serial correlation in the differenced error terms in accordance with Arellano and Bond (1991).

All the policy indices but the BD index in the GMM case are positive and significant. Both aid and aid*policy are not significant in all the regressions. The SSA dummy is significant and negative in all the OLS regressions. The institution variable is positive and significant in five out of the six cases. The lack of significance in aid*policy term may show the fragility of the results of aid-growth regressions which is very well documented in the literature. The coefficient estimates and significance levels of various parameters provide insights into the relationship between aid and economic growth.
key variables in aid-growth regressions have been observed to be very sensitive to changes in data set and estimation techniques (See Roodman, 2004).

We recognize the fact that reform may change the link between aid, policy, and growth. Consequently we run two different regressions by splitting our data set into two groups, one for the pre-reform and the other for the post-reform period. Since doing so significantly reduces the number of observations, we only run OLS regressions using two of our policy indices that do not include the reform dummy. The results are presented in tables 4.3 and 4.4.

---

37 The Arellano and Bond (1991) GMM estimator uses lagged levels of the dependent variable and the predetermined variables along with differences of exogenous variables which significantly reduces the number of observations. We, however, use lagged aid in all the regressions.
Table 4.3

Aggregate Aid in Pre-Reform Period: OLS Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>BD Policy</th>
<th>Policy 1</th>
<th>Policy 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-0.80</td>
<td>-0.09</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>(0.76)</td>
<td>(0.76)</td>
<td>(0.75)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>-0.02</td>
<td>0.23</td>
<td>0.49</td>
</tr>
<tr>
<td></td>
<td>(1.10)</td>
<td>(1.11)</td>
<td>(1.12)</td>
</tr>
<tr>
<td>ASSASIN</td>
<td>-0.90**</td>
<td>-0.71</td>
<td>-0.67*</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td>(0.34)</td>
<td>(0.34)</td>
</tr>
<tr>
<td>ETHASSAS</td>
<td>1.25**</td>
<td>1.07</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>(0.56)</td>
<td>(0.54)</td>
<td>(0.54)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.40**</td>
<td>0.44**</td>
<td>0.40**</td>
</tr>
<tr>
<td></td>
<td>(0.20)</td>
<td>(0.19)</td>
<td>(0.20)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.07**</td>
<td>-2.12**</td>
<td>-2.27**</td>
</tr>
<tr>
<td></td>
<td>(0.74)</td>
<td>(0.77)</td>
<td>(0.77)</td>
</tr>
<tr>
<td>EASIA</td>
<td>-0.32</td>
<td>-0.30</td>
<td>-0.64</td>
</tr>
<tr>
<td></td>
<td>(2.14)</td>
<td>(2.26)</td>
<td>(2.24)</td>
</tr>
<tr>
<td>AID</td>
<td>-0.08</td>
<td>0.82*</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>(0.20)</td>
<td>(0.48)</td>
<td>(0.17)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.71**</td>
<td>0.62*</td>
<td>0.60*</td>
</tr>
<tr>
<td></td>
<td>(0.28)</td>
<td>(0.33)</td>
<td>(0.31)</td>
</tr>
<tr>
<td>AID*POLICY</td>
<td>0.12</td>
<td>0.35</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td>(0.23)</td>
<td>(0.22)</td>
</tr>
<tr>
<td>No. Of Observations</td>
<td>140</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>R²</td>
<td>0.22</td>
<td>0.19</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Note: Dependent variable is GDPG; *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Table 4.4
Aggregate Aid in Post-Reform Period: OLS Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>BD Policy</th>
<th>Policy 1</th>
<th>Policy 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-1.62*</td>
<td>-0.70</td>
<td>-0.66</td>
</tr>
<tr>
<td></td>
<td>(0.91)</td>
<td>(0.92)</td>
<td>(0.91)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>-2.32</td>
<td>-3.30**</td>
<td>-3.12**</td>
</tr>
<tr>
<td></td>
<td>(1.43)</td>
<td>(1.41)</td>
<td>(1.42)</td>
</tr>
<tr>
<td>ASSASIN</td>
<td>-0.14</td>
<td>-0.20</td>
<td>-0.19</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.22)</td>
<td>(0.22)</td>
</tr>
<tr>
<td>ETHASSAS</td>
<td>0.45</td>
<td>0.34</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>(0.49)</td>
<td>(0.48)</td>
<td>(0.49)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.47*</td>
<td>0.40</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>(0.28)</td>
<td>(0.27)</td>
<td>(0.27)</td>
</tr>
<tr>
<td>SSA</td>
<td>-1.75</td>
<td>-1.46</td>
<td>-1.27</td>
</tr>
<tr>
<td></td>
<td>(1.33)</td>
<td>(1.26)</td>
<td>(1.25)</td>
</tr>
<tr>
<td>EASIA</td>
<td>-0.74</td>
<td>-0.35</td>
<td>-0.59</td>
</tr>
<tr>
<td></td>
<td>(1.01)</td>
<td>(1.01)</td>
<td>(1.00)</td>
</tr>
<tr>
<td>AID</td>
<td>-0.22</td>
<td>0.13</td>
<td>-0.14*</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.13)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.35</td>
<td>0.88**</td>
<td>0.86**</td>
</tr>
<tr>
<td></td>
<td>(0.28)</td>
<td>(0.34)</td>
<td>(0.35)</td>
</tr>
<tr>
<td>AID*POLICY</td>
<td>-0.03</td>
<td>0.15**</td>
<td>0.16**</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.08)</td>
</tr>
</tbody>
</table>

