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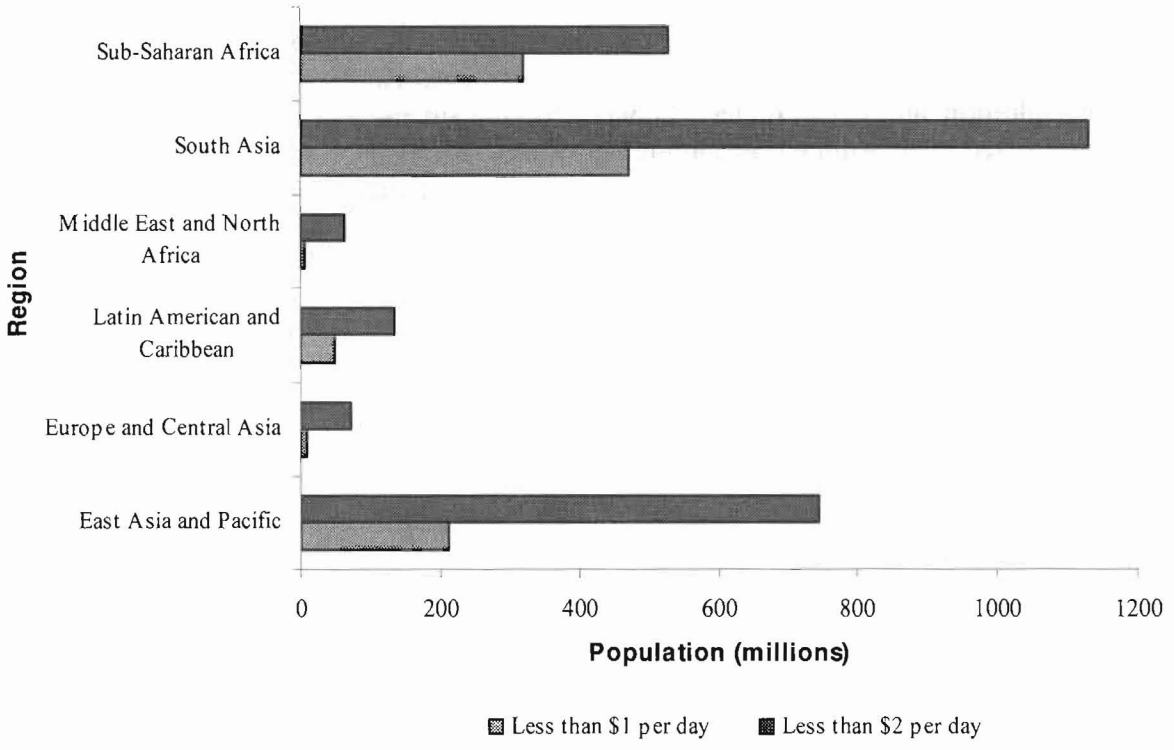
Abstract: Over one billion people across the globe live in extreme poverty, struggling to survive on less than one U.S. dollar per day. The persistently low levels of aggregate welfare and human development in developing countries have recently caught the attention of many politicians and social observers. As the developed nations and multinational organizations of the world are called upon to increase development assistance to these impoverished countries, a question must be asked: Will increased foreign aid effectively raise human development in developing countries? While many studies have analyzed the impact of development aid on economic growth in developing nations, few have addressed the impact of development aid on more comprehensive areas of development. Analyzing data on 87 developing countries from 1980 to 2000, this study employs two-stage least squares estimation to evaluate the impact of foreign aid on the Human Development Index (HDI), a composite index of development and aggregate welfare, while controlling for the level of pro-poor public expenditure within a developing country. In addition, an interaction term between foreign aid and a measure of macroeconomic policies is utilized to determine if economic policy has an impact on the effectiveness of development assistance. This study finds that greater foreign aid is associated with lower levels of HDI after controlling for GDP and pro-poor public expenditure. In addition, the study concludes that macroeconomic policies do not influence the level of HDI in developing countries.

I. Introduction

Individuals living in extreme poverty face some of the most severe conditions imaginable: hunger, epidemic disease, illiteracy, poor sanitation, lack of education, unclean drinking water, and more. For inhabitants of the developed world, these circumstances are barely comprehensible; but for millions of people living in developing countries, a bleak subsistence is a daily reality. In 2003, approximately 1.1 billion people across the globe survived on less than one dollar per day (in PPP-adjusted US dollars), while an additional 1.6 billion people lived on less than two dollars per day. Nearly 50.5 percent of the world's population live in extreme poverty as measured by the international poverty line of two dollars per day (World Bank, 2007). As Figure 1 illustrates, extreme poverty persists throughout the world, although it is unequally concentrated in South Asia, East Asia and the Pacific, and Sub-Saharan Africa.

Figure 1: Regional Distribution of Extreme Poverty in 2003



Source: Compiled from World Bank (2007)

While many individual countries and international organizations have attempted to reduce extreme poverty and promote development worldwide, the Millennium Summit in September 2000 brought together 191 nations in an effort to jointly develop an ambitious roadmap to improve the lives of individuals living in extreme deprivation. The resultant sense of urgency in fighting poverty and promoting development was reflected in the adoption of the Millennium Development Goals, which laid out eight large-scale objectives for reducing human indigence over the next fifteen years (Gilbert, 2004). First and foremost among these objectives was to halve, between 1990 and 2015, the proportion of people living on less than one U.S. dollar per day.

While policy makers have devised various strategies for achieving the comprehensive targets of the Millennium Development Goals, one approach which has received increasing attention among policy analysts and the media is to increase foreign aid. In March 2002, for instance, over fifty heads of state and 200 other high level officials met in Monterrey, Mexico at a UN conference on financing development. During the conference, developed nations agreed to increase their level of official development assistance to 0.7 percent of GDP. Following this conference, President George W. Bush also announced the creation of a new project, the Millennium Challenge Account, which would provide 10 billion dollars in aid over the next three years to developing countries who practice good governance.

Other public figures have also pushed for an increase in foreign aid to developing countries. Rock star Bono of U2, working closely with economist Jeffrey Sachs, has called on developed countries to increase aid to low-income nations. Moreover, many celebrities have lent their assistance to the ONE campaign, which lobbies the U.S. Congress to increase development aid by one percent of the federal U.S. budget.

With this recent push for increasing foreign aid, it is important to ask whether or not development assistance actually impacts the level of development in low-income countries. Numerous studies have examined the effect of foreign aid on growth rates in developing nations. However, economic growth does not necessarily lead to a reduction in extreme poverty levels, and few studies have actually looked at foreign aid's effect on poverty rates or human development. Since cross-country data on poverty rates over time are extremely sparse and often incomparable, measures of aggregate human welfare, such as the Human Development Index (HDI), can be used to determine the impact of development aid on the livelihood of the poor (Gomanee, Morrissey, Mosley, and Verschoor, 2005 p. 355). Welfare measures are likely to be correlated to levels of poverty in developing countries, and foreign aid is often aimed at reducing poverty by improving human development. Thus, this study will examine whether foreign aid has been effective in raising the level of human development and aggregate welfare, as measured by the HDI, within developing countries.

This study proceeds as follows. Section II reviews previous literature on the impact of foreign aid to developing countries. Section III develops an empirical model for analyzing the effect of foreign aid on overall development, while Section IV describes the data utilized in this study. Section V discusses the results of the empirical model, and Section VI provides conclusions and suggests possible policy implications.

