Foreign Aid and Development

A test of the Burnside and Dollar 2000 hypothesis, that aid has a positive impact on growth in developing countries with good fiscal, monetary, and trade policies and is more effective than aid given to countries with poor economic policies, using new data from 1980-2007 and instrumental variables

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Executive Summary

The aim of this thesis is to test the Burnside and Dollar (2000) hypothesis that aid given to countries with good policy environments is more effective than aid given to countries with poor policy environments.

The methods employed by this study, to test the Burnside and Dollar (2000) hypothesis are ordinary least squared and two stage least squared regressions. Appropriate measures are taken to ensure that the methodology used by these authors is followed as closely as possible. Differences between this study and that of Burnside and Dollar (2000) are clearly documented and discussed in the text. In line with Burnside and Dollar (2000) a policy index is constructed using current account balance, inflation and a dummy variable representing openness of the economy. Data in this study cover 1980-2007.

This study employs an Aid x Policy interaction term to test the Burnside and Dollar (2000) hypothesis regarding the effectiveness of aid in countries with good policy environments. An Aid$^2$ term is also introduced in this study, which departs slightly from the Burnside and Dollar (2000) investigation, but is included in line with recent aid growth literature. Finally, the causal relationship between aid in good policy environments and GDP per capita growth is investigated. The instrumental variables used in this study are logarithm of population and the logarithm of land area.

The main findings of this study show that aid has a significant negative impact on GDP per capita growth. The second finding of this study is the insignificant relationship between the interaction term Aid x Policy and GDP per capita growth. The arguments for these findings put forward in this study are discussed in terms of natural resource exploitation as well as the specification of variables used in the policy index. In addition, sample size and threshold for low and middle income groups are highlighted as a major cause of differences between the two studies.

Given these limitations, this study can nevertheless shed fresh light on the important debate which continues to surround the aid effectiveness debate. Further research is needed in this field to provide donors and recipients with better tools in order to improve development policy.
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## Abbreviations

### Table 1 - Abbreviations

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<th>Abbreviation</th>
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<tr>
<td>Two Stage Least Squared</td>
<td>2SLS</td>
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<tr>
<td>Business Environment Risk Intelligence</td>
<td>BERI</td>
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<tr>
<td>Country Policy and Institutional Assessment</td>
<td>CPIA</td>
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<tr>
<td>Creditor Reporting System</td>
<td>CRS</td>
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<tr>
<td>Development Assistance Committee</td>
<td>DAC</td>
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<tr>
<td>East Asia</td>
<td>EA</td>
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<tr>
<td>Gross Domestic Product</td>
<td>GDP</td>
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<tr>
<td>Incremental Capital Output Ratio</td>
<td>ICOR</td>
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<tr>
<td>The International Country Risk Guide</td>
<td>ICRG</td>
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<tr>
<td>International Monetary Fund</td>
<td>IMF</td>
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<td>Instrumental Variables</td>
<td>IV</td>
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<td>Net official development assistance</td>
<td>ODA</td>
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<tr>
<td>Organisation for Economic Co-operation and Development</td>
<td>OECD</td>
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<td>Ordinary Least Squared</td>
<td>OLS</td>
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<td>Sub-Sahara Africa</td>
<td>SSA</td>
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<td>United Nations</td>
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Introduction

In 2000 Burnside and Dollar investigated the impact of aid on economic development in recipient countries. They concluded that aid was most effective in countries with good fiscal, monetary and trade policies.

The aim of this thesis is to test the Burnside and Dollar (2000) hypothesis that aid is most effective under these 'good' policy environments. Statistical methods will be used to measure the economic relationship between aid, growth and policy, the theoretical models will be tested and the results used to evaluate government policy (aid allocation).

Donors have two broad sets of tools which they use to ensure that aid is directed to where it is most likely to succeed. Conditions can be placed on the loans ex ante and the impact of the loans can be evaluated ex post (note: the terms loans and aid will be used interchangeably) (W. Easterly, 2003). However, observers agree that too little effort is placed on imposing conditions or evaluations (W. Easterly, 2003).

There has been continuing debate on using aid effectiveness measures as criteria for the allocation of aid across countries (Hansen & Tarp, 2001). The Washington consensus view is that more aid should go to countries with good policy environments (Finn Tarp & Peter Hjertolm, 2000). Earlier debates were phrased in terms of allocating aid to countries where its 'marginal productivity' was the highest (Finn Tarp & Peter Hjertolm, 2000). It has long been recognized that mechanistic use of such criteria could lead to directing most aid to countries which need it the least (Finn Tarp & Peter Hjertolm, 2000). Conversely, aid is probably needed most in countries in which it is least effective (Finn Tarp & Peter Hjertolm, 2000). However, maximizing the marginal productivity of aid with respect to aggregate growth is not the only relevant criterion for aid allocation. For example colonial ties might be a reason for giving aid. (Finn Tarp & Peter Hjertolm, 2000).

Aid agencies often place conditions on their loans to recipients, such as requirements for macroeconomic stability (e.g., low budget deficits and low inflation), non-interference with
market prices, an open economy and privatization of major industries (W. Easterly, 2003). However, once conditions are stated and evaluated ex ante, the agencies then often provide additional future loans with little regard for previous loans’ performance (W. Easterly, 2003). This problem arises for both the World Bank and the International Monetary Fund (W. Easterly, 2003).

This thesis will investigate the impact of aid on growth in developing countries. Specifically this thesis will examine carefully the issue of endogeneity – the possibility that aid flows could go to countries that are doing particularly badly economically, or to countries that are doing well economically, creating a spurious correlation between aid and growth (Rajan & Subramanian, 2008). Under this framework, the thesis will then examine the hypothesis of Burnside and Dollar (2000) regarding aid: chiefly, that aid does affect growth, but that its impact is conditional on the same policies that affect growth (Burnside & Dollar, 2000). To the extent that it is invested and not consumed, aid will be effective (Burnside & Dollar, 2000). However, the incentive to invest and the subsequent productivity as capital are affected by various policy distortions that can lower the return to capital (Burnside & Dollar, 2000). The impact of aid will then be greater when there are fewer distortions (Burnside & Dollar, 2000). The growth rates in developing countries will then depend on initial income, institutional and policy distortions, aid, and aid interacted with these distortions (Burnside & Dollar, 2000).

As a framework in reflecting upon these hypotheses and questions, the first section of the paper will examine relevant theories and models, starting with the Harrod-Domar model and Solow-Swan model and progressing to contemporary endogenous growth models and reviews of literature and results from previous aid-growth studies. Section two will discuss the methodology and variables used in the new endogenous growth models, as well as of relevant instruments, and identification strategies and robustness testing. Section three will present the results, analysis and discussion. The final section will conclude and summarize results and findings and provide policy directions for improving the effectiveness of aid.
Problem Statement

Topic

The topic area of this thesis is foreign aid and development: Specifically, what is the impact of foreign aid on economic growth in developing countries? Topic focus will be on aid, economic policies and policy implications.

Objective

As a result of the Burnside and Dollar (2000) conclusion that aid is less effective in countries with poor economic policies, many donors have placed conditions on their aid based on ‘good’ economic policies. The Burnside and Dollar (2000) findings also posit that donors, at the time of the study, were not allocating foreign aid based on good economic policies, but based upon variables that reflected their own strategic interests (Burnside & Dollar, 2000). It is therefore important to investigate from a more current perspective and with updated data, the following questions:

1. Is the effect of foreign aid on growth conditional on economic policy?
2. What are the policy implications of such results?

Hypothesis/ Research Question

This thesis will test the Burnside and Dollar (2000) hypothesis that aid has a positive impact on growth in developing countries with good fiscal, monetary, and trade policies and is more effective than aid given to countries with poor economic policies (Burnside & Dollar, 2000). This thesis will investigate the impact of aid on growth in developing countries at the macro level. The empirical review will investigate the most influential empirical papers. Firstly, Burnside and Dollar (2000) – that aid is dependent on ‘good policies’. Secondly, Tarp and Hansen (2001) – that it has diminishing returns. Finally Easterly, Levine and Roodman (2003) – that adding a new dataset and interacting aid with policy does not have any effect on growth (W. Easterly, Ross, & Roodman, 2003). Finally, the findings will be presented from this investigation using ordinary least squared (OLS) and two stage least squared (2SLS) methods.
Theoretical Review

The aim of this section is to give the reader a theoretical basis, with which to better understand later parts of this thesis, for instance, to gain a better understanding of the empirical and literature review. This section will continue as follows: description of the neoclassical model of exogenous growth, which forms the basis of early generations of aid growth literature; this will be followed by a discussion of endogenous growth models, used in current empirical investigations.

The Neo-classical Model of Exogenous Growth

In order to sustain a positive growth rate of output per capita in the long run, there must be continual advances in technological knowledge in the form of new goods, markets or processes (Aghion, 1998).

Solow and Swan (1956) showed that if there is no technological progress, then effects of diminishing returns would eventually cause economic growth to cease.

The aggregate production function is described as follows:

\[ Y = F(K) \]

Where \( K \) is capital stock, \( Y \) is aggregate production, under a given state of knowledge, with a given range of available techniques and a given array of different capital, intermediate and consumption goods. \( K \) is an aggregate index of different capital goods, and should be interpreted broadly so as to include human as well as physical capital. In the model we assume that all capital and labour are fully and efficiently employed.

The crucial property of the aggregate production function is that there are diminishing returns to the accumulation of capital.

Assuming also a constant labour supply and under a given state of knowledge, population growth and technology change are assumed away.
To determine whether and at what rate capital stock will increase in a given situation, we follow Solow Swan in assuming people save a constant fraction $s$ of their gross income $Y$ (Assuming no taxes, so that national income and output are identical) and also a depreciation of capital stock $\delta$.

Because the rate at which new capital accumulates is $sY$, and the rate at which old capital wears out is $\delta K$, therefore the net rate of increase of capital stock i.e. the net investment rate is

$$K = sF(K) - \delta K \text{ (Aghion, 1998)}$$

With no taxes, no government expenditure and no international trade, savings and investment are identical. They both represent the flow of income spent on investment goods rather than on consumption goods.

The above equation indicates how the rate of change of capital stock at any given date is determined by the amount of capital already in existence at that date. Combined with the historically given stock of capital, it determines the entire time path of capital (Aghion, 1998).
The depreciation schedule is a straight line through the origin, with a slope equal to the depreciation rate $\delta$.

Because the marginal production $F'(K)$ is positive but diminishes as $K$ increases, the savings schedule has a positive but diminishing slope.

The rate of increase of capital stock ($K_0$) is the vertical distance between the savings and depreciation schedule.
In the absence of population growth and technology change, diminishing returns will eventually choke off all economic growth. As capital stock approaches its stationary level $K^*$ national income will approach its stationary level $Y^* = F(K^*)$ and growth will fall to zero. (Aghion, 1998)

Any attempt to increase growth by boosting savings will ultimately fail. An increase in $s$ will temporarily raise the rate of capital accumulation, but it will have no long-run effect on the growth rate, which eventually will fall to zero. An increase in $s$ will, however, cause an increase in long-run levels of output and capital, by shifting the savings schedule upwards.

Similarly, an increase in depreciation rate $\delta$ will reduce long-run levels of output and capital by shifting the depreciation schedule up.