|               | No. Of Observations | 77 | 77 | 77 |
|               | R^2                 | 0.25 | 0.32 | 0.32 |

Note: Dependent variable is GDPG; *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses.

Although we do not find a significant impact of aid on growth, we observe a positive impact of the aid-policy interaction term in the post-reform period only when our newly constructed policy indices are used. This may be a manifestation of the argument that reform improves the marginal contribution of aid to growth by improving economic policies. Of particular interest here is the way policy affects growth in pre and post-reform periods. The BD policy index is highly significant in the pre-reform but loses significance during the post-reform period. On the contrary, the new policy indices are only marginally significant in the pre-reform period but appear to be highly significant in the post-reform period. This might reflect the fact that the new policy indices takes...
account of additional variables whose variations may capture different aspects of the reform process.

We then repeat all the regressions using disaggregated aid data that focuses only on two sectors - economic infrastructure and economic sectors, which presumably have stronger impact on growth than the other components. When we use the reform dummy as one of the regressors, it turns out to be positive and significant in five of the six regressions. Aid is found to be significant only in two cases one with negative and the other positive coefficients. Both policy and the aid-policy interaction terms are positive and significant in all the OLS regressions but lose their significance in all the GMM regressions. This may probably be the effect of losing too many degrees of freedom in those "differenced GMM" estimations while trying to address the endogeneity issue in aid, policy, and the interaction term. As before, reform is positive and significant in five of the six cases considered. The estimates of the other control variables are similar to those obtained using the aggregate data set with notable exception of the convergence term which becomes significant in all the OLS estimations. The results are reported in table 4.5.