II. Literature Review

A. *Aid's Impact on Economic Growth*

Numerous studies since the 1960s have attempted to determine empirically the effect of foreign aid on economic growth in developing countries. Prior to the late-1990s, such studies were hindered by inadequate data and econometric specification problems. Many studies, for

instance, were hampered by reverse causality, which portrays a negative impact between aid and growth rates since more aid is typically given to poorer countries (Easterly, 2003 p. 26). The literature examining the impact of aid on growth was rejuvenated, however, with the publication of the paper "Aid, Policies, and Growth" by World Bank economists Craig Burnside and David Dollar (2000, henceforth BD). Using data on development aid from a new World Bank database, BD analyze the effect of foreign aid on economic growth rates for 56 developing countries over four-year time intervals spanning from 1970 to 1993. Unlike previous studies which simply analyze the impact of aid on growth, the BD model includes an interaction term between foreign aid and an index of macroeconomic policies in order to determine if aid's impact on economic growth is affected by a country's macroeconomic policies.

To mitigate the problem of reverse causality, BD employ a two-stage least squares (2SLS) estimation technique. This technique controls for the endogeneity of aid by first regressing aid against several explanatory variables and then regressing growth in GDP against the predicted values of aid from the first equation along with other independent variables. Thus, BD develop two equations: one which estimates foreign aid based on national income coupled with an index of macroeconomic policy variables and several variables representing the recipient country's strategic importance to donating countries, and a second which predicts growth rates based on foreign aid along with an index of macroeconomic policy variables, an interaction between policy and aid, and a vector of control variables (such as ethnic fractionalization, education, etc.).

From their study, BD initially determine that aid by itself is insignificant in creating economic growth. However, when the authors include the aid*policy interaction term, the aid variable remains insignificant while the interaction term becomes significantly positive. This

result holds under several different specifications, including when ordinary-least squares regression technique is used (so that aid is treated as exogenous), as well as when only lower-income countries are considered. BD hence conclude that foreign aid can promote economic growth, but only in countries already engaged in pro-growth macroeconomic policies, such as low inflation, government budget surpluses, and openness to trade.

Although the publication of BD's influential paper prompted a renewed focus on the effect of foreign aid on economic growth in developing countries, many economists published studies questioning the robustness of BD's results. One line of criticism which probes the robustness of BD's findings focuses on the data employed by BD. Using the same econometric model as BD, William Easterly, Ross Levine, and David Roodman (2003) add more countries to BD's dataset while also extending the data to 1997. They find that the aid*policy interaction variable becomes negative and insignificant, indicating that good economic policies do not engender more growth for donor aid. Furthermore, many note that BD's results rest on the exclusion of five outliers which have a significant impact on the coefficient of the aid*policy interaction term. If alternative methods are used to exclude statistical outliers for the aid*policy variable as well as outliers for other variables, while keeping the same data and econometric model as BD, the results indicate that aid alone can have a positive, significant impact on economic growth, regardless of pro-growth macroeconomic policies (Dalgaard and Hansen, 2001 p. 33).

Other economists question whether altering the definitions of the variables used in BD's model impacts the conclusion that aid increases economic growth in countries with good economic policies. Easterly (2003) finds that the significance of BD's aid*policy interaction term is affected when the definitions of foreign aid, good economic policies, or economic growth

are modified. For instance, by including variables such as the black market premium, the ratio of money supply to GDP, or the change in trade-to-GDP ratio in the economic policy index, the interaction between foreign aid and policy becomes insignificant (Easterly, 2003). In contrast, BD's original results are confirmed when other definitions of good policy, such as the World Bank's Country Policy and Institutional Assessment (a broad measure of policies composed of 20 different components ranging from macroeconomic reforms and structural policies to policies of social inclusion and public sector management), are utilized in a model similar to that of BD (Collier and Dollar, 2001, 2002).

Controlling for factors beyond those considered by BD also impacts their results. Carl-Johan Dalgaard, Hernik Hansen, and Finn Tarp (2004) find that aid by itself does have a significant impact on economic growth when controlling for the fraction of a country located within the tropics. However, the effect decreases as the proportion of tropical landmass increases. Controlling for cross-country heterogeneity also shows that aid alone, regardless of macroeconomic policies, can stimulate growth. When Shuang Lu and Rati Ram (2001) include country-specific fixed effects dummy intercepts, they find that the aid*policy interaction term becomes negative and insignificant under these conditions, while the aid term becomes significant and positive. Patrick Guillaumont and Lisa Chauvet (2001) consider the possibility that aid effectiveness depends on the environment in the recipient country. Including an interaction variable between external and climatic shocks (such as terms of trade and real value of exports shocks) and aid, as well as a variable for external and climatic shocks alone, Guillaumont and Chauvet (2001) find that while aid is not more effective in countries with good macroeconomic policies, foreign assistance is more successful in producing economic growth in

countries vulnerable to environmental shocks. Guillaumont and Chauvet (2001) thus argue that aid should be targeted toward countries in danger of climatic or external shocks.

Another criticism of the BD model is that BD only control for the endogeneity of foreign aid while treating other variables as exogenous. Although BD assert that specification tests indicate that only aid is endogenous to the model, many researchers (e.g. Guillaumont and Chauvet (2001), Hansen and Tarp (2001), Hudson and Mosley (2001)) argue that variables such as inflation and budget deficits may also be endogenous to the model. Studies by Guillaumont and Chauvet (2001) and Hansen and Tarp (2001) indicate that when economic policy variables are treated as endogenous, aid increases growth regardless of the macroeconomic policies within a country.

Critics also note that BD model the nonlinear relationship between aid and growth only through the introduction of an aid*policy interaction variable. Economic theory does not provide definitive evidence for including the aid*policy interaction in the model while excluding other interaction terms or squared terms (Hansen and Tarp, 2001 p. 550). In fact, numerous studies choose to include an aid squared term in addition to the aid*policy interaction term to test for diminishing marginal returns to aid (e.g. Dalgaard and Hansen, 2001; Hansen and Tarp, 2001; Lensink and White, 2001; Collier and Dollar 2001, 2002). Many of these studies find the aid squared term to be significantly negative. Moreover, Robert Lensink and Howard White (2001) even hypothesize the existence of an "aid Laffer curve," in which after a certain point, foreign aid causes economic growth to decline.

B. *Aid's Impact on Consumption, Investment and Poverty*

While the majority of studies on aid effectiveness focus on economic growth, like BD's research, some economists have looked at the impact of development assistance on other

macroeconomic variables in developing countries. Peter Boone (1996) finds that foreign aid only increases consumption and does not increase investment in low-income countries. He estimates that nearly three quarters of development assistance finances public consumption while the other quarter finances private consumption. Similarly, Easterly (1999) illustrates that during the period from 1965 to 1995, foreign aid increases investment in only six out of the 88 developing countries he includes in his study. He further shows that increased investment, regardless of source, only triggers a significant increase in economic growth in four out of the 88 countries. These findings suggest that foreign aid does not stimulate investment, which in turn should spur long-term growth, as is typically intended by aid donors. In addition, this conclusion indicates that foreign aid is highly fungible so that targeting specific projects is difficult when distributing development aid.