**The AK Approach to Endogenous Growth**

Diminishing returns to the accumulation of capital, is an inevitable feature of an economy in which the other determinants of aggregate output, namely technology and employment of labour are both given (Aghion, 1998). However, there is a type of model in which one of these other determinants is assumed to grow automatically in proportion to capital and where the growth of this other determinant counteracts the effect of diminishing returns (Aghion, 1998). Thus, output grows in proportion to capital.

These models are known as $AK$ models with the production function $Y = AK$, where $A$ is a constant.
The Harod-Domar model is an earlier version of this model and assumes labour input grows automatically in proportion to capital. Also, supposing the aggregate production function has fixed technological coefficients:

\[ Y = F(L, K) = \min\{AK, BL\} \]

Where A and B are fixed coefficients. Under this technology, producing a unit of output requires \( \frac{1}{A} \) units of capital and \( \frac{1}{B} \) units of labour; if either inputs falls short of this minimum requirement, there is no way to compensate by substituting the other outputs. With a fixed-coefficient technology, there will either be surplus capital or surplus labour in the economy. When \( AK < BL \), capital is the limiting factor. Firms will produce the amount \( Y = AK \), and hire the amount \( \frac{1}{B} Y = \frac{1}{B} AK < L \) of labour.

With a fixed savings rate, capital stock will grow according to:

\[ \dot{K} = sAK - \delta K \]

Thus, the growth rate of capital will be

\[ g = \frac{\dot{K}}{K} = sA - \delta \]

Because output is strictly proportional to capital, \( g \) will also be the rate of growth of output and \( g - n \) will be the growth rate of output per person.

If output per person is rising, then the increase in growth will not be permanent, because \( K \) is growing faster than \( L \), and eventually, the binding constraint on output will become availability of labour rather than availability of capital (Aghion, 1998). However, if output per person is falling, then the increase in growth resulting from an increase in savings will be permanent. In this case, diminishing returns will never set in because the faster growth of capital will be accompanied by a permanently faster growth in labour input, made possible by the surplus of unemployed labour in the economy (Aghion, 1998).
Theory of Aid and Economic Growth

For many years, the standard model used to justify aid was the ‘two-gap’ model of Chenery and Stout. Conceptually, the first gap is described as that between the amount of investment necessary to attain a certain rate of growth and available domestic savings. The second gap is that between import requirements for a given level of production and foreign exchange earnings. One or the other gap is binding at different times in different countries.

Chenery and Stout built on earlier work by other development economist such as Arthur Lewis (1954) and Rostow (1960).

In the Chenery and Stout model below, economic growth depends on investment as a share of GDP, adjusted for factors that reveal whether investment is of high or low quality. The amount of investment will be the sum of domestic savings and foreign aid.

\[ g = \frac{I}{Y} / \mu \]

\[ \frac{I}{Y} = \frac{A}{Y} + \frac{S}{Y} \]

Where \( I \) is required investment, \( Y \) is output, \( g \) is target GDP growth, \( A \) is aid and \( S \) is domestic savings. The variable \( \mu \) denotes the Incremental Capital Output Ratio (ICOR). It can approximately be defined as follows:

\[
ICOR = \frac{Average\ annual\ share\ of\ investment\ in\ GDP}{Annual\ growth\ rate\ of\ GDP}
\]

The ICOR is a measure of how many additional units of capital are required to produce or yield an additional unit of output.
1. **Endogenous Growth Models**

The main alternative to the neoclassical growth models is the use of endogenous growth models. These models differ from the neoclassical growth models in that they include a multitude of inputs, which include physical capital, technology, human capital, intermediate goods, organizational capital, social capital and institutional design. The incremental output ratio changes with these other inputs, so that there is no longer a stable linear relationship between investment and growth. Empirically, many cross-country regressions have shown a statistically significant linear relationship between investment and growth, but the relationship does not hold under shorter intervals (W. Easterly, Levine, & Roodman, 2003).

A second key departure from neoclassical results is that aid fills the finance gap and allows for greater investment. This assumption holds true if investment is liquidity constrained and incentives to invest are favourable. If the cause of low investment is that the incentives to invest are poor, then aid will not increase investment. Moreover, aid could have the effect of worsening investment incentives as it could signal the need for aid in the future (arguably, a situation of moral hazard). In either case, aid would finance consumption rather than investment (Boone, 1996). Similarly, Burnside and Dollar's finding that aid increases growth under good policy environments shows that aid will not necessarily lead to investment.

In summary, the main theoretical approaches to growth theory have been presented and discussed. In the section literature review will be made.
Literature Review

1. Early Generations

Previous studies of the aid-growth relationship can be classified into three generations, each influenced by dominant theoretical paradigms as well as available empirical tools. The first two generations were inspired by relatively simple growth models such as the Harrod-Domar model and the two-gap Chenery-Strout extension. The underlying idea behind the Harrod-Domar model is of a stable linear relationship between growth and investment in physical capital. Assuming all aid is invested, it is straightforward to calculate how much aid is required to achieve a target growth rate. The impact of aid is assumed to be positive and helps plug either a savings or foreign exchange gap. Empirical studies in this tradition consequently focused on the extent to which aid increases savings and investment in recipient countries.

2. Aid Savings and Growth

In line with a number of studies at the time, Gupta classified less developing countries according to per capita income levels (I) per capita GNP of up to $124; (II) per capita GNP of $125-$249; and (III) per capita GNP of $250-$675 (Gupta, 1970). For groups I and III the effect of foreign capital inflows on domestic savings was positive (Gupta, 1970). He suggested that foreign capital may really spur efforts towards greater domestic savings (Gupta, 1970). He also suggested that the marginal propensity to save out of group III was higher than for group I (Gupta, 1970). Gupta tentatively concluded that as per capita income increased, the positive effect of capital inflows on domestic savings also increased (Gupta, 1970).

Papenek (1972) reviewed the early literature on the impact of foreign resources on the economic growth of less developed countries, where 'aid' and 'total resource inflows' were often treated as though they were synonymous. Papenek (1972) discussed two plausible savings functions which alone or in combination would result in a fall in the domestic savings rate and a small or zero increase in investment as a result of foreign flows (Finn Tarp & Peter Hjertolm, 2000). The first,
attributed to Rahman, Griffin and Weisskopf imply that savings are determined by government policy in that savings effort will be lower as more foreign inflows become available. They argue that governments have target growth rates and if they see an increase in foreign inflows, then the government will change its policies to reduce the savings by that equivalent amount. Secondly, if savings are a function of investment, then an anticipation of foreign capital will cause an equivalent decrease in domestic savings.

Papenek also suggests another set of explanations as to how foreign inflow could cause an increase in savings: If investment is substantially a function of foreign exchange, which can then be used to import goods and inputs to maintain capacity, then an increase in foreign inflows would increase investment and so raise both income and savings; If savings are a function of the rate of growth of particular groups such as industrialist, then increasing capital inflow may increase income and so increase savings; If the government does not have the capability to reduce domestic savings (for example by changing policy) then capital inflows will lead to an increase in investment. As most aid donors allocate aid directly to investment, there may be additional pressure to increase domestically financed investment. The resulting pressure could lead to higher incomes in the short term and so increase domestic savings. Papenek (1973) wrote another article, which followed a different approach from the literature of the time. He dropped the assumption that the impact of inflows on savings could be regressed one on the other and substituted with the assumption that independent variables explain growth. By disaggregating foreign capital flows into foreign aid, foreign investment, other inflows and domestic savings, he found that savings and foreign inflows explain over a third of growth (Papanek, 1973); foreign aid has a substantially larger effect than the other variables (Papanek, 1973); only for Asia are the variable significant (Papanek, 1973); and growth does not correspond with exports, education, per capita income, or country size (Papanek, 1973). Savings are highly correlated with exports and per capita income, not with country size (Papanek, 1973).

In line with Papenek 1973, Singh found the aid-savings results to be consistent with the literature. There was a negative relationship between the dependent variable savings (as a % of GDP) and independent variable aid (as % of GDP) (-2.7 1960-1970 and -1.7 1970-1980) (Singh, 1985). The data used was for two periods from 1960-1970 and 1970-1980 for 73 of countries.
(Singh, 1985). Of these 36 countries were from Africa with the remaining from the rest of the world (Singh, 1985).

Snyder suggested an alternative hypothesis: That higher per capita income (CPI) countries tend to have higher savings ratios and smaller current account deficits (implying smaller aid flows) than low CPI countries (Snyder, 1990). If aid were distributed according to need and per capita income were used by donors as an index of need, aid and savings would have a spurious negative correlation because low PCI countries simultaneously experience low savings rates and large aid inflows based on need (Snyder, 1990).

White's 1992 paper is a critic of the literature of how aid affects savings and growth, in which he concludes that empirical work should be based on better formulated models and that studies should be carried out on a country level rather than employing cross-sectional data (White, 1992).
**Empirical Review**

**Burnside and Dollar (2000)**

In the influential paper by Burnside and Dollar, the authors set out to investigate the relationship between foreign aid, economic policy and growth of per capital GDP using a new database on foreign aid that had just been developed by the World Bank (W. Easterly, 2003). Their findings were summarized as follows “We find that aid has a positive impact on growth in developing countries with good fiscal, monetary, and trade policies but has little effect in the presence of poor policies” (Burnside & Dollar, 2000). However, their results proved fragile and dependent on the datasets used as well as the definitions of 'aid' 'policies' and 'growth' (W. Easterly, 2003; W. Easterly et al., 2003).

The Burnside and Dollar study draws on the new empirical results in the new growth literature. In addition, it includes an economic policy index as well as institutional variables (Ethnic fractionalization, Assassinations institutional quality and broad money (M2)). The conditional convergence effects are captured by the initial GDP. However, according to Hansen and Tarp the issue of the debate is the inclusion of an interaction term between Aid/GDP and the policy index (Burnside & Dollar, 2000).

The policy index is constructed as follows. The authors form a policy index of three policies to interact with foreign aid – budget surplus, inflation rate and the openness dummy developed by Sachs and Warner (1999). The authors believed that in terms of exposition and simplicity that it would be useful to have an overall measure of policy rather than three separate variables (Burnside & Dollar, 2000). The first method, which they considered was the principles component approach (Burnside & Dollar, 2000). However, the first two principle components were almost perfectly correlated with openness and inflation (Burnside & Dollar, 2000). As an alternative they dropped budget surplus and included both openness and inflation, however, this too did not solve the problem of estimating the interaction terms (Burnside & Dollar, 2000). Instead, the authors suggested that the policy distortions that affect growth would determine the effectiveness of aid (Burnside & Dollar, 2000). Therefore, they created a policy index, by
weighting the policies according to their correlation with growth (a feature absent from the principle components analysis). This allowed the authors to examine aid effectiveness in light of “good” or “bad” policies.

Where $i$ is the index (cluster) of countries, $t$ is an index of time, $g_{it}$ is per capita real GDP growth, $y_{it}$ is the logarithm of initial real per capita GDP, $a_{it}$ is aid receipts relative to GDP, $p_{it}$ is a P x 1 vector of macroeconomic policies that affect growth, $z_{it}$ is a K x 1 vector of other exogenous variables that might affect growth and $g_{z}$ is a fixed time effect.

The OLS regression is as follows:

(a) $g_{it} = y_{it} \beta_y + p_{it} \beta_p + z_{it} \beta_z + g_{t} + \epsilon_{it}$

Letting $p_{it} = p_{it} b_p$, where $b_p$ is the OLS estimate of $\beta_p$ in equation (a). Then, rather than estimating their growth equation (a), they estimate:

(b) $g_{it} = y_{it} \beta_y + a_{it} \beta_a + p_{it} \theta_p + a_{it} p_{it} \theta_1 + z_{it} \beta_z + g_{t} + \epsilon_{it}$

This is an implicitly restricted version of the grow equation.