38 The various components of aid are discussed in chapter three.
<table>
<thead>
<tr>
<th>Variable</th>
<th>OLS (BD Policy)</th>
<th>OLS (Policy 1)</th>
<th>OLS (Policy 2)</th>
<th>GMM (BD Policy)</th>
<th>GMM (Policy 1)</th>
<th>GMM (Policy 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-1.29**</td>
<td>-1.23*</td>
<td>-1.20*</td>
<td>0.01</td>
<td>-0.05</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.63)</td>
<td>(0.67)</td>
<td>(0.66)</td>
<td>(0.08)</td>
<td>(0.11)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>-1.19</td>
<td>-1.57</td>
<td>-1.52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.10)</td>
<td>(1.07)</td>
<td>(1.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASSASIN</td>
<td>-0.11</td>
<td>-0.08</td>
<td>-0.07</td>
<td>0.12</td>
<td>-0.09</td>
<td>4.53</td>
</tr>
<tr>
<td></td>
<td>(0.20)</td>
<td>(0.21)</td>
<td>(0.21)</td>
<td>(0.18)</td>
<td>(0.25)</td>
<td>(6.60)</td>
</tr>
<tr>
<td>ETHASSAS</td>
<td>0.14</td>
<td>0.04</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.33)</td>
<td>(0.34)</td>
<td>(0.34)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.41**</td>
<td>0.48**</td>
<td>0.45**</td>
<td>0.29</td>
<td>0.12</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>(0.19)</td>
<td>(0.19)</td>
<td>(0.19)</td>
<td>(0.26)</td>
<td>(0.35)</td>
<td>(0.36)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.32**</td>
<td>-2.34**</td>
<td>-2.38**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.86)</td>
<td>(0.83)</td>
<td>(0.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EASIA</td>
<td>-1.20</td>
<td>-0.91</td>
<td>-1.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.89)</td>
<td>(0.86)</td>
<td>(0.87)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REFORM</td>
<td>0.86</td>
<td>1.26**</td>
<td>1.37**</td>
<td>1.75**</td>
<td>2.49**</td>
<td>2.53**</td>
</tr>
<tr>
<td></td>
<td>(0.54)</td>
<td>(0.54)</td>
<td>(0.54)</td>
<td>(0.73)</td>
<td>(0.92)</td>
<td>(0.93)</td>
</tr>
<tr>
<td>AID</td>
<td>-0.01</td>
<td>-0.10**</td>
<td>-0.10</td>
<td>0.56**</td>
<td>-6.56</td>
<td>-4.53</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.02)</td>
<td>(0.04)</td>
<td>(0.28)</td>
<td>(6.89)</td>
<td>(0.59)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.47**</td>
<td>0.68**</td>
<td>0.67**</td>
<td>0.30</td>
<td>0.60</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
<td>(0.18)</td>
<td>(0.34)</td>
<td>(0.33)</td>
<td>(0.30)</td>
<td>(0.68)</td>
<td>(0.69)</td>
</tr>
<tr>
<td>AID*POLICY</td>
<td>0.15**</td>
<td>0.82**</td>
<td>0.78**</td>
<td>0.07</td>
<td>0.53</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.27)</td>
<td>(0.28)</td>
<td>(0.07)</td>
<td>(0.54)</td>
<td>(0.51)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. Of Observations</th>
<th>150</th>
<th>150</th>
<th>150</th>
<th>100</th>
<th>100</th>
<th>100</th>
</tr>
</thead>
</table>

Sargan Test (P-Value): 0.2975, 0.2697
Arellano-Bond Test (P-Value): 0.2368, 0.2496

Note: Dependent variable is GDPG. *, **, and *** indicate 10%, 5%, and 1% significant levels respectively. Consistent standard errors are in parentheses. The Sargan of Over-identifying Restrictions shows the validity of the instruments used and there is also no second order serial correlation in the differenced error terms in accordance with Arellano and Bond (1991).
When we use the policy indices that incorporate reform rather than explicitly using the reform dummy, neither aid nor the interaction term becomes significant except the case where aid is significant in the GMM regression when the Burnside and Dollar policy index is used. Policy, however, is significant in five of the six cases. The results are reported in table 4.6.

Table 4.6

Disaggregated Aid when Reform is Included in Policy Index: Parametric Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>OLS (BD Policy)</th>
<th>OLS (Policy 3)</th>
<th>OLS (Policy 4)</th>
<th>GMM (BD Policy)</th>
<th>GMM (Policy 3)</th>
<th>GMM (Policy 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-1.15* (0.67)</td>
<td>-1.03 (0.66)</td>
<td>-0.99 (0.62)</td>
<td>0.01 (0.08)</td>
<td>-0.01 (0.77)</td>
<td>-0.002 (0.07)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>-0.89 (1.23)</td>
<td>1.69 (1.23)</td>
<td>-1.43 (1.08)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASSASIN</td>
<td>-0.07 (0.29)</td>
<td>-0.07 (0.29)</td>
<td>-0.10 (0.20)</td>
<td>0.15 (0.18)</td>
<td>0.15 (0.18)</td>
<td>0.14 (0.17)</td>
</tr>
<tr>
<td>ETHASSAS</td>
<td>0.09 (0.56)</td>
<td>0.10 (0.55)</td>
<td>0.14 (0.33)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.40** (0.18)</td>
<td>0.48** (0.18)</td>
<td>0.45** (0.19)</td>
<td>0.29 (0.26)</td>
<td>0.42* (0.25)</td>
<td>0.25 (0.25)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.36** (0.85)</td>
<td>-2.16** (0.84)</td>
<td>-2.20** (0.86)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EASIA</td>
<td>-1.06 (1.11)</td>
<td>-0.81 (1.10)</td>
<td>-1.08 (0.98)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AID</td>
<td>0.01 (0.18)</td>
<td>-0.005 (0.46)</td>
<td>0.09 (0.33)</td>
<td>0.67** (0.28)</td>
<td>0.66 (0.43)</td>
<td>0.48 (0.43)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.48** (0.21)</td>
<td>0.90** (0.26)</td>
<td>0.85*** (0.22)</td>
<td>0.34 (0.30)</td>
<td>1.07** (0.39)</td>
<td>0.96** (0.35)</td>
</tr>
<tr>
<td>AID*POLICY</td>
<td>0.11 (0.11)</td>
<td>-0.05 (0.19)</td>
<td>0.003 (0.12)</td>
<td>0.09 (0.07)</td>
<td>0.02 (0.08)</td>
<td>0.002 (0.08)</td>
</tr>
</tbody>
</table>