More recent studies have also looked at the impact of foreign aid on extreme poverty in developing countries. Collier and Dollar (2001, 2002) argue that foreign aid reduces poverty by increasing economic growth. Therefore, the authors first estimate aid's impact on income per capita in a model similar to the BD model. Like BD, the authors find that aid is effective in promoting economic growth in countries with pro-growth macroeconomic policies. Collier and Dollar (2001, 2002) then develop a theoretical model to determine a poverty-efficient aid allocation rule which maximizes poverty reduction given a certain level of aid. From this model, they find that aid's impact on poverty depends on a country's initial level of poverty, its elasticity of poverty with respect to income, and its macroeconomic policies. Collier and Dollar (2001, 2002) assume that the elasticity of poverty with respect to per capita income, or the amount by which poverty decreases when per capita income increases, is constant at two. This value for the elasticity is taken from previous studies, which indicate that the mean elasticity

across a large sample of countries is equal to two. Collier and Dollar (2001, 2002) argue that the poverty-efficient aid allocation rule illustrates that aid should be redirected to countries with good economic policies and higher poverty rates, *ceteris paribus*, until the marginal productivity of aid in decreasing poverty is equalized across countries. The authors estimate that by allocating foreign aid in this way, an additional 9.1 million people could be lifted out of poverty.

While development aid may spur poverty alleviation by promoting economic growth, others argue that aid could impact the level of poverty within a country through channels other than growth. Paul Mosley, John Hudson, and Arjan Verschoor (2004) contend that aid can impact poverty directly (for instance, through projects aimed at raising the incomes of individuals living below the poverty line), through growth, or by influencing the elasticity of poverty with respect to growth. Additionally, the authors hypothesize that pro-poor expenditure (PPE), such as expenditure on healthcare, education, water and sanitation, rural roads, and agriculture, can impact the elasticity of poverty with respect to growth. Because of the multiple mechanisms by which aid affects poverty, the authors attempt to estimate the impact of aid on poverty while treating aid, poverty (measured by the headcount index of the number of people living on less than one US dollar per day), and PPE as endogenous. Mosley, Hudson, and Verschoor (2004), therefore, utilize the generalized method of moments (GMM) technique to simultaneously estimate three equations, one for each of the endogenous variables. From this model, the authors determine that aid not only has a significant, negative impact on poverty, but that donor assistance also increases PPE in countries with low initial incomes. They further find from the regression relating poverty to per capita income and the PPE index that the elasticity of poverty with respect to income across all countries receiving aid is 0.48, which is significantly lower than the elasticity of two assumed by Collier and Dollar (2001, 2002).

C. *Aid's Impact on HDI*

Since data availability on poverty is relatively sparse, few studies look directly at the influence of foreign aid on poverty measures. However, several studies do address the impact of donor assistance on development and welfare, as measured by such indicators as the Human Development Index (HDI), literacy rates, or infant mortality rates. These measures are highly correlated with the level of poverty in developing countries and may even be superior to income measures of poverty, which do not consider the nonmonetary factors of being poor (Gomanee, Morrissey, Mosely, and Verschoor, 2005 p. 356). When controlling for the level of PPE in recipient countries, Karuna Gomanee, Oliver Morrissey, Mosely, and Verschoor (2005) show that foreign aid can increase HDI levels and reduce infant mortality rates. The authors construct a weighted PPE index to capture the impact of each category of expenditure (education, healthcare, and sanitation, housing, and water) on infant mortality rates and HDI. Gomanee, Morrissey, Mosley, and Verschoor (2005) then use OLS estimation to regress the two different measures of aggregate welfare against the PPE index, per capita income, government military expenditure, and foreign aid for 104 countries from 1980 to 2000. The authors determine that although the PPE index does not significantly impact either measure of welfare, aid itself directly influences HDI and infant mortality rates.

Gomanee, Girma, and Morrissey (2003) also develop a similar empirical model looking at the effect of development aid, PPE, and military spending on HDI and infant mortality rates. However, they appeal to quantile regression techniques rather than OLS in order to determine if the impact on aid differs based on a country's level of initial welfare. While the level of PPE is determined to have a positive impact on both measures of welfare when controlling for initial welfare, the authors confirm Gomanee, Morrissey, Mosley, and Verschoor's (2005) result that

aid increases HDI and decreases infant mortality rates in recipient countries. Gomanee, Girma, and Morrissey (2003) further find that foreign aid and PPE are more effective at improving both measures of welfare in countries with low initial levels of aggregate welfare.

Nadia Masud and Boriana Yontcheva (2005), on the other hand, analyze the impact of different types of aid on infant mortality and literacy rates. The authors consider two different sources of aid—bilateral aid and aid donated by European NGOs—to determine if these different types of assistance have similar impacts on infant mortality and literacy rates. The results of this analysis are mixed: while neither type of aid influences literacy rates, NGO aid significantly decreases infant mortality in recipient countries (Masud and Yontcheva, 2005). Thus, it is important to recognize that the type of aid, whether bilateral, multilateral, or NGO generated, may influence the effectiveness of the assistance.

As can be seen, many studies have analyzed the effectiveness of foreign aid in developing countries. While BD find that foreign aid can promote economic growth in nations which possess pro-growth economic policies, studies since the publication of BD's seminal paper have found a wide array of results, ranging from aid being ineffective in all policy environments to aid being effective regardless of the policy environment. These papers demonstrate that BD's results are not robust when alternative definitions of policies and aid are utilized, when additional control variables are added to the model, when other variables in the model are treated endogenously, or when further nonlinear terms are included. Since GDP growth does not necessarily improve the quality of life for all citizens in a developing country, several authors have extended the BD model to explore the impact of aid on extreme poverty, aggregate welfare, and human development. Many of these studies find that foreign aid is effective in increasing aggregate welfare and human development. However, none of the studies

consider whether development assistance has a greater impact on welfare and development in countries with pro-growth macroeconomic policies. In addition, only one study controls for the endogeneity of foreign aid when analyzing the impact of foreign aid on extreme poverty or aggregate welfare.

This study, in fact, seeks to extend the previous literature looking at the effect of foreign aid on aggregate welfare by considering the impact of macroeconomics policies and the endogeneity of foreign aid. A policy index (similar to BD's index) is thus considered in order to control for the effect of macroeconomic policies on HDI. This policy index is also interacted with foreign aid to create an aid*policy interaction term to determine if macroeconomic policy has an impact on the effectiveness of development assistance in improving HDI. In addition, this research will utilize 2SLS in order to ascertain if foreign aid continues to increase aggregate welfare and human development when aid is treated as endogenous.

III. Empirical Model

Previous studies have used a variety of measures to capture the impact of aid on levels of development. The most frequently utilized statistic for human development (Gomanee, Girma, and Morrissey (2003); Mosley, Hudson, and Verschoor (2004); and Gomanee, Morrissey, Mosley, and Verschoor (2005)) is HDI, or the Human Development Index, which is published annually in the United Nations Development Program's *Human Development Report.* HDI offers a more comprehensive measure of welfare and development in comparison to GDP per capita because it considers school enrollment, literacy rates, and life expectancy, in addition to GDP per capita. Specifically, HDI is an average of GDP per capita, education levels (measured by a weighted average of school enrollment and literacy rates), and life expectancy for each country (Appendix I details exactly how HDI is calculated). While income measures, such as the

headcount index, could be utilized to quantify extreme poverty or welfare in developing countries, these measures are not widely available over time and do not consider the nonmonetary aspects of being poor. HDI, on the other hand, considers non-pecuniary factors of poverty, such as life expectancy and school enrollment, and thus provides a better measure of overall poverty.