Supposing that $\beta_{ij} / \beta_{pj} = \beta_{1i} / \beta_{p1} = \theta$, it follows that Burnside and Dollar (2000)'s equation for the effect of aid on growth conditional on economic policy can be rewritten as:

(b) $g_{it} = y_{it} \beta_y + a_{it} \beta_a + p_{it} \beta_p + a_{it} \left(p_{it} \beta_p\right) \theta_1 + z_{it} \beta_z + \epsilon_{it}$

By estimating the equation (a) the authors ran the risk of possible bias if either the restrictions implicit were false, or if the policy variables were endogenous (Burnside & Dollar, 2000). The authors report that there is no evidence against the restrictions and specification tests suggest that the policy variables can be considered as exogenous (Burnside & Dollar, 2000).
**Hansen and Tarp (2001)**
Hansen and Tarp (2001) find that entering a square of aid pushes out the significance of the aid x policy interaction term and conclude that aid works on average, but with diminishing returns (Roodman, 2007). Guillaumont and Chauvet (2001) also fail to find significance of the aid x policy interaction term and instead offer evidence that aid works best in difficult economic environments, characterized by volatile and declining terms of trade, low population, and natural disasters (Roodman, 2007). In a similar line Collier and Dehn (2001) find that increasing aid cushions against negative export price shocks (Roodman, 2007). Collier and Hoeffler (2004) offer a triple interaction term: that aid works particularly well in countries recovering from civil war and with good economic policies (Roodman, 2007). Finally, Dalgaard, Hansen and Tarp (2004) find that aid increases growth outside of the tropics but not in them (Roodman, 2007).

**Easterly (2003)**
To reconsider the role of policy, Easterly (2003) considers several alternatives to the index employed by Burnside and Dollar (2000). The first alternative, based on a critic of the Sachs and Warner (1995) measure for being subjective and opaque uses an alternative measure of openness and trade distortions, namely using the black market premium (W. Easterly, 2003). It adds a measure of M2/GDP, as it is the subject of extensive literature (Levine 1997) (W. Easterly, 2003). The second policy index adds the change in the trade to GDP ratio in the first policy index, as this has been used in the literature as a measure of integration with global trade (Dollar and Kraay 2001), (W. Easterly, 2003).

In line with the Burnside and Dollar (2000) approach, the different combinations of each variable are weighted according to their impact on growth, when all foreign aid terms are excluded (W. Easterly, 2003). Easterly’s alternative policy indexes remains significantly correlated with growth, which suggests that the alternative measures of policy do capture some real effect (W. Easterly, 2003).

When testing the interaction term between foreign aid and the alternative measures of policy index. Easterly, finds that the interaction term is no longer a statistically significant (W. Easterly, 2003). However, his sample only includes low-income countries.

These authors maintained the Burnside and Dollar (2000) methodology, but applied a number of robustness checks. The authors extend the sample countries in the same time period used in the Burnside and Dollar (2000) study and they extend the time period by four years, from 1970-1993 to 1970-1997.

First of all the authors mirror the sample in the Burnside and Dollar (2000) study, i.e. middle-income and low-income developing countries, and five outliers are omitted and reproduced the same results as Burnside and Dollar (2000). To test the robustness of these results they reconstructed the entire database and extended the data to 1997. The sample was increased from the original 275 observations in 56 countries to 356 observations in 62 countries (before outlier exclusions). Their results are presented below:
### Table 2 - Robustness Check

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</tr>
<tr>
<td>Burnside and Dollar (2000) regressions</td>
<td>BSD data, BD sample 70-93</td>
<td>BSD data, BD sample 70-93</td>
</tr>
<tr>
<td>Aid</td>
<td>-0.02</td>
<td>-0.24</td>
</tr>
<tr>
<td></td>
<td>(-0.13)</td>
<td>(-0.89)</td>
</tr>
<tr>
<td>Aid x Policy</td>
<td>0.19**</td>
<td>0.25*</td>
</tr>
<tr>
<td></td>
<td>(-2.61)</td>
<td>(-1.99)</td>
</tr>
<tr>
<td>Log initial GDP per capita</td>
<td>-0.6</td>
<td>-0.83</td>
</tr>
<tr>
<td></td>
<td>(-1.02)</td>
<td>(-1.02)</td>
</tr>
<tr>
<td>Ethnic</td>
<td>-0.42</td>
<td>-0.67</td>
</tr>
<tr>
<td></td>
<td>(-0.57)</td>
<td>(-0.76)</td>
</tr>
<tr>
<td>Assassination</td>
<td>-0.45</td>
<td>-0.76</td>
</tr>
<tr>
<td></td>
<td>(-1.68)</td>
<td>(-1.63)</td>
</tr>
<tr>
<td>Ethnic * Assassination</td>
<td>0.79</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>(-1.74)</td>
<td>(-0.67)</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>-1.87*</td>
<td>-2.11**</td>
</tr>
<tr>
<td></td>
<td>(-2.41)</td>
<td>(-2.77)</td>
</tr>
<tr>
<td>Fast-growing E.Asia</td>
<td>1.31*</td>
<td>1.46</td>
</tr>
<tr>
<td></td>
<td>(-2.19)</td>
<td>(-1.95)</td>
</tr>
<tr>
<td>Institutional quality</td>
<td>0.69**</td>
<td>0.85**</td>
</tr>
<tr>
<td></td>
<td>(-3.9)</td>
<td>(-4.17)</td>
</tr>
<tr>
<td>M2/GDP lagged</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(-0.84)</td>
<td>(-1.39)</td>
</tr>
<tr>
<td>Policy</td>
<td>0.71**</td>
<td>1.613**</td>
</tr>
<tr>
<td></td>
<td>(-3.63)</td>
<td>(-1.49)</td>
</tr>
<tr>
<td>Observations</td>
<td>270</td>
<td>184</td>
</tr>
<tr>
<td>R2</td>
<td>0.39</td>
<td>0.47</td>
</tr>
</tbody>
</table>

Numbers in parenthesis are t-statistics

*Significant at a 5 per cent level

**Significant at a 1 per cent level
The results in Table 2 show that with the new data set the Aid * Policy term turns negative and insignificant and the t-statistic also turns negative. Likewise, for the sample for low-income countries. The only significant result for the Aid x Policy interaction, reported by ELR concerns regression 8, OLS, which uses ELR data, Burnside and Dollar (2000) country sample and time period 1970-1993 (0.38*, (2.36)) and ELR data, Burnside and Dollar (2000) countries and the extended time period (1970-1997) (0.40*, (2.38)).

Easterly, Levine and Roodman (2003) constructed a policy index that extended the original Burnside and Dollar (2000) data set by 4 years, following the same procedure as Burnside and Dollar (2000) in constructing the policy index. In addition, the authors extend the original data set by including more observations in the Burnside and Dollar (2000) time period. The Burnside and Dollar (2000) results do not hold with additional countries and extended coverage (W. Easterly et al., 2003). The Aid x Policy term enters insignificantly when using data from 1970-1997 (W. Easterly et al., 2003). The coefficient also changes markedly, turning negative, with a t-statistic of -1.09 (W. Easterly et al., 2003).

To test the robustness of their findings the authors apply the same procedure to Burnside and Dollar (2000) regression 8 (sample of low income countries, omitting outliers). As justification for this robustness test, the authors quote Burnside and Dollar (2000) that the low income sample might be a preferred sample to detect the effects of aid as well as the interaction between aid and policy (W. Easterly et al., 2003). Here again the Aid x Policy variable is not only insignificant but again changes sign (W. Easterly et al., 2003).

The fragility of the results remains apparent when changing the sample and methods (OLS and 2SLS). Results are shown in the table below (W. Easterly et al., 2003).
Table 3 – ELR Policy Index

<table>
<thead>
<tr>
<th>Sample/Estimation</th>
<th>Developing countries (outliers omitted)</th>
<th>Low-income countries (outliers omitted)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>2SLS</td>
</tr>
<tr>
<td>Burnside and Dollar (2000) original sample</td>
<td>.19 (2.61)**</td>
<td>.18 (-1.63)</td>
</tr>
<tr>
<td>Observations</td>
<td>270</td>
<td>270</td>
</tr>
<tr>
<td>ELR data, Burnside and Dollar (2000) countries, 1970-93</td>
<td>.34 (2.41)*</td>
<td>.56 (2.87)**</td>
</tr>
<tr>
<td>Observations</td>
<td>268</td>
<td>268</td>
</tr>
<tr>
<td>ELR data, full sample, 1970-93</td>
<td>-.08 (-0.65)</td>
<td>.11 (.52)</td>
</tr>
<tr>
<td>Observations</td>
<td>291</td>
<td>291</td>
</tr>
<tr>
<td>ELR data, Burnside and Dollar (2000) countries, 1970-97</td>
<td>.3 (1.96)</td>
<td>.38 (.75)</td>
</tr>
<tr>
<td>Observations</td>
<td>310</td>
<td>310</td>
</tr>
<tr>
<td>ELR data, full sample, 1970-97</td>
<td>-.15 (-1.09)</td>
<td>.01 (.05)</td>
</tr>
<tr>
<td>Observations</td>
<td>345</td>
<td>345</td>
</tr>
<tr>
<td>ELR data, full sample, outliers included, 1970-93</td>
<td>.05 (.82)</td>
<td>.07 (.86)</td>
</tr>
<tr>
<td>Observations</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>ELR data, full sample, outliers included, 1970-97</td>
<td>.05 (.81)</td>
<td>.06 (.79)</td>
</tr>
<tr>
<td>Observations</td>
<td>356</td>
<td>356</td>
</tr>
</tbody>
</table>

Numbers in parenthesis are t-statistics
*Significant at a 5 per cent level
**Significant at a 1 per cent level
The authors manage to reproduce statistical significance when restricting the data to the Burnside and Dollar (2000) sample (W. Easterly et al., 2003). The significance vanishes, however, for both OLS and 2SLS in either regressions 5 & 8 (full sample or low income countries), when using the Burnside and Dollar (2000) countries and ELR sample and period or ELR countries and Burnside and Dollar (2000) sample period and for samples including and excluding outliers (W. Easterly et al., 2003), (W. Easterly et al., 2003). Not only does the significance of the coefficient vanish, but the magnitude changes greatly too (W. Easterly et al., 2003).
Methodology

Introduction
The empirical method follows the general structure of Burnside and Dollar (2000). It will begin by describing the empirical model and data sources used in the investigation. This will be followed by a discussion of instruments and identification strategy.

Empirical Model
In order to test hypothesis one - that the effect of aid on growth is conditional on macroeconomic policies (i.e. trade openness, inflation, current account balance etcetera) the following equation is estimated:

Equation 1,

\[ g_{it} = y_{it}\beta_y + a_{it}\beta_a + p'_{it}\beta_p + a_{it}p'_{it}\beta_1 + z'_{it}\beta_w + g_t \]

Where \( i \) is the index (cluster) of countries, \( t \) is an index of time, \( g_{it} \) is per capita real GDP growth, \( y_{it} \) is the logarithm of initial real per capita GDP, \( a_{it} \) is aid receipts relative to GDP, \( p_{it} \) is a P x 1 vector of macroeconomic policies that affect growth, \( z_{it} \) is a K x 1 vector of other exogenous variables that might affect growth and \( g_t \) is a fixed time effect.