No. Of Observations | 150 | 150 | 150 | 100 | 100 | 100

Sargan Test (P-Value) | 0.7445 | 0.1755 | 0.2788
Arellano-Bond Test (P-Value) | 0.5525 | 0.3683 | 0.5267
R² | 0.30 | 0.31 | 0.31

Note: Dependent Variable is GDPG. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses. The Sargan of Over-identifying Restrictions shows the validity of the instruments used and there is also no second order serial correlation in the differenced error terms in accordance with Arellano and Bond (1991).
In tables 4.7 and 4.8, we split the data by reform dates. Overall, there is no support for the claim that policy increases the effectiveness of aid no matter which policy definition is used. But we observe an interesting finding. We find policies to be more effective in periods of reform than in periods of non-reform again when the new policy indices are used.

Table 4.7

Disaggregated Aid in Pre-Reform Period: OLS Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>BD Policy</th>
<th>Policy 1</th>
<th>Policy 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-1.73*</td>
<td>-1.96*</td>
<td>-1.97*</td>
</tr>
<tr>
<td></td>
<td>(1.02)</td>
<td>(1.04)</td>
<td>(1.05)</td>
</tr>
<tr>
<td>ETHNIC</td>
<td>-0.37</td>
<td>-0.84</td>
<td>-0.76</td>
</tr>
<tr>
<td></td>
<td>(1.57)</td>
<td>(1.51)</td>
<td>(1.51)</td>
</tr>
<tr>
<td>ASSASIN</td>
<td>0.36</td>
<td>0.20</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(0.49)</td>
<td>(0.55)</td>
<td>(0.55)</td>
</tr>
<tr>
<td>ETHASSAS</td>
<td>-0.58</td>
<td>-0.39</td>
<td>-0.49</td>
</tr>
<tr>
<td></td>
<td>(0.79)</td>
<td>(0.88)</td>
<td>(0.89)</td>
</tr>
<tr>
<td>INSTITUTION</td>
<td>0.51</td>
<td>0.51**</td>
<td>0.49*</td>
</tr>
<tr>
<td></td>
<td>(0.25)</td>
<td>(0.25)</td>
<td>(0.25)</td>
</tr>
<tr>
<td>SSA</td>
<td>-2.79**</td>
<td>-2.95**</td>
<td>-3.12**</td>
</tr>
<tr>
<td></td>
<td>(0.91)</td>
<td>(0.90)</td>
<td>(0.91)</td>
</tr>
<tr>
<td>EASIA</td>
<td>-1.00</td>
<td>-1.11</td>
<td>-1.32</td>
</tr>
<tr>
<td></td>
<td>(2.68)</td>
<td>(2.74)</td>
<td>(2.73)</td>
</tr>
<tr>
<td>AID</td>
<td>0.35</td>
<td>-15.64</td>
<td>-15.71</td>
</tr>
<tr>
<td></td>
<td>(0.43)</td>
<td>(11.2)</td>
<td>(-.85)</td>
</tr>
<tr>
<td>POLICY</td>
<td>0.56***</td>
<td>0.44</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>(0.26)</td>
<td>(0.43)</td>
<td>(0.44)</td>
</tr>
<tr>
<td>AID*POLICY</td>
<td>-0.13</td>
<td>1.21</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td>(0.86)</td>
<td>(0.74)</td>
</tr>
</tbody>
</table>

| No. Of Observations | 83  | 83  | 83  |
| R²                  | 0.22| 0.22| 0.23|

Note: Dependent Variable is GDP. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses.
Finally, we turn to the question “Does Reform/Policy Affect Aid Allocation?”