Although difficulties exist when comparing a country's total welfare with that of its poorest citizens, poverty levels are likely to be lower in countries with higher levels of HDI; and measures aimed at increasing HDI are likely to improve the livelihood of those living in poverty (Gomanee, Morrissey, Mosley, and Verschoor 2005 p. 356). Because previous research indicates that aid can increase a nation's HDI through a variety of channels--both directly, such as when foreign aid finances projects aimed at providing greater access to public healthcare or education (Gomanee, Morrissey, Mosley, and Verschoor 2005 p. 356), and indirectly, such as when aid contributes to economic growth or boosts the level of government expenditure on sectors benefiting the poor (Mosley, Hudson, and Verschoor, 2004 p. 221), these variables need to be considered in order to determine the impact of foreign assistance on HDI.

A. *Controlling for Initial Income*

Like the model employed by Gomanee, Morrissey, Mosley, and Verschoor (2005), $GDP0/capita_{it}$ is included in the model in order to control for initial income per capita. This variable represents constant dollar GDP per capita for country i in the year preceding the start of time period *t*. By considering income per capita in the year preceding the start of the time period, the model controls for the effect of GDP on HDI since any aid disbursement could increase GDP in the current time period. Because an increase in per capita income directly increases aggregate

welfare in developing countries, real GDP per capita is predicted to have a positive impact on HDI.

B. *Controlling for Pro-Poor Expenditure*

Aggregate welfare in a country can also be impacted by the level of government spending on various social sectors. This study, therefore, follows the works of Mosley, Hudson, and Verschoor (2004), Gomanee, Girma, and Morrissey (2004), and Gomanee, Morrissey, Mosley, and Verschoor (2005) by controlling for the level of government pro-poor expenditure (PPE) in a developing country. These previous studies indicate that certain sectors of public spending increase aggregate welfare, especially for the most impoverished citizens (Gomanee, Morrissey, Mosley, and Verschoor, 2005 p 357). Expenditures on health, education, and sanitation are particularly likely to raise aggregate welfare since these three sectors are most closely linked to the measures included in HDI (Gomanee, Morrissey, Mosley, and Verschoor, 2005 p 358). Thus, greater PPE within a country should be positively correlated with HDI. In order to measure the various expenditures that comprise PPE, Gomanee, Girma, and Morrissey (2004) and Gomanee, Morrissey, Mosley, and Verschoor (2005) create two PPE indexes. First, the authors construct an unweighted pro-poor expenditure index, UPPE/GDP, which is the sum of expenditure on health, expenditure on education, and expenditure on housing, sanitation, and water, all taken as a percentage of GDP. Thus,

(1) $UPPE/GDP = P_h/GDP + P_e/GDP + P_s/GDP$

where P_h/GDP is government expenditure on health relative to GDP, P_e/GDP is government expenditure on education relative to GDP, and P_s/GDP is government expenditure on housing, sanitation, and water relative to GDP.

Although the UPPE/GDP index is simple to construct, it assumes that the three components have an equal impact on aggregate welfare. This assumption, as Gomanee, Morrissey, Mosley, and Verschoor (2005) demonstrate, is empirically false. The authors thus create a second index, BPPE/GDP, which uses beta-weights in order to capture the relative impact of the three expenditure categories on HDI. These beta-weights are determined from a regression of HDI on expenditures on health, education, and housing, sanitation, and water[1]. Once the beta-weights are determined, the index is computed according to equation (2):

(2) $BPPE/GDP = \beta_h P_h/GDP + \beta_e P_e/GDP + \beta_s P_s/GDP$.

It has also been argued that foreign aid is often utilized to finance greater pro-poor expenditure by recipient governments. PPE, therefore, could be a function of aid, and including both PPE and Aid as control variables in explaining HDI may lead to double counting of foreign aid (Gomanee, Morrissey, Mosley, and Verschoor, 2005 p. 360). To overcome this problem, this study follows the methodology of Gomanee, Morrissey, Mosley, and Verschoor (2005) by constructing a generated regressor to "strip out" aid from the PPE indices. This method separates pro-poor expenditure funded by foreign aid from pro-poor expenditure funded by other sources of government revenue. More specifically, each PPE index (UPPE/GDP and BPPE/GDP) is regressed against aid, and then the residuals of each equation are saved as two new variables, $UPPE_{res}/GDP$ and $BPPE_{res}/GDP$. Like the paper by Gomanee, Morrissey, Mosley, and Verschoor (2005), this study will consider each of the four indices, UPPE/GDP, BPPE/GDP, $UPPE_{res}/GDP$, and $BPPE_{res}/GDP$, in order to control for the level of pro-poor government spending in developing countries and to test the robustness of the results depending on the PPE index utilized. Each is predicted to have a positive impact on a country's HDI.

[1] The beta-weight for an expenditure category is calculated by multiplying the regression coefficient for that expenditure category by the standard deviation of the expenditure category and then dividing by the standard deviation of HDI.

C. *Controlling for Macroeconomic Policies*

The economic growth literature indicates that several macroeconomic policy variables can impact growth rates in developing countries. Since growth leads to increases in HDI levels, any variable which raises growth should similarly improve aggregate welfare and development. This study, thus, includes an index of macroeconomic policy variables to reflect the quality of policies within a developing country. The creation of this index follows from BD, who include three variables in their policy index. First, the inflation rate is included as a measure of a country's monetary policy. As is standard in the literature, the inflation rate is measured as the natural logarithm of one plus the inflation rate. BD also include government budget surplus (or deficit) relative to GDP in order to evaluate the quality of a country's fiscal policy. Finally, they consider trade openness to see how well a country is integrated into international markets. In their study, BD utilize a dichotomous variable developed by Jeffrey Sachs and Andrew Warner in which zero represents a closed economy and one represents an open economy. Unfortunately, the Sachs and Warner measure could not be included in this study due to data availability, so total trade volume (exports plus imports) relative to GDP is used as an alternative measure of openness. This variable is frequently utilized to reflect openness, and Easterly (2003) employs it as a substitute for the Sachs and Warner measure in creating his policy index.

While BD consider several techniques for combining the three macroeconomic indicators into one policy index, they conclude that the best method for creating a policy index is to weight each of the three indicators by the variable's impact on economic growth. They therefore utilize ordinary least squares (OLS) to estimate a regression of growth on all the variables included in their growth equation, excluding the foreign aid variables. As previously mentioned, these variables include the three individual macroeconomic variables as well as a vector of control

variables such as ethnic fractionalization, education, institutional quality, regional dummies, etc. The index is then formed by weighting each of the policy variables by the corresponding regression coefficient and scaling the weighted average to have the same mean as per capita GPD growth. This study utilizes a similar method for determining the policy index by estimating the following equation using OLS:

(3) $HDI_{it} = \beta_1 + \beta_2 GDP0/capita_{it} + \beta_3 PPE/GDP_{it} + \beta_4 Budget/GDP_{it} + \beta_5 Inflation_{it} + \beta_6 Openness/GDP_{it} + \varepsilon_{it}$

where Budget/GDP is the government budget surplus (deficit) relative to GDP, Inflation is the natural logarithm of the inflation rate plus one, and Openness/GDP is exports plus imports relative to GDP. Hence, from equation (3), the following policy index is created:

(4) $Policy_{it} = \alpha + \beta_4 Budget/GDP_{it} + \beta_5 Inflation_{it} + \beta_6 Openness/GDP_{it}$

where α is a scalar term that ensures that the weighted average has the same mean as HDI. As the quality of macroeconomic policies increase, HDI should similarly increase, so the policy variable is predicted to be positively correlated with HDI.