Hypothesis one assumes that if there were policies that affect growth, they would also affect the extent to which a gift of aid is used productively (Burnside & Dollar, 2000). Therefore, the aid term is interacted with policy (Burnside & Dollar, 2000).
Variables

The following six variables are included in the aid-growth model.

Initial Real GDP per Capita

Unlike the Burnside and Dollar specification, which uses the logarithm of initial real GDP per capita at the beginning of the period, this model includes initial real per capita GDP at the beginning of the period. This is included to capture the convergence effects in line with the neoclassical model of exogenous growth. This variable was collected from the World Bank data bank.

Broad Money (M2)

The final institutional variable from Burnside and Dollar (2000) is the level of broad money (M2) relative to GDP, which proxies for the development of the financial system. Due to concerns of endogeneity between the denominator (GDP) and dependent variable (GDP per capita growth) the variable is lagged as in Burnside and Dollar (2000). Small values are regarded as being associated with financial repression, while large values indicate greater financial liberalism (Durbarry Ramesh, Gemmell Norman, & Greenaway David, 1998). According to Burnside and Dollar (2000) this variable is an institutional variable, which proxies for the development of the financial system. The source for this data is the World Bank data bank.

Regional Variables

Regional dummies are included for Sub-Saharan Africa (SSA) and East Asia (EA). These variables control for the regional and income differences. Typically, SSA countries lie either in the low income or lower middle-income bracket (The World Bank).

Policy Index

As indicators of macroeconomic policies the following three variables as elements of $p_{it}$ (a P x 1 vector of macroeconomic policies that affect growth) are included:

- A dummy for trade openness developed by Sachs and Warner (1995)
The dummy for trade openness, developed by Sachs and Warner (1995), differentiates between closed and open economies. Closed economies are those with at least one of the following characteristics: Average tariff rates above 40 per cent; non-tariff barriers covering 40 per cent or more of trade; a black market exchange rate at least 20 per cent lower than the official exchange rate; state monopoly on major exports; or a socialist economic system (Wacziarg & Welch, 2008).

- Inflation

Following Fischer (1993), inflation is used as a measure of monetary policy (Burnside & Dollar, 2000). Fischer 1993 regards inflation as the best indicator of macroeconomic policy and Dubarry et al regard this variable as the best way to see if government has control of the macroeconomic.

- Current account balance forms the final part of the policy index.

This is relative to GDP.

A key feature of the policy index is that it weighs the policy variables according to their correlation with growth. This is done by using an OLS regression of the growth equation with no aid terms.

Equation 2,

\[ g_{it} = y_{it}\beta_y + p'_{it}\beta_p + z'_{it}\beta_z + g_t \]

Fixing the values of the coefficients that determine the policy index, let \( p_{it} = p_{it}'b_p \) where \( b_p \) is the OLS estimate of \( \beta_p \) in equation 3. Rather than estimating equation 1, equation 4 is estimated,

Equation 3,

\[ g_{it} = y_{it}\beta_y + a_{it}\beta_a + p_{it}\theta_p + a_{it}p_{it}\theta_1 + z'_{it}\beta_z + g_t \]

Equation 3 is a restricted version of equation 1.
Suppose that $\beta_{1j}/\beta_{pj} = \beta_{11}/\beta_{p1} = \theta_1$, $j = 2, 3$, where $\beta_{1j}$ and $\beta_{pj}$ are the $j$th elements of $\beta_1$ and $\beta_p$ respectively. Then equation 1 can be rewritten as:

Equation 4,

$$g_{it} = y_{it}\beta_y + a_{it}\beta_a + p_{it}\beta_p + a_{it}(p_{it}\beta_p)\theta_1 + z_{it}\beta_x + g_t$$

The base specification given by Burnside and Dollar is the OLS regression of the growth equation with no aid terms (Burnside & Dollar, 2000), as shown in equation 3. This regression is used to form the policy index comprising of budget surplus, inflation and trade openness. The regression coefficients are reported as follows:

$$Policy = 0.96 + 0.07 \cdot CurrAccBal - 0.35 \cdot Inflation + 1.02 \cdot Openness$$

As described above, this weighs the three policy variables according to growth. The constant 0.96 can be interpreted as a country's predicted growth rate, given its current account balance, inflation rate and trade openness, assuming that it has the mean characteristics of all other included variables (Burnside & Dollar, 2000).

OLS (1) is used to form a policy index comprising of Current Account Balance, Inflation and Trade Openness. The policy index is formed by using the regression coefficients from Table 1, Regression (1).

As described in the methodology, the policy index weighs the policy variables according to GDP per capita growth. This would mean that a constant rate of GDP per capita growth of 0.96 per cent given all other variables (excluding the policy variables) in the model have their mean values. As in the Burnside and Dollar study, openness has a large impact on the policy index, as shown by its large coefficient.
Aid/GDP

The standard definition of aid according to the DAC of the OECD is grants and concessional loans net of repayment of previous aid loans, which treats forgiveness of past loans as current aid. This measure of foreign aid is known as ODA, which is used in this thesis. This is taken from the OECD CRS. These data are in current U.S. dollars. Like in the Burnside and Dollar methodology this study converts them into constant 2005 dollars using the unit-value of imports price index from IMF. GDP is taken from the Penn World Tables in constant 2005 prices.

Net ODA Received per Capita (Current USD)

ODA per capita consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the DAC, by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients. It includes loans with a grant element of at least 25 percent (calculated at a rate of discount of ten percent). The source for this data is the OECD CRS.

Institutional Quality

Data for institutional quality are derived from the CPIA and UN database (Appendix A). Proxies for each of the indicators were compiled using the 2005 figure. Three CPIA variables are included, two represent the ICRG and one represents the BERI. Both the ICRG and BERI are used to create the institutional quality variable in Knack and Keefer (1995).
Sample

This chapter will discuss the countries selected and provide a definition of the income groups for low-income as well as middle-income countries. A full listing of the countries included in this study can be found in the appendices.

Countries

The countries selected for this study were those used in the Burnside and Dollar (2000) study. However, due to unavailable CPIA data for most middle-income countries, the sample used in this study is reduced by approximately half.

Income Groups

In the original study countries were categorized according to a) low income and b) Middle income. Countries defined as middle income had, in 1970, per capita real GDP greater than 1,900 constant (1985) USD. As in the Burnside and Dollar (2000) study an arbitrary figure of $1,900 GDP per capita in constant 2005 prices, at the starting period (1980 in this study) is used as the threshold.

The study sample includes 14 low income countries and 12 middle income countries (Appendix B).

Sample Period

Data in this study cover the years 1980-2007.
**Instruments**

OLS is bias in three situations

1. Omitted variables, correlated with one of the \( x_i \)
2. Measurement errors
3. Simultaneity / Simultaneous equations / reverse causality

Given the equation

\[ y_i = \beta_0 + \beta_1 x_i + u_i \]

\( \text{cov}(x_i; u_i) \neq 0 \)

\( x_i \) has two components

1. One which is correlated with \( u_i \)
2. The other part is uncorrelated with \( u_i \)

Aim: Isolate uncorrelated part of \( x_i \)

As stated in the empirical model, there is concern regarding the simultaneity bias in the aid-growth regressions, caused by the potential endogeneity of aid. Assuming aid is endogenous we have the following equation

\( \text{cov}(\text{aid}; u) \neq 0 \)

Given the following IV estimation of the multiple regression

\[ y_1 = \beta_0 + \beta_1 y_2 + \beta_2 x_1 + u_i \]

In this structural equation a distinction is made between endogenous and exogenous variables. The dependent variable \( y_1 \) is endogenous, as it is correlated with \( u_i \). Variables \( y_2 \) and \( x_1 \) are independent variables and \( u_i \) is the error term. We assume that \( E(u_i) = 0 \). Here \( x_1 \) indicates the exogenous variable, while \( y_2 \) is the endogenous variable, which we suspect is correlated with \( u_i \).
This may be due to omitted variable(s) in the structural equation, which are also correlated with $y_2$. Estimation by OLS will lead to biased and inconsistent estimators.

We need an instrument(s) $z_i$, which is correlated (either positively or negatively) with $y_2$.

$$y_2 = \pi_0 + \pi_1 x_1 + \pi_2 z_i + v_i$$

We test the null hypothesis that $\pi_2 = 0$ using the t statistic. The key identification assumption is that $\pi_2 \neq 0$.

An IV must satisfy two requirements: $\text{cov}(z_i; u_i) = 0$ and $\text{cov}(z, x) \neq 0$. We have seen a method to test whether the second requirement can be tested. The first requirement cannot be tested because it involves the unobservable error. We must assume that one of the IVs in the equation is not correlated with $u_i$. Then, we test the over identification restrictions for 2SLS.

The first instrument used in this study is the logarithm of population. This data comes from the Penn World Tables (PWT). This instrument was among those used by Burnside and Dollar (2000). The second instrument comes from the paper by Rajan and Subramanian (2008). Country area (in square km) is suggested by these authors,

“When the log of area is used as the sole instrument, it yields good first stage results.” (Rajan and Subramanian 2008)

In this thesis the logarithm of the country’s land area in square km is used. This data comes from the World Bank Data bank.
Endogeneity of Aid

This chapter will discuss the instruments used in the study and provide an overview of the statistical problems involved in the aid growth studies and the solutions to these problems.

The Identification Problem

The biggest problem in evaluating aid effectiveness, by way of regression analysis, arises because politicians direct aid flows to countries where the resources are perceived to be most needed: The poorest countries (Carl-Johan Dalgaard & Henrik Hansen, March 2009). If observed aid flows are distributed according to GDP per capita it becomes virtually impossible to interpret the association between aid and growth that are recovered from simple regression analysis (Carl-Johan Dalgaard & Henrik Hansen, March 2009).

Figure 2 – The Identification Problem

Source: (Carl-Johan Dalgaard & Henrik Hansen, March 2009)
The box labelled “instrument” is meant to encompass a factor which affects aid disbursements (Carl-Johan Dalgaard & Henrik Hansen, March 2009). Notice that the box “instrument” is not connected to any other box, aside from aid (Carl-Johan Dalgaard & Henrik Hansen, March 2009). Hence, the instrument does not affect growth (above its impact via aid), it is independent of other factors (intervening variables) that explain growth, and it is not itself explained by growth (Carl-Johan Dalgaard & Henrik Hansen, March 2009). Let us call it ‘size’, measuring the size of countries for example, by population size (Carl-Johan Dalgaard & Henrik Hansen, March 2009). The identification problem can now be addressed as follows. First, one must figure out how much of the cross-country differences in aid levels can be explained by country size (Carl-Johan Dalgaard & Henrik Hansen, March 2009). Second, one takes the amount of aid that size-and only size-can motivate in each country in the world, and look at the association with observed growth rates in these countries (Carl-Johan Dalgaard & Henrik Hansen, March 2009). If a significant association prevails it can be said that this is because aid affects growth. (Carl-Johan Dalgaard & Henrik Hansen, March 2009)

**Instrumental Variables**

Boon (1995, 1996) used IV techniques and concluded that aid has no significant positive impact on growth.

As explained earlier it is crucial to determine instrumental variables, which are correlated with aid but uncorrelated with growth. The purpose of this section is to determine which variables to include as instruments.

- The first variable is population

Population is a key determinant of aid because it determines the influence a donor has on the recipient country. Countries that receive aid with low populations, donors will generally have more influence over the country. This may not always be the case, especially when a donor does not have colonial ties with the recipient country. In this case, it will more likely be the country with colonial ties, which provides most aid, regardless of population.