This sheds some light on the debate about the motives behind aid giving. Is it conditional on reform or policy? Is aid giving motivated by donors’ political/strategic interests? Or is it purely altruistic? To answer these questions, we estimate the following aid allocation equation.

\[
\text{Aid} = f(\text{LGDP, Reform (Policy), SSA, Egypt, C. America, Franc Zone, Arm Imports})
\]

This is the exact aid allocation equation estimated by Burnside and Dollar (2000) where LGDP is initial per capita income.
The above specification is based on the literature on the determinants of aid (see, for example, Trumbull and Wall (1994)). The various regional dummies and arms imports relative to total imports lagged one period are meant to capture donors' strategic interests. The inclusion of reform/policy is to check if donors favor countries with good policies in aid allocation. The logarithm of population and initial income are included to see if more aid is given to countries with low income and large population, which supposedly are the needy ones.

We find (results are reported in table 4.9) negative and significant coefficients on initial income and population implying that more aid goes to poorer but smaller countries. This is in line with Burnside and Dollar (2000). While the dummy variables we use to capture strategic interests of donors are all found to be insignificant, the measure of arms imports relative to total imports is found to be positive and highly significant - a reflection of strategic considerations by donors in aid allocation.
Table 4.9
Aid Allocation: OLS Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reform</th>
<th>BD Policy</th>
<th>Policy 3</th>
<th>Policy 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-1.97***</td>
<td>-1.99</td>
<td>-2.02***</td>
<td>-2.03***</td>
</tr>
<tr>
<td></td>
<td>(0.30)</td>
<td>(0.29)</td>
<td>(0.30)</td>
<td>(0.30)</td>
</tr>
<tr>
<td>SSA</td>
<td>0.23</td>
<td>0.14</td>
<td>0.22</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>(0.50)</td>
<td>(0.49)</td>
<td>(0.52)</td>
<td>(0.51)</td>
</tr>
<tr>
<td>REFORM (POLICY)</td>
<td>0.23</td>
<td>-0.24*</td>
<td>-0.19*</td>
<td>-0.24*</td>
</tr>
<tr>
<td></td>
<td>(0.38)</td>
<td>(0.12)</td>
<td>(0.11)</td>
<td>(0.12)</td>
</tr>
<tr>
<td>EGYPT</td>
<td>0.61</td>
<td>0.76**</td>
<td>0.68*</td>
<td>0.71**</td>
</tr>
<tr>
<td></td>
<td>(0.41)</td>
<td>(0.36)</td>
<td>(0.37)</td>
<td>(0.36)</td>
</tr>
<tr>
<td>C. AMERICA</td>
<td>0.23</td>
<td>0.19</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>(0.34)</td>
<td>(0.33)</td>
<td>(0.33)</td>
<td>(0.33)</td>
</tr>
<tr>
<td>FRANC ZONE</td>
<td>0.52</td>
<td>0.59</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>(0.67)</td>
<td>(0.66)</td>
<td>(0.68)</td>
<td>(0.67)</td>
</tr>
<tr>
<td>ARMS IMPORT</td>
<td>4.17***</td>
<td>3.57***</td>
<td>3.77***</td>
<td>3.66***</td>
</tr>
<tr>
<td></td>
<td>(0.87)</td>
<td>(0.76)</td>
<td>(0.77)</td>
<td>(0.77)</td>
</tr>
<tr>
<td>LPOP</td>
<td>-0.59***</td>
<td>-0.61***</td>
<td>-0.58***</td>
<td>-0.59***</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.09)</td>
<td>(0.08)</td>
<td>(0.08)</td>
</tr>
</tbody>
</table>

No. of Observations | 217 | 217 | 217 | 217
R² | 0.54 | 0.55 | 0.54 | 0.55

Note: The dependent variable is aid as a percentage of GDP. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses.