Several studies (such as BD (2000); Collier and Dollar (2001, 2002)) find that foreign aid only produces economic growth in countries with "good" macroeconomic policies. This conclusion is determined by including an interaction term between aid and the policy index in the growth equation. Since this study seeks to determine if a similar result holds regarding foreign aid's impact on aggregate welfare and development, an interaction term between foreign aid and the policy index is also considered. It is hypothesized that the Aid*Policy interaction term will have a positive impact on HDI, reflecting the increased effectiveness of aid in countries with pro-growth economic policies.

D. *Controlling for the Endogeneity of Aid*

As indicated by the previously-cited studies, the direction of causation between foreign aid and development is uncertain. Development assistance is typically extended to low-income countries in order to promote economic growth and to advance the level of development. To the degree that foreign aid is successful in raising aggregate welfare in a developing country, foreign aid should be positively correlated with a country's HDI or other measures of aggregate welfare. Since donor countries, however, tend to provide more development assistance to countries with lower economic growth rates, there could also be a negative correlation between GDP and foreign aid (Easterly, 2003). To the extent that GDP is correlated with HDI, foreign aid could have a negative relationship with HDI as well.

In order to control for this problem, Gomanee, Morrissey, Mosley, and Verschoor (2005) lag the aid term one period so that aid from the previous period is employed to predict current HDI. To the extent that welfare changes slowly over time, however, this technique may not completely solve the problem of endogeneity. Other researchers, such as BD, employ two-stage least squares (2SLS) estimation techniques in order to endogenize aid. This econometric method consists of first estimating one equation in which foreign aid is regressed against GDP per capita and one or more instrumental variables and then estimating a second equation in which a measure of development is regressed against the predicted aid values from the first equation and additional exogenous variables. Since 2SLS is a better technique for endogenizing aid, this study applies this econometric method, estimating aid in the first-stage equation and utilizing these very values to estimate HDI in the second-stage equation. Hence, aid is treated as endogenous to the model while all other variables are assumed to be exogenous.

With regard to the first-stage equation estimating aid, several studies explore the variables which determine the allocation of development assistance to developing countries (Maizels and Nissanke (1984); Alesina and Dollar (2000); Alesina and Weder (2002)). Since donors tend to contribute more foreign aid to countries with lower levels of GDP, a result confirmed by BD, $GDP0/capita_{it}$ is included in the aid equation. $GDP0/capita_{it}$ is thus predicted to have a negative relationship with aid. Aid donors may also provide more development aid to recipient countries which possess "good" macroeconomic policies. A donating country or organization may believe, for example, that its aid contributions will be more effective in countries with pro-growth policies. Aid donors may similarly want to reward countries for enacting macroeconomic reforms and have their increased aid serve as an incentive for other countries to adopt reforms as well. In consideration of any correlation between aid and macroeconomic policy, BD include their policy index as an independent variable in their first-stage aid equation. Although BD find that policy has an insignificant impact on aid allocation, Alesina and Dollar (2000) conclude that a significant positive relationship exists between democracy and aid allocation and trade openness and aid allocation. This study accounts for this connection by also including the policy index as an explanatory variable for aid. Policy is hypothesized to have a positive impact on aid.

Research on aid allocation also considers the impact of a country's strategic importance on the amount of development aid received by that nation. Economists have explored the correlation between such variables as colonizing country, national religion, proportion of UN votes shared with the donating nation, and arms transfers to the allocation of aid to developing countries (Alesina and Dollar (2000); Alesina and Weder (2002)). Many of these studies, however, are inconclusive, and to consider all of these strategic variables in the aid allocation

equation lies outside the scope of this study. Two strategic variables, however, are included in the estimation of aid allocation. Since many studies conclude that smaller countries receive more aid per capita than larger countries (Maizels and Nissanke (1984); Alesina and Dollar (2000); BD (2000)), a population variable is included in the first-stage equation. This variable is predicted to be negatively correlated with the level of foreign aid. Alesina and Dollar (2000) and BD also find that Egypt, because of its historical and political importance in the Middle East, receives significantly more aid than other countries with similar levels of per capita income, particularly from the United States. Thus, like Alesina and Dollar (2000) and BD, this study includes a dichotomous variable which equals one for the country of Egypt and zero otherwise in order to capture the increased level of aid received by Egypt. This variable is hypothesized to be positive.

As previously stated, this study utilizes 2SLS estimation to determine the impact of foreign aid on HDI while controlling for the endogeneity of aid and other exogenous variables. Thus, the following two equations are estimated:

(5) $\text{Aid/GDP}_{it} = \delta_1 + \delta_2\text{GDP0/capita}_{it} + \delta_3\text{Population}_{it} + \delta_4\text{Egypt}_{it} + \delta_5\text{Policy}_{it} + \varepsilon_{it}$

(6) $\text{HDI}_{it} = \gamma_1 + \gamma_2\text{GDP0/capita}_{it} + \gamma_3\text{PPE/GDP}_{it} + \gamma_4\text{Aid/GDP}_{it} + \gamma_5\text{Policy}_{it} + \gamma_6(\text{Aid/GDP}_{it})*\text{Policy}_{it} + \varepsilon_{it}$

where i indexes countries, t indexes the time period, HDI is the Human Development Index, GDP0/capita is initial real GDP per capita, PPE/GDP is pro-poor expenditure relative to GDP, Aid/GDP is the level of foreign aid relative to GDP, Policy is an index of macroeconomic policies which impact the level of development in a country, Population is a country's population, and Egypt is a dichotomous variable capturing the high level of aid given to Egypt. In estimating equations (5) and (6), all variables are entered as natural logarithms except for the

Egypt and the Policy variables. This follows the methodology of Gomanee, Girma, and Morrissey (2003) and Gomanee, Morrissey, Mosley, and Verschoor (2005), which allows the coefficients to be interpreted as elasticities, meaning that the coefficients represent the percentage change in the dependent variable when the independent variable increases by one percent.

IV. Data

The data used in this study are obtained from a variety of sources. As is often the case with statistical research on developing countries, data on many variables are frequently unavailable or inaccessible for all countries in all years. To overcome this difficulty, some of the data included in this study are derived from previous studies (notably, Gomanee, Morrissey, Mosley, and Verschoor (2005)) rather than original sources. Furthermore, this study follows Gomanee, Morrissey, Mosley, and Verschoor (2005) by averaging the data over several years in order to compensate for missing observations, to create a more complete data set, and to overcome the fact that HDI is only available for every five years. Like Gomanee, Morrissey, Mosley, and Verschoor (2005), this study averages all of the available data over five mutually exclusive periods: 1980-1983 (Period 1), 1984-1987 (Period 2), 1988-1991 (Period 3), 1992-1995 (Period 4), and 1996-2000 (Period 5).

HDI values are published annually in the United Nations Development Program's (UNDP) *Human Development Report*. While these measures cannot be compared from year to year because of differences in methodology and revisions, every edition of the *Human Development Report* includes comparable trend data at five-year intervals for HDI starting in

1975. HDI data for 1980, 1985, 1990, 1995, and 2000 are included in this study.[2] HDI values range from zero to one, with one representing the highest level of development. As mentioned previously, Appendix I provides details on the exact calculation of the HDI.

The UNDP divides countries into three categories: high development (HDI values of 0.8 and above), medium development (HDI values between 0.5 and 0.8), and low development (HDI values below 0.5). Since this study examines the impact of foreign aid on developing countries, the 113 countries ranked in 2006 as having medium or low development are examined in this study. Twenty-six countries which have no HDI observations for any of the time periods between 1975 and 2000 were dropped, leaving 87 countries having at least one HDI observation to be included in the study. To the extent that the countries excluded from the study possess similar characteristics, dropping this group could bias the results. However, the countries included (see Appendix II) represent a wide range of developing countries which should supply a balanced foundation for analysis.