Given that donors will provide more aid to countries with lower population due to strategic interests of the donors it can be argued that population will provide a good instrument, as it will
be correlated with aid. However, an instrument must also be uncorrelated with the dependent variable growth.

Burnside and Dollar (2000) in their investigation of aid growth and policies, use logarithm of population among their instrumental variables. They argue that these variables reflect donors’ strategic interests and therefore should fulfil condition of ‘instrument relevance’ i.e. that they are correlated with the endogenous variable aid as well as ‘instrument exogeneity’ i.e. that it is uncorrelated with the dependent variables growth.

- The second variable is land area (in square km)

This is another strategic variable, which proxies for donor strategic interests. Donors will give aid to recipient countries based on land area because countries with larger land area require more aid as their projects will be larger. However, the results show that more aid is given to countries with larger area. This will be further discussed in later part of this thesis.

1. First stage regression

In the first stage, the endogenous variable is regressed on all other exogenous variables. In this case, Aid (the endogenous variable) is regressed on all the institutional, policy and regional variables. This is called the reduced form equation. This is the first part of the 2SLS procedure, which is done to ensure that only the uncorrelated part of Aid is regressed in the structural equation i.e. the base equation (where aid is an independent variable). By regressing Aid on all other variables in the reduced form equation, as well as the instrumental variables ($z_i$) (which must fulfil the instrument relevance and instrument exogeneity conditions). Given these conditions are fulfilled, the first stage regression will ensure that only the exogenous part of Aid is used in the second stage of the 2SLS procedure.

2. 2SLS

There are various statistical programs, which can be used to produce the regression results. In this investigation STATA is used to produce the regression results. SAS is alternative program, but requires specialist coding in order to produce standard errors, which are adjusted to account for the two stages of the regressions. This is possible in both SAS and STATA.
3. STATA

Another reason for using STATA instead of SAS is that because time dummies are used for each country from 1980-2007 the data is set up so that the standard errors must be cluster robust. This requires specialised code, which was unavailable at the time of the study. STATA provided both the standard errors, which were consistent in both the first and second stage regressions. This program also provided the user with the possibility of cluster robust standard errors. These were needed to ensure that standard errors were robust across countries. (Boone, 1996)
Results

In this section the empirical findings will be presented and analysed.

Deriving the Policy Variable

As earlier discussed the relevant policy variables to include was determined based on economic theory and previous research to be current account balance relative to GDP, inflation as well as the openness of a country. In this section an initial test of the Burnside and Dollar (2000) model will be performed with a special focus on the policy variables.

As explained in the methodology section the following type of variables are included as independent variables:

Table 4 – Independent Variables

<table>
<thead>
<tr>
<th>Type</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergence</td>
<td>Initial GDP per capita</td>
</tr>
<tr>
<td>Institutional</td>
<td>Money and quasi money relative to GDP lagged</td>
</tr>
<tr>
<td></td>
<td>CPIA business regulatory environment dummy</td>
</tr>
<tr>
<td></td>
<td>CPIA property rights and rule-based governance dummy</td>
</tr>
<tr>
<td></td>
<td>CPIA transparency, accountability, and corruption dummy</td>
</tr>
<tr>
<td>Regional</td>
<td>Sub Sahra Africa</td>
</tr>
<tr>
<td></td>
<td>East Asia</td>
</tr>
<tr>
<td>Policy</td>
<td>Current account balance relative to GDP</td>
</tr>
<tr>
<td></td>
<td>Log 1+Inflation (Annual % CPI)</td>
</tr>
<tr>
<td></td>
<td>Openness (Sach-Warner index)</td>
</tr>
<tr>
<td>Endogenous</td>
<td>Official development aid relative to GDP</td>
</tr>
<tr>
<td>Instruments</td>
<td>Logarithm of population size</td>
</tr>
<tr>
<td></td>
<td>Logarithm of land area in km$^2$</td>
</tr>
<tr>
<td>Time Dummy</td>
<td>Year dummy</td>
</tr>
</tbody>
</table>
Table 5 contains two regressions. *Regression (1)* is constructed using GDP per capita growth as the dependent variable and including the above mentioned variables apart from the instruments and the endogenous variables.

**Table 5 - Growth Regressions: Using all Countries and the Individual Policy Variables**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>First stage regression</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regression (1)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial GDP per capita</td>
<td>-0.00334 (0.004135)</td>
<td>-0.00404 (0.003745)</td>
<td>-0.005311 (0.003249)</td>
</tr>
<tr>
<td>Money and quasi money/GDP lagged</td>
<td>0.028026 (0.005323)**</td>
<td>0.028075 (0.005187)**</td>
<td>0.028157 (0.004768)**</td>
</tr>
<tr>
<td>CPIA business regulatory environment rating (1=low to 6=high) (d-1 if rating &gt;3)</td>
<td>0.024606 (1.864404)</td>
<td>0.093053 (1.770985)</td>
<td>-0.004176 (1.49783)</td>
</tr>
<tr>
<td>CPIA property rights and rule-based governance rating (1=low to 6=high) (d-1 if rating &gt;3)</td>
<td>1.025672 (6.71577)</td>
<td>1.161159 (5.704735)**</td>
<td>1.407529 (4.384982)**</td>
</tr>
<tr>
<td>CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high) (d-1 if rating &gt;3)</td>
<td>1.877054 (6.281984)</td>
<td>1.984887 (5.254940)</td>
<td>2.179624 (5.387318)</td>
</tr>
<tr>
<td>BCA (d-1 if BCA)</td>
<td>1.44346 (0.60843)**</td>
<td>1.25682 (0.587017)**</td>
<td>0.934732 (0.566719)</td>
</tr>
<tr>
<td>EA (d-1 if EA)</td>
<td>2.134032 (7.52596)**</td>
<td>1.927558 (6.129838)**</td>
<td>1.552532 (3.820268)**</td>
</tr>
<tr>
<td>Current account balance/GDP</td>
<td>0.668280 (0.047476)</td>
<td>0.05014 (0.046550)</td>
<td>0.01888 (0.049285)</td>
</tr>
<tr>
<td>Log 1 + Inflation (Annual % CPI)</td>
<td>-0.350028 (2.161243)</td>
<td>-0.257540 (2.345111)</td>
<td>-0.281383 (2.168885)</td>
</tr>
<tr>
<td>Openness (Sachs-Warner)</td>
<td>1.019077 (0.508339)**</td>
<td>1.121753 (0.459795)**</td>
<td>1.331819 (0.448308)**</td>
</tr>
<tr>
<td>Total ODA/GDP</td>
<td>-0.221933 (0.6914623)**</td>
<td>-0.024921 (0.185099)**</td>
<td>-1.179058 (14.46979)**</td>
</tr>
<tr>
<td>Logpop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logarea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>9502122</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>580</td>
<td>580</td>
<td>580</td>
</tr>
<tr>
<td>R² (Adj R-squared for 1st stage)</td>
<td>0.24609</td>
<td>0.2486</td>
<td>0.2232</td>
</tr>
<tr>
<td>Std. Err. adjusted</td>
<td>26 clusters in countryname</td>
<td>26 clusters in countryname</td>
<td>26 clusters in countryname</td>
</tr>
</tbody>
</table>

- 188
- 188

The dependent variable is real per capita GDP growth from World Bank Databank. Standard errors are robust variance estimates in parentheses.
- Significant at the 10% level.
- ** Significant at the 5% level.

The most important finding from *Regression (1)* relating to the policy variables is that they have their intuitive signs. Current account balance relative to GDP is positive, which is intuitive as a current account surplus is expected to have a positive effect on GDP growth per capita.

Conversely, Logarithm of inflation affects GDP per capita growth negatively, which is also as expected. The final policy variable Openness Index developed by Sachs and Warner (1995) has a positive sign as expected and is significant at the ten per cent level.

However, current account balance relative to GDP and inflation are not significant at ten per cent. The finding here is different from Burnside and Dollar (2000) who find that the variables...
are significant both at five per cent and ten per cent level. There are however several differences that exist between the data used in this study and the data employed by Burnside and Dollar (2000). The first is the difference is time period. Burnside and Dollar (2000) analyse a time period spanning 1970 to 1993, while in this study the time period spans from 1980 to 2007. The second difference is the fact that Burnside and Dollar (2000) use four year panel data, while in this study one year time dummies are used. Another possible explanation for this difference could be that Burnside and Dollar (2000) use budget balance relative to GDP instead of current account balance relative to GDP. The insignificance of these variables means that they should be removed. However, following the lead of Burnside and Dollar (2000) this study will continue to use the policy variables.

Regression (1) also gives an indication of the other significant variables. The most significant results shown are Sub Sahara Africa (SSA), East Asia (EA), broad money/GDP (M2) and Openness index Sachs and Warner (1995).

Regression (2) presents the results with Aid relative to GDP (Aid) included in the model. It has a negative sign and is significant at the five per cent level. Adding Aid, the policy variables maintain their similar values. The Openness index developed by Sachs and Warner increases from the ten per cent to the five per cent level of significance. The institutional variable M2, as well as the regional variables SSA and EA maintains their significance from Regression (1) to Regression (2). The CPIA property rights and rule-based governance rating, becomes significant at the five per cent level in Regression (2). Most importantly, there is a significant negative relation between Aid and GDP per capita growth in both OLS and 2SLS.

In the first stage of the 2SLS procedure, where Aid is the dependent variable, both instruments the logarithm of population and logarithm of land area are both significant at the five per cent level. This satisfies the first condition of an instrumental variable which is the instrument relevance:

\[ \text{cov}(z,x) \neq 0 \]

Moving from OLS to 2SLS estimation Aid becomes more negative and remains significant at a five per cent level.
The institutional variable M2, regional variable EA and policy variable Openness Index maintain their significance. Openness index remains significant and maintains its large impact. Current account balance relative to GDP and inflation maintain their intuitive signs but remain insignificant. In the 2SLS regression the regional dummy SSA reduces from a five per cent level to a ten per cent level of significance and increases in magnitude, yet remains negative, as expected.

Furthermore, it can be seen that including Aid in Regression (2) has little effect on the coefficients of the Policy variables. This finding is in line with Burnside and Dollar (2000) i.e. that aid has little or no impact on the policy variables. Therefore, it indicates that when the policy index is used in table 2, Regression (3) it is expected to be close to one.

Policy Index

The main finding from Table 5, Regression (1) is that it enables the construction of the Policy Index. Even though two of the variables (current account balance relative to GDP and inflation) were insignificant at 10 per cent, they will still be used in order to follow the Burnside and Dollar (2000) methodology, as closely as possible. The policy index is constructed by applying the following formula also presented on page 27.

\[ \text{Policy} = 0.96 + 0.07 \cdot \text{CurrAcc Bal} - 0.35 \cdot \text{Inflation} + 1.02 \cdot \text{Openness} \]

This means that a new variable; Policy has been created. An interesting observation is that for negative values of policy index, inflation is generally high.