Does aid favor reform or good policy? Our results do not support this claim. Actually, the policy variable is weakly significant when all the policy indices are used, perhaps reflecting the possibility of giving more aid to those with bad policies with the hope that they improve their policies. This is in line with Kilby’s (2005) result. We checked the robustness of our results by using lagged policy\(^{40}\) and the results are qualitatively the same.

---

\(^{40}\) This captures any lag effect of policy and it also somehow helps to address the potential endogeneity in policy.
We further split our data into pre and post-reform periods and we observe an interesting finding (see table 4.10). In the pre-reform period, the coefficients on ARMS IMPORT, EGYPT are all positive and significant supporting the view that some aid is given for strategic purposes. On the other hand, none of the five strategic variables appears to be significant in the post reform sub-sample. This may be attributed to the fact that many developing countries were reforming when the cold war was about to be over. The weakening of the communist camp reduced the East-West competition for strategic/political allies around the globe and did significantly reduce the volume of strategic aid to former socialist and developing countries. Consequently, developing countries, especially those in the Eastern Bloc, did face severe economic and political crisis and this motivated economic and political reform from within. This evidence supports the belief that unlike the pre-cold war era aid in the post-cold war era does not have much to do with donors’ strategic/political interests.
### Table 4.10

Aid Allocation in Pre-and Post-Reform Periods: OLS Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-Reform</th>
<th>Post-Reform</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BD Policy</td>
<td>Policy 1</td>
</tr>
<tr>
<td>LGDP</td>
<td>-1.75***</td>
<td>-1.79***</td>
</tr>
<tr>
<td></td>
<td>(0.36)</td>
<td>(0.38)</td>
</tr>
<tr>
<td>SSA</td>
<td>-0.35</td>
<td>-0.32</td>
</tr>
<tr>
<td></td>
<td>(0.45)</td>
<td>(0.45)</td>
</tr>
<tr>
<td>REFORM</td>
<td>-0.17*</td>
<td>-0.12</td>
</tr>
<tr>
<td>(POLICY)</td>
<td>(0.10)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>EGYPT</td>
<td>1.17**</td>
<td>1.13**</td>
</tr>
<tr>
<td></td>
<td>(0.44)</td>
<td>(0.45)</td>
</tr>
<tr>
<td>CENTRAL</td>
<td>0.30</td>
<td>0.34</td>
</tr>
<tr>
<td>AMERICA</td>
<td>0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>FRANC</td>
<td>1.69**</td>
<td>1.69</td>
</tr>
<tr>
<td>ZONE</td>
<td>(0.63)</td>
<td>(0.62)</td>
</tr>
<tr>
<td>ARMS</td>
<td>3.64***</td>
<td>3.98***</td>
</tr>
<tr>
<td>IMPORT</td>
<td>(0.80)</td>
<td>(0.97)</td>
</tr>
<tr>
<td>LPOP</td>
<td>-0.51***</td>
<td>-0.49***</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.07)</td>
</tr>
</tbody>
</table>

|          | No. of Observations | R²   | 140 | 0.60 | 140 | 0.60 | 140 | 0.60 | 77 | 0.51 | 77 | 0.53 | 77 | 0.53 |

Note: The dependent variable is aid as a percentage of GDP. *, ** and *** indicate 10%, 5% and 1% significant levels respectively. Consistent standard errors are in parentheses.

In both pre and post-reform regressions, the logarithm of population and the initial per capita GDP are both found to be negative and significant indicating that aid favors countries that are poor and small. This result appears to be robust.

### Conclusion

The aid-growth literature discusses a wide range of issues with serious implications for policies regarding aid allocation. Most importantly, it deals with such issues as the effect of aid on growth, the impact of recipients’ policies on aid allocation.
effectiveness and the aid-policy relationship. In this chapter, we examine how reform impacts upon the aid-growth relationship.