Data for the foreign aid variable are acquired from the World Bank's *World Development Indicators*, which lists yearly net official development assistance and official aid, in current U.S. dollars, for a large group of developing countries. Net official development assistance and official aid consists of "loans made on concessional terms (net of repayments of principal) and grants... to promote economic development and welfare" (World Bank, 2007). In order to compare development aid across time, these data for development assistance are subsequently converted into real values using the United States Consumer Price Index. The resulting data are

[2] Since HDI observations occur at five year intervals, this study would ideally average the data over five-year time periods, each containing one HDI observation. However, due to data availability, this study must use the time periods utilized in Gomanee, Morrissey, Mosley, and Verschoor (2005). Nevertheless, each time period in this study does include one HDI observation.

divided by the real GDP for the respective country to produce a value of foreign aid as a percentage of a country's GDP.

Values for initial real GDP per capita, GDP0/capita, are also obtained from the *World Development Indicators*. Replicating the methodology of Gomanee, Morrissey, Mosley, and Verschoor (2005), $GDP0/capita_{it}$ represents GDP per capita in country i in constant 1995 US dollars in the year preceding the start of time period t.[3]

As previously discussed UPPE/GDP and BPPE/GDP are calculated as follows:

(1) $UPPE/GDP = P_h/GDP + P_e/GDP + P_s/GDP$

(2) $BPPE/GDP = \beta_h P_h/GDP + \beta_e P_e/GDP + \beta_s P_s/GDP$.

Unfortunately, data for some components of the PPE indices were unobtainable for this current study (specifically, all of P_e/GDP and portions of P_s/GDP). However, the authors of Gomanee, Morrissey, Mosley, and Verschoor (2005) kindly provided data for both the UPPE/GDP and BPPE/GDP indices. These authors obtained public expenditure on health (P_h/GDP) from UNESCO's annual statistical yearbooks, while public expenditure on education (P_e/GDP) was found in the IMF's *Government Finance Statistics* database. Spending on housing, sanitation, and water (P_s/GDP) was taken from the *World Development Indicators*. Prior to 1993, the World Bank reported expenditures on social services, so P_s/GDP is obtained by subtracting P_e/GDP and P_h/GDP from total expenditures on social services. In 1993, the World Bank redefined its public expenditure variables and created a variable measuring spending on housing, sanitation, and water. Thus, after 1993, P_s/GDP is taken directly from the *World Development Indicators*. Since the authors of Gomanee, Morrissey, Mosley, and Verschoor (2005) provided data for the PPE

[3] Utilizing GDP in the year preceding the start of time period t may capture an economic expansion or recession. While averaging GDP over several years prior to the start of time period t would smooth out any such fluctuations from long-term real income, GDP in the year immediately prior to the start of time period t is used in order to replicate the Gomannee, Morrissey, Mosley, and Verschoor (2005) study.

indices rather than data for the individual expenditure categories, their beta-weights must be utilized. BPPE/GDP is, hence, calculated as follows:

(7) $BPPE/GDP = 0.1032*P_h/GDP + 0.1150*P_e/GDP + 0.2309*P_s/GDP$.

These beta-weights represent the relative importance that each expenditure category has on increasing HDI. The coefficients indicate that expenditure on sanitation, housing, and water, have the greatest impact on welfare, while expenditure on healthcare has the least.

As mentioned previously, including both Aid/GDP and PPE/GDP in the same equation may lead to double counting of foreign aid if the level of pro-poor spending depends on the amount of aid a country receives. To address this possible double counting, the PPE indices are stripped of foreign aid by regressing each of the PPE indices against foreign aid and then saving the residual values of each regression. Appendix III presents the results of these regressions. Although the magnitudes of the coefficients on Aid/GDP are small, the negative signs on these coefficients indicate that aid and pro-poor expenditure have an inverse relationship. This relationship is marginally significant for the beta-weighted PPE index and insignificant for the unweighted PPE index. The negative correlation suggests that governments in developing countries may reduce pro-poor expenditure in response to increased aid. In other words, foreign aid may "crowd out" PPE if governments reduce spending on pro-poor sectors in response to increased development assistance. These regressions, however, have very low adjusted R^2 values (0.004 when UPPE/GDP is regressed against Aid/GDP and 0.008 when BPPE/GDP is regressed against Aid/GDP). Such small R^2 values imply that the variation in Aid/GDP does not explain much of the variation in PPE, which suggests that very little double counting of aid is occurring.

The policy index is comprised of three variables: total trade volume (exports plus imports) as a percentage of GDP, budget surplus (deficit) as a percentage of GDP, and the

natural logarithm of one plus the inflation rate. All three variables are found in the Global Development Network Growth Database, a World Bank database created by William Easterly. Easterly compiles data from both the *World Development Indicators* and the *Government Finance Statistics* in order to provide more accurate and complete data for a large set of countries. In this database, the inflation rate is defined as the percentage change in consumer prices. In addition, the overall budget surplus (deficit) includes grants received by developing countries.

Finally, population data are taken from the *World Development Indicators*. Table 1 provides descriptive statistics for each of the variables included in the model.

V. Results

A. *Influence of Macroeconomic Policy*

The first step in the empirical model is to estimate equation (3), the HDI regression excluding all aid terms, in order to construct the policy index. The results for this regression are presented in Table 2. Column 1 displays the results using UPPE/GDP as the pro-poor expenditure index while Column 2 displays the results using BPPE/GDP as the expenditure index. In both regressions, initial GDP per capita and pro-poor expenditure have a significant and positive effect on a country's HDI. As predicted, higher initial GDP and greater levels of pro-

Table 1: Descriptive Statistics

Variable	Definition	N	Minimum	Maximum	Mean	Std Dev
HDI	Human Development Index	349	0.260	0.809	0.555	0.147
Aid/GDP	(Constant Dollar Aid)/(Real GDP)	349	0.017	65.618	8.502	9.667
GDP0/capita	Real GDP per capita	349	92.409	4415.371	1014.729	922.265
UPPE/GDP	Unweighted PPE index (Equation 1)	349	0.019	38.519	6.202	4.292
BPPE/GDP	Beta-weight PPE index (Equation 7)	349	0.002	4.742	0.859	0.675
Population	Population (millions)	349	0.152	1238.500	5.162	166.513
Budget/GDP	(Constant Dollar Budget Surplus)/(Real GDP)	162	-18.204	4.325	-4.429	3.919
Inflation	LN(1 + inflation rate)	162	-0.003	4.167	0.280	0.608
Openness/GDP	(Constant Dollar Exports+Imports)/(Real GDP)	162	13.885	153.493	59.071	32.043

poor government expenditure are associated with higher aggregate welfare and development in developing countries.

Although all of the macroeconomic policy variables have the intuitive signs, none are significant in either of the HDI regressions. The results in Table 2 thus indicate that macroeconomic policy variables such as openness, budget surplus, and inflation have no additional explanatory power after controlling for initial GDP and pro-poor expenditure. This finding appears to imply that macroeconomic policies do not have a direct impact on HDI. Instead, their impact occurs indirectly by increasing growth rates, which in turn raises HDI. The inclusion of the PPE indices in the HDI regression may also reflect government policy since higher PPE values correspond to greater public spending on sectors benefiting the poor. Any of the effects of "good" policy may as a consequence be captured by the PPE variables instead of the macroeconomic policy variables.