Growth Regressions: Using all Countries and the Policy Index

Now that the Policy Index has been created a new set of regression can be run. Table 2 on the next page presents regressions with 580 observations over a period from 1980-2007, using time dummies for each year and cluster robust error terms. The sample used is for all countries, which includes 26 low and middle-income countries as defined using the Burnside and Dollar (2000) methodology (see sample section for further discussion of samples used).
<table>
<thead>
<tr>
<th>Table 6 – Growth Regressions: Using All Countries and the Policy Index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Estimation</strong></td>
</tr>
<tr>
<td>Initial GDP per capita</td>
</tr>
<tr>
<td>Money and quasi money/GDP</td>
</tr>
<tr>
<td>CPA index of regulatory environment rating (1-low to 5-high)</td>
</tr>
<tr>
<td>CPA index of transparency, accountability, and corruption in the public service rating (1-low to 5-high)</td>
</tr>
<tr>
<td>CPA index of rule-based governance rating (1-low to 5-high)</td>
</tr>
<tr>
<td>CPA index of performance of the legal system and rule of law</td>
</tr>
<tr>
<td>SFA (Fixed Effect)</td>
</tr>
<tr>
<td>EFA (Fixed Effect)</td>
</tr>
<tr>
<td>Total ODA/GDP</td>
</tr>
<tr>
<td>Total ODA/GDP &amp; Policy</td>
</tr>
<tr>
<td>Log Import</td>
</tr>
<tr>
<td>Log Exports</td>
</tr>
<tr>
<td>Time dummy variables</td>
</tr>
<tr>
<td>Observations</td>
</tr>
<tr>
<td>R² (adj R-squared in parentheses)</td>
</tr>
<tr>
<td>Wald Chi2 (5)</td>
</tr>
<tr>
<td>Std. Em. adjusted</td>
</tr>
</tbody>
</table>

The dependent variable is real per capita GDP growth from World Bank Databank. Standard errors are robust variance estimates in parentheses.

* Significant at the 10% level.

** Significant at the 5% level.
**Regression (3):** In this regression the Policy Index is used for the first time. Aid alone is significant at the five per cent level and negative, as in 2SLS. The institutional variables M2 and CPIA property rights and rule based governance; regional dummies SSA and EA and the Policy index are all significant in OLS. Initial GDP and the institutional variables M2 and CPIA ratings have their intuitive signs as do the regional dummies SSA and EA. The policy index is close to one, as expected and in line with Burnside and Dollar (2000). However, as previously mentioned, Aid is negative and significant, which is not as expected. A discussion of this will be necessary if from this study are consistent with these findings.

In the 2SLS regression all terms maintain their similar values and signs in comparison with OLS, although, the regional dummy SSA reduces significance from the five to ten per cent level. In addition, Aid becomes more negative and maintains its significance at the five per cent level in comparison to OLS.

In line with the discussion of Table 5, Policy is close to one in the OLS and 2SLS. This is as expected, as Aid had a minimal impact on the individual policy variables, when it was introduced in Regression (2).

The instruments logarithm of population and logarithm of area are significant at the five per cent level and so fulfil the ‘instrument relevance’ condition.

**Regression (4):** In this regression the interaction term between Aid and Policy is included. The institutional variable M2 maintains its significance and magnitude in both OLS and 2SLS. CPIA property rights and rule based governance rating and the CPIA business regulatory environment rating decrease in magnitude, but only CPIA property rights and rule-based governance rating remains significant at the five per cent level.

The regional dummy, SSA maintains its similar value and remains significant at the five per cent level in OLS and at the ten per cent level in 2SLS.

The interaction term between Aid and Policy is included to test the Burnside and Dollar (2000) hypothesis that aid is most effect under ‘good’ policy environments. It is significant at 5% and shows a negative effect on growth in the OLS estimation. The effect is slightly more positive but
remains negative in 2SLS estimations using logarithm of population and logarithm of area as instruments.

Regression (5): Here Regression (4) is expanded by including Aid$^2$ to express the diminishing returns to the accumulation of capital.

Burnside and Dollar (2000) chose to look at the Aid$^2$ x Policy interaction because it is in line with theory, when returns to capital are diminishing and it appeared to improve the fit of regression (Burnside & Dollar, 2000). This study follows this theoretical basis for aid and growth by including only the Aid$^2$ term. In line with theory, it has its expected sign (negative) in OLS but has an unexpected positive sign in 2SLS; these results are not significant in either OLS or 2SLS. It appears to increases the fit of the model.

Aid Policy interaction term is still negative in OLS and 2SLS. These findings are significant in OLS and insignificant in 2SLS. In line with Burnside and Dollar (2000), this result is unexpected. One expects a positive and significant interaction term.

The instrumental variables logarithm of population and logarithm of land area both fulfil instrument relevance for both the endogenous variables Aid and Aid$^2$.

Regression (6): In this regression outliers are excluded. The results will be compared to Regression (4), which has an identical specification, in terms of variables included. The method of outlier exclusion follows that of Burnside and Dollar (2000), by removing the same country years as in their study.
The following table show those country years, which are excluded when outliers are dropped in line with the Burnside and Dollar (2000) methodology:

**Table 7 - Outliers**

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gambia</td>
<td>1986-1989</td>
</tr>
<tr>
<td></td>
<td>1990-1993</td>
</tr>
<tr>
<td>Guyana</td>
<td>1990-1993</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>1986-1989</td>
</tr>
<tr>
<td></td>
<td>1990-1993</td>
</tr>
</tbody>
</table>

In comparison to *Regression (4)* the Aid Policy interaction term remains negative and remains significant at the five per cent level. This result is unexpected, in line with the Burnside and Dollar (2000) results. It also remains insignificant in 2SLS. Aid maintains significance in the 2SLS and remains negative, but increases slightly in magnitude. The policy index increases and remains significant and positive which is not in line with the Burnside and Dollar (2000) results. The regional variables SSA and EA maintain their expected values and significance. No major changes are found, when outliers are dropped, in comparison to *Regression (4).*
Growth Regressions: Using Low-Income Countries and the Policy Index.

For policy makers it could be of great interest to have a separate sample of low-income countries, as many of these countries may be most in need of aid. The purpose of this section will be to show how and whether aid has a positive effect on growth under a good policy environment in low-income countries.


The following table shows the full low-income country sample. For comparison, middle-income countries have also been included in the Table 8.

**Table 8 - Sample Countries**

<table>
<thead>
<tr>
<th>Low-Income Countries</th>
<th>Middle-Income Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gambia</td>
<td>Kenya</td>
</tr>
<tr>
<td>Ghana</td>
<td>Haiti</td>
</tr>
<tr>
<td>Madagascar</td>
<td>Indonesia</td>
</tr>
<tr>
<td>Malawi</td>
<td>Bolivia</td>
</tr>
<tr>
<td>Mali</td>
<td>Guyana</td>
</tr>
<tr>
<td>Niger</td>
<td>Honduras</td>
</tr>
<tr>
<td>Togo</td>
<td>Nicaragua</td>
</tr>
<tr>
<td>Zambia</td>
<td>Sri Lanka</td>
</tr>
<tr>
<td>Senegal</td>
<td>Cameroon</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Cote d’Ivore</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Sierra Leone</td>
</tr>
<tr>
<td>India</td>
<td>Zimbabwe</td>
</tr>
<tr>
<td>Pakistan</td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
</tr>
</tbody>
</table>
As can be observed from the table the GDP per capita threshold of USD 1,900 might be too low so that countries that might otherwise be considered low income are included in the middle-income country sample. For example, one might be cautious about including Sierra Leone or Zimbabwe in the list of middle-income countries. There are 332 observations for 14 countries over the period 1980-2007.

Table 9 on the following page shows the results from the low-income countries and the policy index.
Table 9 – Growth Regressions: Using Low-Income Countries and the Policy Index

<table>
<thead>
<tr>
<th>Estimation</th>
<th>OLS</th>
<th>2SLS</th>
<th>First stage regression</th>
<th>OLS</th>
<th>2SLS</th>
<th>First stage regression</th>
<th>OLS</th>
<th>2SLS</th>
<th>First stage regression (aid)</th>
<th>OLS</th>
<th>2SLS</th>
<th>First stage regression (aid)^2</th>
<th>OLS OD</th>
<th>2SLS</th>
<th>First stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial GDP per capita</td>
<td>0.00022</td>
<td>-0.00559</td>
<td>-0.001279</td>
<td>0.00185</td>
<td>-0.005585</td>
<td>-0.000199</td>
<td>0.000248</td>
<td>-0.001991</td>
<td>0.000299</td>
<td>-0.00176</td>
<td>0.001489</td>
<td>0.000266</td>
<td>-0.003309</td>
<td>0.0007641</td>
<td>-0.000499</td>
</tr>
<tr>
<td>Money and quasi-money/GDP</td>
<td>0.00002</td>
<td>-0.00009</td>
<td>-0.000049</td>
<td>-0.000089</td>
<td>-0.00009</td>
<td>-0.000089</td>
<td>-0.00005</td>
<td>-0.00001</td>
<td>-0.00001</td>
<td>-0.00001</td>
<td>-0.00001</td>
<td>-0.00001</td>
<td>-0.00001</td>
<td>0.000085</td>
<td>-0.00001</td>
</tr>
<tr>
<td>CPIA business regulatory environment rating (1 to 6)</td>
<td>-0.558028</td>
<td>1.950981</td>
<td>3.71247</td>
<td>-0.462055</td>
<td>1.924618</td>
<td>0.543899</td>
<td>0.528751</td>
<td>1.760299</td>
<td>0.615742</td>
<td>0.643879</td>
<td>0.538753</td>
<td>5.830563</td>
<td>6.25533</td>
<td>654874</td>
<td>5.152764</td>
</tr>
<tr>
<td>CPIA property rights and rule of law governance ratings (1 to 6)</td>
<td>3.422176</td>
<td>0.612602</td>
<td>0.616364</td>
<td>0.640455</td>
<td>0.618563</td>
<td>0.665582</td>
<td>0.515742</td>
<td>0.5203283</td>
<td>0.665582</td>
<td>5.830563</td>
<td>6.25533</td>
<td>654874</td>
<td>5.152764</td>
<td>654874</td>
<td>5.152764</td>
</tr>
<tr>
<td>CPIA transparency, accountability, and corruption in the public sector rating (1 to 6)</td>
<td>3.422176</td>
<td>0.612602</td>
<td>0.616364</td>
<td>0.640455</td>
<td>0.618563</td>
<td>0.665582</td>
<td>0.515742</td>
<td>0.5203283</td>
<td>0.665582</td>
<td>5.830563</td>
<td>6.25533</td>
<td>654874</td>
<td>5.152764</td>
<td>654874</td>
<td>5.152764</td>
</tr>
<tr>
<td>SBA (1 to 5)</td>
<td>-0.561096</td>
<td>0.920239</td>
<td>0.955313</td>
<td>-0.623254</td>
<td>-0.289902</td>
<td>0.989649</td>
<td>0.810493</td>
<td>0.948435</td>
<td>0.575873</td>
<td>0.712049</td>
<td>0.548435</td>
<td>0.324476</td>
<td>0.26385</td>
<td>0.712254</td>
<td>0.9853118</td>
</tr>
<tr>
<td>EIA (1 to 5)</td>
<td>-0.561096</td>
<td>0.920239</td>
<td>0.955313</td>
<td>-0.623254</td>
<td>-0.289902</td>
<td>0.989649</td>
<td>0.810493</td>
<td>0.948435</td>
<td>0.575873</td>
<td>0.712049</td>
<td>0.548435</td>
<td>0.324476</td>
<td>0.26385</td>
<td>0.712254</td>
<td>0.9853118</td>
</tr>
<tr>
<td>Policy</td>
<td>-0.561096</td>
<td>0.920239</td>
<td>0.955313</td>
<td>-0.623254</td>
<td>-0.289902</td>
<td>0.989649</td>
<td>0.810493</td>
<td>0.948435</td>
<td>0.575873</td>
<td>0.712049</td>
<td>0.548435</td>
<td>0.324476</td>
<td>0.26385</td>
<td>0.712254</td>
<td>0.9853118</td>
</tr>
<tr>
<td>Total ODA/GDP</td>
<td>-0.561096</td>
<td>0.920239</td>
<td>0.955313</td>
<td>-0.623254</td>
<td>-0.289902</td>
<td>0.989649</td>
<td>0.810493</td>
<td>0.948435</td>
<td>0.575873</td>
<td>0.712049</td>
<td>0.548435</td>
<td>0.324476</td>
<td>0.26385</td>
<td>0.712254</td>
<td>0.9853118</td>
</tr>
<tr>
<td>Total ODA/GDP Policy</td>
<td>-0.561096</td>
<td>0.920239</td>
<td>0.955313</td>
<td>-0.623254</td>
<td>-0.289902</td>
<td>0.989649</td>
<td>0.810493</td>
<td>0.948435</td>
<td>0.575873</td>
<td>0.712049</td>
<td>0.548435</td>
<td>0.324476</td>
<td>0.26385</td>
<td>0.712254</td>
<td>0.9853118</td>
</tr>
<tr>
<td>(Total ODA/GDP)^2</td>
<td>-0.561096</td>
<td>0.920239</td>
<td>0.955313</td>
<td>-0.623254</td>
<td>-0.289902</td>
<td>0.989649</td>
<td>0.810493</td>
<td>0.948435</td>
<td>0.575873</td>
<td>0.712049</td>
<td>0.548435</td>
<td>0.324476</td>
<td>0.26385</td>
<td>0.712254</td>
<td>0.9853118</td>
</tr>
<tr>
<td>Loggap</td>
<td>-1.206199</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
<td>0.614013</td>
</tr>
<tr>
<td>Loggaps</td>
<td>0.301587</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
<td>0.297952</td>
</tr>
<tr>
<td>Observations</td>
<td>332</td>
<td>0.3044</td>
<td>332</td>
<td>0.2432</td>
<td>332</td>
<td>0.545</td>
<td>332</td>
<td>0.314</td>
<td>332</td>
<td>0.2589</td>
<td>332</td>
<td>0.5055</td>
<td>332</td>
<td>0.3168</td>
<td>332</td>
</tr>
<tr>
<td>Wald chi2(34)</td>
<td>76.74</td>
<td>0.0000</td>
<td>76.74</td>
<td>0.0000</td>
<td>76.74</td>
<td>0.0000</td>
<td>76.74</td>
<td>0.0000</td>
<td>76.74</td>
<td>0.0000</td>
<td>76.74</td>
<td>0.0000</td>
<td>76.74</td>
<td>0.0000</td>
<td>76.74</td>
</tr>
</tbody>
</table>