Like Burnside and Dollar, we do not find evidence that corroborates the claim that aid, on average, enhances growth in developing countries. We find that the aid-policy interaction term is sometimes significant in the OLS but not in GMM regressions. The results seem to be very sensitive to changes in data sets and estimation techniques. This evidences the fragility of results in aid-growth regressions as discussed in Roodman (2004).

One interesting finding is that reform increases the marginal effect of policy on growth when policy includes the reform dimension. By splitting the data into pre and post-reform sub-samples, we see that the effect on growth of policy is more pronounced in post-reform than in pre-reform periods.

We do not find evidence for the view that aid giving is conditioned by reform indicators. But we find that the significance of political/strategic considerations decreases with reform. This supports the argument that donors attach a relatively lower importance to strategic motives in aid giving following the end of the cold war. We also see that aid decreases with the population and increases with the level of poverty in recipient countries.
CHAPTER V

OVERALL CONCLUSION

The aid-growth relationship is a hotly debated issue in the academic arena and among policy makers. Empirical studies dealing with the aid effectiveness issue have produced mixed results. Despite this controversy, a single academic paper has had a tremendous impact on donor policies about how aid should be allocated. The belief that aid works in countries with sound policies, the basic finding of Burnside and Dollar (2000), is also the building block of President Bush’s Millennium Challenge Account. This dissertation reexamines this specific postulate and sheds light on the surrounding controversies in the aid-growth literature.

The first chapter provides a simple model of asymmetric information to examine the link between aid, incentives, policies and growth in developing countries. The solution to the model shows that sound policies are required for aid to be effective when information is asymmetric. This suggests that information asymmetry can give rise to a performance based aid allocation rule, which is similar to the selectivity approach for aid giving.

In the second chapter, we examine the aid-growth relationship by using aggregate aid data from 48 developing countries. Using the currently popular semiparametric estimation technique, we find that policy is always an important determinant of economic growth in developing countries. We also find that the BD story, aid spurs growth in a
good policy environment, has some support when non-linearity in the variables of interest is properly addressed.

The third chapter takes the analysis further by resorting to the use of disaggregated aid data. We argue that different aid categories have different effects on growth. Using aid that goes to production sectors, economic and social infrastructures, we do not find evidence favoring the belief that aid enhances growth. In most cases, the aid-interaction term appears to be significant when we use aid that goes only to production sectors and economic infrastructures. This may reflect the fact that aid to social infrastructure has a longer gestation period such that its effect on growth may not be realized within the four years – the period of analysis used in most aid-growth regressions.

The fourth chapter assesses the link between foreign aid and growth when reform is relevant. Using both aggregate and disaggregated data, we still do not find evidence for the claim that aid, on average, facilitates growth in developing countries. It is shown, however, that the aid-policy interaction term is mostly positive and significant when a new policy index is used, instead of the Burnside and Dollar (2000) policy index. In contrast to what is observed in previous chapters, the Burnside-Dollar policy appears to lose significance implying the sensitivity of results to changes in data set and estimation techniques. On the question whether aid buys policies, there is some evidence that aid goes to countries with poor policies. This result would mean that aid is allocated on the basis of ex ante conditionality. Finally, it is important to note that donors also consider political and strategic reasons in allocating aid.
APPENDIX-A

Derivation of the Impact of the Interaction of Aid and Policy on $C_{t+1}$

(Performance Based and Need Based Allocation Rules)
Performance-Based Allocation Rule

Let

\[ C_{t+1} = q^l C_{t+1}^l + q^h C_{t+1}^h \]  

(1.13)

Where \( C_{t+1} \) is the average \( C_{t+1}^l \) and \( C_{t+1}^h \)

Substituting the expressions for \( C_{t+1}^l \) and \( C_{t+1}^h \), from (1.3) we have

\[ C_{t+1} = (q^l I^l + q^h I^h) (1+r) \]  

(1.14)

Substituting the expression for \( I^h \) from (1.12) in (1.14) and using the fact that

\[ q^l I^l + q^h I^l = I^l \],

we can write (1.14) as

\[ C_{t+1} = [I^l + q^h (\alpha x^h + \theta) \delta(l+\delta)] (1+r) \]  

(1.15)

Using the fact that \( q^l x^l + q^h x^h = x \), (15) can be written as

\[ C_{t+1} = [I^l + q^h (\alpha x/l - \alpha q^l) \delta'(l+\delta)] (1+r) \]  