Table 2: HDI Regressions Excluding Aid Terms

	(1)		(2)		(3)	
Variable	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-0.278***	-5.599	-0.278***	-5.600	0.532***	20.690
	(0.050)		(0.050)		(0.026)	
GDP0/capita	0.121***	16.523	0.121***	16.599		
	(0.007)		(0.007)			
UPPE/GDP	0.005**	3.058				
	(0.002)					
BPPE/GDP			0.029**	2.992		
			(0.010)			
Openness/GDP	0.000	1.056	0.000	1.454	0.001***	2.519
	(0.000)		(0.000)		(0.000)	
Budget/GDP	0.002	1.030	0.002	0.936	0.007*	2.542
	(0.002)		(0.002)		(0.003)	
Inflation	-0.005	-0.394	-0.006	-0.503	0.077***	3.742
	(0.012)		(0.012)		(0.020)	
Adjusted R^2	0.715		0.714		0.110	
f-statistic	81.700		81.247		7.859	
N	162		162		167	

Note: *Significant at the 5-percent level, **Significant at the 1-percent level, and ***Significant at the 0.1-percent level. Numbers in parenthesis represent standard errors for each coefficient. HDI, GDP0/capita, UPPE/GDP, BPPE/GDP, and Inflation are measured as natural logarithms.

Column 3 of Table 2, which presents results for equation (3) without the initial GDP term and the PPE indices, confirms this explanation. In this regression, all three policy variables are individually significant. The regression in Column 3, however, does not explain as much of the variance in HDI as the regressions which include GDP0/capita and PPE. This is illustrated by the lower adjusted R-square of 0.110 (compared to 0.715 in Column 1 and 0.714 in Column 2). The coefficient for the inflation variable is also the opposite sign as predicted, which indicates the puzzling conclusion that higher inflation is correlated with increased HDI values.

The insignificance of the macroeconomic policy variables in the HDI equation indicates that the coefficients on each of the macroeconomic policy variables cannot be utilized as weights for creating the policy index. Since macroeconomic policy does not influence HDI directly, there is little theoretical justification to believe that macroeconomic variables impact how well development aid effects HDI. Ultimately, the irrelevance of macroeconomic policy variables in determining HDI requires that the policy variables be excluded from subsequent regressions in this study.

With the policy indices excluded from equations (5) and (6), the new regressions to be estimated are[4]:

(8) $\text{Aid/GDP}_{it} = \delta_1 + \delta_2\text{GDP0/capita}_{it} + \delta_3\text{Population}_{it} + \delta_4\text{Egypt}_{it} + \varepsilon_{it}$

(9) $\text{HDI}_{it} = \gamma_1 + \gamma_2\text{GDP0/capita}_{it} + \gamma_3\text{PPE/GDP}_{it} + \gamma_4\text{Aid/GDP}_{it} + \varepsilon_{it}.$

B. *Influence of Aid*

Table 3 presents the results of the 2SLS estimation of equations (8) and (9). Column 1 indicates the first-stage regression where initial GDP, population, and the Egypt variable are

[4] Although the macroeconomic policy variables are insignificant in explaining HDI variations, macroeconomic policies could theoretically influence the allocation of aid to developing countries. When the individual macroeconomic policy variables were included in the aid regression, however, none were significant to the five-percent level (see Appendix IV). The macroeconomic policies were, therefore, also excluded from the aid allocation regression.

utilized to predict aid allocation. Columns 2 through 5 illustrate the results from the second-stage regression in which HDI is regressed against the predicted aid values, initial GDP, and the various PPE indices. In the first stage regression, all variables are statistically significant to at least the 0.1-percent level and all posses the hypothesized sign. These results confirm the conclusions of BD and Alesina and Dollar (2000), that nations with smaller populations receive more foreign aid relative to GDP, while Egypt is given significantly more aid than other countries, *ceteris paribus*. Moreover, GDP0/capita's negative impact on aid allocation parallels the finding that donors extend foreign aid to countries with lower levels of GDP. For every one percent increase in a country's initial real GDP, that country receives 1.225 percent less foreign aid relative to real GDP.

Table 3: Aid and HDI Regressions (2SLS)

	(1)		(2)		(3)		(4)		(5)	
Variable	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	19.144***	34.198	-1.949***	-18.991	-1.868***	-17.364	-1.880***	-17.753	-1.905***	-17.931
	(0.560)		(0.103)		(0.108)		(0.106)		(0.106)	
Population	-0.610***	-22.443								
	(0.027)									
Egypt	1.622***	4.4143								
	(0.389)									
Aid/GDP			-0.034***	-3.626	-0.032***	-3.409	-0.039***	-4.088	-0.037***	-3.896
			(0.009)		(0.009)		(0.009)		(0.009)	
GDP0/capita	-1.225***	-25.028	0.196***	13.286	0.200***	13.431	0.200***	13.502	0.203***	13.685
	(0.049)		(0.015)		(0.015)		(0.015)		(0.015)	
UPPE/GDP			0.055***	4.217						
			(0.013)							
BPPE/GDP					0.042***	3.353				
					(0.012)					
$UPPE_{res}$/GDP							0.007**	2.961		
							(0.002)			
$BPPE_{res}$/GDP									0.029*	2.041
									(0.014)	
Adjusted R^2	0.735		0.654		0.648		0.652		0.648	
f-statistic	351.698		224.688		218.638		218.443		214.105	
N	380		356		356		349		349	

Note: *Significant at the 5-percent level, **Significant at the 1-percent level, and ***Significant at the 0.1-percent level. Numbers in parenthesis represent standard errors for each coefficient. All variables except Egypt are measured as natural logs. Standard errors and t-statistics in the second-stage regression do not take into account results from the first-stage regression.

All variables in the second stage regressions are also statistically significant. As previously found by Gomanee, Morrissey, Mosley, and Verschoor (2005), initial real GDP per capita and pro-poor expenditure both have a positive impact on HDI. This finding is robust regardless of whether UPPE/GDP or BPPE/GDP is included in the regression, or whether the residual values for PPE are included in the regression. The fact that these results are robust, even when including the residual PPE values, can be explained by the low magnitude of the coefficients on Aid/GDP in the regressions in Appendix III, as well as the low R^2 values for these regressions. Hence, there appears to be very little double counting of foreign aid when both Aid/GDP and PPE/GDP are included in the HDI regressions, and stripping foreign aid from the PPE values does not affect the positive signs on either GDP0/capita or PPE/GDP. A one percent increase in initial real GDP per capita corresponds to approximately a 0.20 percent increase in HDI no matter the PPE index, illustrating that countries with higher initial GDP possess higher HDI levels. Furthermore, a one percent increase in the unweighted PPE index corresponds to a 0.055 percent increase in HDI. A one percent increase in the beta-weighted PPE index corresponds to a 0.042 percent increase in HDI. The coefficients for the PPE index are smaller once aid is stripped out from the indices, yet they still indicate that HDI increases by 0.007 percent when the residual UPPE/GDP index increases by one percent and that HDI increases by 0.029 percent when the residual beta-weighted PPE index increases by one percent. These positive coefficients on the PPE indices demonstrate that government spending on social services such as healthcare, education, housing, sanitation, and water is effective in improving welfare.