The dependent variable is real per capita GDP growth from World Bank Databank. Standard errors are robust variance estimates in parentheses.

* Significant at the 10% level.
** Significant at the 5% level.

Note: n = number of observations

Note: d_ex dropped because of collinearity
As earlier discussed, the institutional variable CPIA rates countries from one to six (one for low and six for high a rating). Then the dummy variable is one if the rating is equal to or above three. In the low-income country sample all the observations have a CPIA dummy of one, which leads to perfect multicollinearity. Thus, this variable automatically dropped from the regressions. In the remaining of this section the finding from each regression will be discussed.

The East Asia dummy variable is also dropped from each regression due to perfect multicollinearity.

In the following analysis low-income country results will be directly compared to the all country sample.

Regression (7): The Aid coefficient increase but remains negative. It also loses significance in OLS compared with the all country sample. In the first regression for low-income countries (regression seven) Initial GDP per capital does not have its intuitive sign. M2, the CPIA ratings, SSA, and the policy index all have their intuitive signs in OLS. Both M2 and the CPIA property rights and rule-based governance are significant at the ten per cent level. CPIA transparency, accountability and corruption in the public sector rating and the policy index are significant at the five per cent level. Aid has a negative sign and is insignificant.

In 2SLS the Aid coefficient remains negative and maintains significance at the five per cent level. In the 2SLS estimations initial GDP per capita has its intuitive sign. M2 and CPIA property rights and rule-based governance rating also have their initiative signs, while CPIA transparency, accountability and corruption in the public sector rating and SSA do not have their expected signs.

Both instruments are significant in the first stage regression, which fulfils instrument relevance condition, but logarithm of area is only significant at the ten per cent level. This may cause serious problems in estimating 2SLS.

Regression (8): This regression introduces the interaction term. It shows that the interaction remains negative and significant at the five per cent level in OLS but insignificant in 2SLS. Both instruments are significant although, log area is again significant at the ten per cent level.
**Regression (9):** This regression introduces the Aid$^2$ term. In OLS the Aid$^2$ maintains its expected sign but remains insignificant. The instruments logarithm of population and logarithm of area are both insignificant for in the first stage regression for Aid$^2$.

**Regression (10):** Outliers are dropped in Regression (10). The results show that the interaction term remains negative in both OLS and 2SLS and maintains significance in OLS. It remains insignificant in 2SLS. Aid maintains negative value in both OLS and 2SLS. This result is significant in 2SLS. The instruments logarithm of population and logarithm of area are now both significant at the five per cent level in comparison to the all country sample.

**Main Findings**

The results of this study show that Aid affected GDP per capita growth negatively. This result is significant both for OLS and 2SLS, both in Table 5, Regression (2) where policy variables are introduced separately and for Table 6, Regression (3) where a Policy Index is constructed. In Regression (4), with the interaction term between Aid and the Policy Index, again Aid has a negative impact on GDP per capita growth, but this result is only significant in 2SLS. This result is robust in all 2SLS estimations, across samples (all country and low income) and when outliers are excluded. With the exception of the Aid$^2$ term being introduced (the Aid term is no longer significant in 2SLS) the negative Aid result is significant with and without the interaction term between Aid and Policy.

The Aid x Policy coefficient is significant and negative. The negative relationship between the interaction term and GDP per capita growth is significant across all OLS regressions in the all country sample. This also holds true for the low-income sample. However, this negative relationship is significant to a ten per cent level in Regression (9) (with Aid$^2$ term included).
Discussion

In the previous section this study found several unexpected results. Firstly that Aid affected GDP per capita growth negatively and secondly, that the relationship between the Aid-Policy interaction term and Per Capita GDP growth was also negative. In this section these finding will be discussed and analysed and the implications for policy makers will be evaluated. This discussion will take place in light of the Burnside and Dollar (2000) conclusions that Aid would be most effective in good policy environments.

There are several similarities between the Burnside and Dollar (2000) investigation and this study. Firstly, the Aid term decreases and becomes more negative in 2SLS. This similarity holds in all but one of the Burnside and Dollar (2000) regressions. Burnside and Dollar (2000) suggest that this is because of a positive correlation between aid and the error term

Before turning to the possible explanations for the inconsistency between this study and Burnside and Dollar (2000), the limitations of the data used will be discussed.

Limitation of the Data

One limitation with the data is the availability of it. For example, Somalia lacked sufficient GDP per capita and current account balance data and was therefore excluded from the sample. Several other countries lacked data going back to 1980, in order to overcome this, the nearest observation to the initial year was used. As mentioned in the Sample section only half the Burnside and Dollar (2000) sample was used in this study because only certain countries had CPIA ratings.

Variables not Included in the Model

Several of the Burnside and Dollar (2000) variables have been excluded from this study. The excluded variables will be discussed in the following section.
EDA vs. ODA

In the Burnside and Dollar (2000) study a version of Aid is used, which is called ‘Effective Development Aid’ (EDA). This has several advantages over ODA. The shortcomings of ODA (used in this study) will now be addressed.

The most important shortcoming of ODA data is the over-representation of loans with high concessionality. ODA includes the full face value of grants and highly concessional loans. However, concessional loans entail repayment obligations. Therefore, the inclusion in ODA of the full face value of these loans overestimates their true aid content. Only the grant element should be accounted at face value (CC, E, & L, Dec 1998).

Another shortcoming of ODA is that they consist of loans and grants, the latter sometimes includes Technical Assistance (TA)(CC et al., Dec 1998). Inclusion of this assistance is questionable due to its quid pro quo nature. Therefore one must focus on official flows, which exclude TA (CC et al., Dec 1998).

Ethnolinguistic Fractionalization and Assassinations

Selected individuals in a country belong to different ethnolinguistic groups. The assassination variable is the probability of an official government representative getting assassinated in the defined country.

Burnside and Dollar (2000) use the ethnolinguistic fractionalization data set from Easterly and Levine 1997, who apply the same assumption as with the institutional quality variable which changes slowly over time. Burnside and Dollar (2000) find that this variable is not significant and on that basis it was decided to exclude the variable from this investigation altogether. Assassinations and the interaction term between ethnic fractionalization and assassinations both had moderate explanatory power in the Burnside and Dollar (2000) initial regressions and it was therefore decided also to exclude these variables.

Easterly and Levine (1995) report that ethnic fractionalization is correlated with bad policies and poor growth performance after controlling for policies (Burnside & Dollar, 2000). It is therefore correlated with both policies and growth. Excluding this terms may result in some misspecification in the model.
Arms Imports

The Arms imports variable is an indicator of donor strategic interests. However, due to a substantial amount of missing data this variable was dropped. Burnside and Dollar (2000) use this variable as one of their instruments, however due to the large amount of missing data this variable could not be considered as an instrument in this study.

Discussion of Policy Index

In this thesis, the Burnside and Dollar (2000) Policy Index specification is preferred, which fixes the Policy Index, for all subsequent analysis using one specification of Equation 2, instead of a different measure of the Policy Index depending on the exact specification of the growth equation or sub sample of the data being used (Burnside & Dollar, 2000).

As can be seen in Equation 3 the policy is fixed based on this equation and is therefore dependent on the sample and growth equation used. Burnside and Dollar recognize that this may lead to misspecification in the model (Burnside & Dollar, 2000).

The Burnside and Dollar (2000) study uses budget surplus relative to GDP as part of the Policy Index, which includes foreign grants in revenue and aid-financed projects in expenditure, therefore there is no relationship between aid and this measure of budget surplus (Dollar & Kraay, 2001) (Burnside & Dollar, 2000). In the current study the current account balance is used instead, it is assumed that this is uncorrelated with Aid, however, this assumption is not tested.

With regard to endogeneity of policy variables, Burnside and Dollar (2000) test this but find no evidence of endogeneity of the policy variables (Burnside & Dollar, 2000). In this study the exogeneity of the policy variables is assumed but not tested. This may cause possible problems with the accuracy of estimations.
Conditionality and Policy Implications

In this section first the Burnside and Dollar (2000) findings will be discussed in relation to conditionality. Second, the Ravi Kanbur (2000) finding will be discussed. Lastly, the findings of this study will be presented and related to the above.

Figure 3 – Burnside and Dollar (2000) Findings

Burnside and Dollar (2000) findings show that Aid is most effective in good policy environments. Their findings also show that donors do not give aid to countries will good policy environments. These authors therefore conclude that if donors were to condition their aid based on good policy environments in the recipient countries, the aid given by the donor would be more effective.
Aid, Conditionality and Debt in Africa

Having shortly discussed the Burnside and Dollar (2000) findings, here a discussion of the Africa case will made before turning the findings of this study.