(1.16)

From (16)\(^4\)

\[ \frac{dC_{t+1}}{dx} = \frac{q^h \text{(policy)}}{(1-a) + \alpha q^h \text{(policy)}} \alpha (1+r) \delta'(l+\delta) \]  

(1.17)

From (17), we can get

\[ \frac{\partial^2 C_{t+1}}{\partial x \partial p} = (q^h \text{(policy)}}/(1-a) \right) (\alpha (1+r) \delta'(l+\delta))/(1-a + \alpha q^h \text{(policy)})^2 \]  

(1.18)

(1.18) says that good policies influence the effect of aid on future consumption by increasing the occurrence of the high state for given values of \( \alpha, r, \) and \( \delta \)

\(^4\) The \( f \) part, which is a function of \( x \), in (1.16) does not affect the result in (1.17). This can be shown by the fact that \( \frac{\partial^2 C_{t+1}}{\partial x \partial r} = -(\frac{\partial}{\partial x} q^h \text{(policy)}}/(1-a) \right) (\alpha (1+r) \delta'(l+\delta))/(1-a + \alpha q^h \text{(policy)})^2 \) for the \( f \) part, which is zero.
**Need-based Allocation Rule**

Equations (1.6) and (1.7) are equal in the case of need-based allocation since $y_i^h - y_i^l = x_i^h - x_i^l = 0$ and we can write $x^l$ and $x^h$ respectively as $x^l = x + q^h \theta$ and $x^h = x + (q^h - 1) \theta$.

We can then use (1.3) to show that

$$\frac{\partial c_{i+1}}{\partial x} = (\frac{\partial}{\partial + \delta}) (1 + r)$$

(1.19)

and

$$\frac{\partial^2 c_{i+1}}{\partial x \partial p} = 0$$

(1.20)

What equation (20) says is that given the definition of policy and the way it works (through increasing the probability of the occurrence of the high state), there is no room for policy to influence aid effectiveness in the need-based allocation.
APPENDIX-B

List of Countries in the Sample
Chapter 2
Algeria, Argentina, Bolivia, Brazil, Chile, Cote d’Ivoire, Cameroon, Colombia, Cost Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Gabon, Gambia, Ghana, Guatemala, Honduras, Haiti, India, Indonesia, Jamaica, Kenya, Korea, Madagascar, Malaysia, Mexico, Morocco, Nicaragua, Niger, Nigeria, Pakistan, Paraguay, Peru, Philippines, Senegal, Sierra Leone, Sri Lanka, Syria, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uruguay, Venezuela, Zaire (Democratic Congo), and Zambia.

Chapter 3
Algeria, Argentina, Bolivia, Brazil, Chile, Cote d’Ivoire, Cameroon, Colombia, Cost Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Gabon, Gambia, Ghana, Guatemala, Honduras, Haiti, India, Indonesia, Jamaica, Kenya, Korea, Madagascar, Malaysia, Mexico, Morocco, Nicaragua, Niger, Nigeria, Pakistan, Paraguay, Peru, Philippines, Senegal, Sierra Leone, Sri Lanka, Syria, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uruguay, Zaire (Democratic Congo), and Zambia. 42

42 The All Donors two sectors data does not include Venezuela and when we focus on multilateral aid the following countries are further excluded: Algeria, Argentina, Brazil, Chile, Mexico, Malaysia, Nicaragua, Peru, Paraguay, Syria, Thailand, Tunisia, Turkey, and Uruguay.

Chapter 4
Argentina, Bolivia, Brazil, Chile, Cameroon, Colombia, Cost Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Ghana, Guatemala, Honduras, Haiti, India, Jamaica, Kenya, Mexico, Morocco, Nicaragua, Nigeria, Peru, Philippines, Senegal, Sri Lanka, Syria, Tunisia, Turkey, Uruguay, and Zambia. 43

43 The sample with disaggregated aid further eliminates Bolivia, Dominican Republic, El Salvador, Honduras, Haiti, and Nicaragua.

94
BIBLIOGRAPHY


95

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.


http://www.oecd.org/dataoecd.htm


World Bank (2004), World Development Indicators CD ROM. Washington DC.