Africa can be seen as a test case of aid effectiveness. Ravi Kanbur argues that aid has failed in Africa, that aid conditionality has failed in Africa and that there is very little chance of recovery from this failure under the current institutional arrangements. It is the last remaining region in the world where official aid inflows outstrip private capital inflows, and they do by a large margin (RK, FAD ch18).

In using Africa as a test case, Ravi Kanbur focuses on aid in Africa, and so it follows that aid is at the centre stage when discussing development failures in Africa. The author notes, however, that aid plays 'quite a small part' of the development process in Africa. For example, Sach and Warner (1997) highlight the burden of geography and poor policies. Easterly and Levine (1997) through econometric analysis confirm the importance of ethnic fragmentation in explaining Africa's poor performance. Others lay the blame with international capital markets as well as Africa's specialisation in primary commodities. Despite the natural tendency among those discussing aid – supporters and critics alike – to talk up aid's impact on development, it is only a part, and perhaps a small part of the overall picture of why development has failed in Africa so far (RK, FAD, Ch18 p410).

Ravi Kanbur highlights two key relationships from the Burnside and Dollar (2000) study. He finds no simple correlation between aid and growth and that aid does not flow to countries with good policy environments. However, it can be argued that they may be no need for this relationship if aid flows to countries with bad policy environments induce or support improvements in the country's policy environment. Secondly and most importantly, the relationship between the macroeconomic policy environment and aid flows – which in fact reveals, that 'aid does not induce good policy environments' and therefore may not induce or support improvements is the country's policy environment.
Aid Conditionality

These results had a huge impact on the conditionality, which the international community placed on its aid flows, specifically directing aid towards good policy environments and encouraging good policy environments to emerge. Those like Burnside and Dollar (2000) argued that aid should be channelled towards those places with sound macroeconomic policy environments, as it would spur growth and development. But there were those who rejected, at least the detail of 'good macroeconomic policy environments' but still believed that conditionality with different sets of conditions were essential. One of the best-known proponents of this view is quoted:

“Oxfam believes that new forms of conditionality could help to bring about positive policy reforms...” “Governments and donors could, in principles, agree on incremental steps for raising investment in primary health care, basic education, and the provision of water and sanitation...”

“Most donor reject such an approach on the grounds that it would undermine the national sovereignty of developing country governments. They have been considerably less reluctant about eroding sovereignty in other areas; through their structural adjustment programs, donors have obliged governments to impose fees for primary education and basic health facilities, to devalue currencies, set interest rates at level dictated by the IMF, privatise who industries, and liberalise markets.” (Oxfam 1995)

Interaction between donors and recipients

Two major lines of argument exist in on the conditionality of aid to Africa. The first presents the argument that donors (multilateral, bilateral and aid agencies) are in such a strong position with respect to recipients that it diminishes the independence and national sovereignty of the recipient country. The other view, presented by Ravi Kanbur, made clear by the results of Burnside and Dollar (2000), Mosley et al and Oxfam is that the issue is much more subtle than imposing conditionality. In fact, the evidence shows that aid conditionality is often not adhered to. Instead, it is argued that the unhealthy donor recipient relationship leads to aid dependences, which cannot be captured simply as the strength of donors and weakness of recipients.

Many cases exist in the literature of the many pressures donors face precisely because they control so much of the funding, particularly in Africa. A stop in funding could disrupt debt servicing to the World Bank, the IMF, donor governments and private creditors. Côte d'Ivoire is an example of this. Aid agencies have an incentive to keep on good terms with recipient
countries, as this is a prerequisite for the continuation of aid flows. Any stop on funding would damage their relationship and put future projects at risk. The underlying message is that the aid system is dysfunctional and it is not clear where the strengths and weakness lie. In conclusion, the interpretation of the Burnside and Dollar (2000) results, in light of the state of aid in Africa is that aid flows have not helped to develop policies they were meant to be conditional on.

**Ravi Kanbur’s Conclusion**

Ravi Kanbur argued that the relationship between donors and recipients is far more complex than on the surface. He also argued that the institution of aid dependence is that much time is wasted on political mediation between donor agencies and recipient governments, which also has an impact on the political economy in the recipient country as well as the decisions made by its government.

Ravi Kanbur's hypothesis is that it is the volume of aid, in and of itself, that is a key feature of the dysfunctional aid institutions and relationships we currently see in Africa. He concludes that it is a tautology to say that were the current volume of aid delivered more effectively, it would have a better impact on growth and development.
The Findings of This Study

The following figure, illustrates the findings of this paper based on Table 6, Regression (6).

**Figure 4 – Findings of This Study**

This has two major implications. Firstly, the study finds that there is a significant negative relationship between aid and GDP growth per capita. In other words aid is not effective in improving GDP growth per capita.

The second and more important finding is that aid conditioned on a good policy environment is not significantly different from zero. This finding is inconsistent with the Burnside and Dollar (2000) finding that aid given under good policy environments is more effective.

In Table 5 and in Regression (1) it was found that two of the variables used to create the Policy Index were actually not significant. This might explain the difference between the Burnside and Dollar (2000) findings at the findings of this study. For future reference it may be useful in future studies to use alternative variables in the Policy Index that are more robust in the estimations.

Durberry et al (1998) consider alternative Policy Indices for example, collected taxes, Blackmarket exchange rate, Average trade ratio, openness defined by PWT, growth rate of total trade as a percentage of GDP. However, these authors’ findings indicate that the aid coefficient
did not change much in magnitude or significance, except when using trade as a percentage of GDP (Durbarry Ramesh et al., 1998).

The sample size of this study is considerably smaller than that of Burnside and Dollar (2000). Many of the countries in the Burnside and Dollar (2000) study lacked CPIA ratings. The CPIA rating was the preferred measure of institutional quality. This rating is produced by the World Bank and is readily available via the World Bank databank; this is in contrast to the institutional quality ratings used by Burnside and Dollar (2000). This may have influenced the results of this study.

The arguments for including the current account balance according to World Bank (1990) are that reductions in fiscal deficits have typically been at the core of successful stabilisation programmes and are prerequisites for successful structural adjustment and improved efficiency of investment. In regard to inflation, also insignificant in Table 1, regression (1) Fischer (1993) regards inflation rate as best indicator for macroeconomic policy. Durbarry (1998) argues that since high inflation rates tent to correlated with high inflation variability this might indicate the prevailing macroeconomic climate.

As highlighted in Durbarry (1998) investigation ‘Issues of sample composition and endogeneity deserve further attention.(Durbarry Ramesh et al., 1998)’ Durbarry (1998) also suggests that the Burnside and Dollar (2000) positive significant results for the Aid x Policy interaction and GDP per capita growth can also be exampled by sample period. Low-income country sample could imply low growth. This would explain the negative results of aid on growth or could also be caused by problems of endogeneity. Post liberalisation aid, which was lined to policy reform has been much more effective at generating faster growth. While, studies using data up mid 1980’s (pre liberalisation) find no significant effect of aid on growth.

It might seem unintuitive that aid destroys value through reduction in GDP per capita growth. However, a similar argument to that of natural resource exploitation can be made. For example it is sometimes seen that natural resource exploitation in a weak institutional context makes governments:

- Less Accountable and responsible to citizens
- Encourages rent seeking and other unproductive competition and can lead to
- Macroeconomic imbalances
- Weaker economic performance
- Violent conflict (in extreme cases)

International Aid can have similar effects in impeding the emergence of inclusive and responsive institutions. (World Bank, 2003). This might explain why this study finds a negative relationship between aid and GDP growth per capita.

Multilateral and bilateral aid agencies must therefore ensure that aid does not make governments less accountable. Aid must be used to help governments leverage domestic resources to bring about change.

Aid and natural resource rents share a key attribute “the potential for weakening the accountability of governments to its citizens.(World Bank, 2003)” Despite this weak relationship between contracting governments and its citizens, development agencies continue to extend loans (World Bank, 2003). This can have damaging effects, The World Bank (1998) aid effectiveness study showed that: (World Bank, 2003).

- Countries with poor policy receive as much aid as countries with bad policy.
- Aid has sometimes prolonged bad policy.
- Aid is fungible.

The results of this study agree with the above findings from the World Bank (1998) Aid effectiveness report.

Firstly, in countries where the exploitation of natural resources is abundant Aid may prolong bad policy environments. This is in line with the findings of this study, which finds that first of all aid has a negative significant impact on GDP per capita growth. Finally, the fact that aid is fungible means aid can be used for unproductive purposes by recipient governments. This again is in line with the results of this study, as aid could encourage negative growth as well as prolong a bad policy environment.
Furthermore this study found that the relationship between aid given in good policy environments and GDP per capita growth is insignificant, therefore more research must be done to address the causal relationship between aid policies and growth.

How can one increase aid effectiveness without incurring undue transaction costs? Donor need to ensure enhanced accountability mechanisms e.g. detailed project involvement or conditionality, until more permanent domestic measures based on transparency and participation are developed.

**Institutional Conditionality**

International financial institutions increasingly seek to promote emergence of better institutions and participatory approaches. The aim is therefore to strengthen coordination among donors and recipients by directly addressing problems of finding channels for disbursed interests. Debt relief is one way to address these problems, as it seeks to encourage reform and channel funds to development.

Recipient governments and donor governments are starting to address the problem by permitting greater transparency in the aid business. This has led to the following initiatives:

- Providing access to information
- Facilitating participation of society
- Poverty reduction strategy papers (PRSP), (Produced by the IMF), (World Bank, 2003)
Conclusion

The motivation of this paper was to use empirical methods to give donor as well as recipient governments an indication of aid effectiveness. Aid has been decreasing by donor countries over the last decade, as many have questioned its effectiveness and impact.

The purpose of this study was to test the Burnside and Dollar (2000) hypothesis that aid given to countries with good policy environments is more effective than aid given to countries with poor policy environments. Therefore, their methodology was applied using more recent data and instrumental variables.

Burnside and Dollar (2000) found firstly, the relationship between aid and GDP per capita growth to be insignificant. Secondly, that aid interacted with their measure of policy has a significant positive impact on GDP per capita growth. Finally, the authors conclude that aid would be more effective if it were conditioned on good policy. However, their results have been debated and disputed in the empirical literature. This was another reason for the study to apply and test the Burnside and Dollar (2000) methodology on more recent data.

This study found that the aid has a significant negative impact on GDP per capita growth. The second major finding of this study is that aid given under good policy environments does not have a significant impact on GDP per capita growth.

The differences between the findings of this study and the highly influential results of Burnside and Dollar (2000) have be argued from a number of different prospectives. The problems associated with natural resource exploitation are a reoccurring problem for developing countries. Similar problems have been recognised by the World Bank (2003) with regard to aid giving.

The discussion has also focused on the significance of the individual policy variables, which make up the policy index. This study found that current account balance and inflation were insignificant, when fixing the policy index in Table 5 on page 41. Nonetheless, the arguments for including these variables in the policy index are in line with aid growth literature.
It must also be recognising that limitations of sample size and differences in data collected in this study may also have been a cause of differences between the findings of this study and those of Burnside and Dollar (2000).

It is hoped that this study has added to the current aid effectiveness debate by revisiting the disputed Burnside and Dollar (2000) results and by putting fresh light on their findings. Further research is needed in the field of aid effectiveness to provide donors and recipients with better tools in order to improve development policy.
## Appendices

### Appendix A

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<th><strong>ICRG</strong></th>
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## Appendix B

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<th>Low-Income Countries</th>
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¹ GDP Per capita above 1,900 USD in 1980, constant 2005 prices, source: Penn World Tables
References