While the aid variable is statistically significant, the variable's negative coefficient in Columns 2-5 is the opposite sign from the one that is predicted and that was empirically determined in studies by Mosley, Hudson, and Verschoor (2004), Gomanee, Girma, and

Morrissey (2004), and Gomanee, Morrissey, Mosley, and Verschoor (2005). Since the endogeneity of aid is controlled for by 2SLS, this negative coefficient on aid does not reflect the fact that donors provide more assistance to poorer countries. Rather, these results appear to indicate that increased foreign aid, when controlling for initial GDP and pro-poor expenditure, leads to lower levels of aggregate welfare and human development. For the average country included in this study, the coefficient for the aid variable indicates that a ten percent increase in aid from 9.3336 to 10.2670 percent of GDP causes HDI to decline from 0.5545 to at least 0.5524 (Column 4) and to at most 0.5528 (Column 3). Increasing foreign aid, thus, appears to reduce HDI and aggregate welfare in developing countries. This conclusion contradicts the hypothesis that development aid improves HDI, and this result seems to suggest that foreign aid to developing countries should be reduced. However, if foreign aid is being misallocated and misused to finance non-development related tasks (such as arms expenditure or payoffs for corrupt officials), then increased aid could theoretically have no impact on HDI. Many studies on foreign aid, in fact, include additional control variables such as corruption or military expenditure in order to capture the fact that some foreign aid may be misallocated toward projects that do not affect HDI. Hence, excluding these variables from the model in this study may bias the aid results. It could also be the case that additional variables beyond aid, such as PPE, are endogenous to the model, and treating these variables as exogenous could produce the negative coefficient on aid. Furthermore, in order to consider the impact of aid on developing nations, this study excludes the high-human development countries included in Gomanee, Morrissey, Mosley, and Verschoor (2005). It could thus also be that the different sample of countries is driving the negative coefficient on aid found in this study.

C. *Influence of Aid in Low or Medium Human Development Countries*

Including all developing nations ranked as having low and medium human development together in one regression may also impact the results. Aid may be allocated to low and medium human development countries differently, since donors may specifically target aid to countries with low levels of health or education. In addition, development assistance could have dissimilar effects on aggregate welfare in low and medium human development countries. For instance, medium human development countries may have better infrastructure and greater absorptive capacity, so aid may be more effective in nations with medium human development. In order to investigate this more closely, this study divides the sample of countries into a low human development subsample (HDI of less than 0.5) and a medium human development subsample (HDI greater than or equal to 0.5 and less than 0.8).[5] As Tables 4 and 5 indicate, low human development countries, on average, receive more aid relative to GDP than medium human development countries. In addition, governments in countries ranked as medium human development spend a slightly larger percentage of GDP on pro-poor expenditure than governments in countries ranked as low human development. Appendix II also illustrates that the majority of low human development countries tend to be located in sub-Saharan Africa. To the extent that the effectiveness of aid differs between sub-Saharan Africa and other regions of the world, aid effectiveness may vary between low human development and medium human development nations. For all of these reasons, equations (8) and (9) are re-estimated for both subsamples to see if aid effectiveness diverges between low and medium human development countries.

[5] Countries are assigned to a subsample based on their 2000 HDI value, which corresponds to time period five. Since a country's HDI may increase or decrease over time, using the value in period five prevents nations from being included in one subsample in one period and the other subsample in a different period.

Tables 6 and 7 provide the regression results for the low and medium human development subsamples, respectively. Column 1 in Tables 6 and 7 indicate that all variables in the first-stage regressions are significant to the 0.1-percent level and all possess the hypothesized sign in both subsamples. As was found for the full sample of countries, nations with smaller populations receive more foreign aid relative to GDP. In both the low human development subsample and the medium human development subsample, initial GDP has a negative impact on the amount of aid received. Thus, donors extend less aid to countries with higher levels of GDP. Compared to countries with medium human development, Egypt receives significantly more development assistance, *ceteris paribus*.[6] Since similar results were obtained in the first-stage regressions for both low and medium human development countries, it appears that donors do

Table 4: Descriptive Statistics for Low Human Development Countries

Variable	Definition	N	Minimum	Maximum	Mean	Std Dev
HDI	Human Development Index	121	0.260	0.626	0.398	0.077
Aid/GDP	(Constant Dollar Aid)/(Real GDP)	121	0.086	65.618	14.580	11.881
GDP0/capita	Real GDP per capita	121	92.409	1219.633	352.922	205.660
UPPE/GDP	Unweighted PPE index (Equation 1)	121	0.019	22.243	6.2017	4.2916
BPPE/GDP	Beta-weight PPE index (Equation 7)	121	0.002	3.532	0.859	0.675
Population	Population (millions)	121	0.887	131.610	18.846	27.332

Table 5: Descriptive Statistics for Medium Human Development Countries

Variable	Definition	N	Minimum	Maximum	Mean	Std Dev
HDI	Human Development Index	235	0.352	0.809	0.641	0.098
Aid/GDP	(Constant Dollar Aid)/(Real GDP)	235	0.017	37.830	5.276	6.204
GDP0/capita	Real GDP per capita	235	160.202	4415.371	1381.736	987.858
UPPE/GDP	Unweighted PPE index (Equation 1)	235	0.320	38.519	7.289	4.636
BPPE/GDP	Beta-weight PPE index (Equation 7)	235	0.074	4.742	1.007	0.724
Population	Population (millions)	235	0.152	1238.5	67.305	200.253

[6] Since Egypt is a medium human development country, the Egypt dichotomous variable was excluded from the first-stage regression for the low human development subsample. Because the Egypt variable was omitted from the first stage regression for the low human development subsample, coefficients from the first-stage regressions cannot be compared across the two subsamples.

not allocate aid to nations with low and medium human development in systematically different ways.

Columns 2 through 5 in both tables 6 and 7 also illustrate that initial GDP per capita maintains a significant positive impact on HDI when dividing the countries into the low and medium human development subsamples. For countries with low human development, a one percent increase in initial GDP raises HDI by 0.142 percent to 0.150 percent, depending on the PPE index included in the regression. The coefficients for initial GDP are slightly smaller for countries with medium human development, and a one percent increase in initial GDP increases HDI by at least 0.122 percent to at most 0.128 percent. This slight difference in the coefficients for initial GDP between the two subsamples indicates that, *ceteris paribus*, initial GDP has a greater impact on HDI in low human development countries than in medium human

Table 6: Aid and HDI Regressions for Low Human Development Countries (2SLS)

	(1)		(2)		(3)		(4)		(5)	
Variable	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	16.564***	14.479	-1.638***	-8.361	-1.584***	-8.166	-1.527***	-8.056	-1.544***	-8.023
	(1.144)		(0.196)		(0.194)		(0.190)		(0.192)	
Population	-0.610***	-11.483								
	(0.053)									
Aid/GDP			-0.086***	-3.833	-0.087***	-3.837	-0.089***	-4.173	-0.090***	-4.131
			(0.022)		(0.023)		(0.021)		(0.022)	
GDP0/capita	-0.776***	-6.872	0.150***	5.237	0.150***	5.186	0.142***	5.031	0.144***	5.034
	(0.113)		(0.029)		(0.023)		(0.028)		(0.029)	
UPPE/GDP			0.0250	1.421						
			(0.018)							
BPPE/GDP					0.018	1.005				
					(0.017)					
$UPPE_{res}$/GDP							0.013**	2.862		
							(0.005)			
$BPPE_{res}$/GDP									0.066*	2.104
									(0.032)	
Adjusted R^2	0.539		0.405		0.400		0.434		0.417	
f-statistic	79.381		28.224		27.653		31.709		29.584	
N	139		121		121		121		121	

Note: *Significant at the 5-percent level, **Significant at the 1-percent level, and ***Significant at the 0.1-percent level. Numbers in parenthesis represent standard errors for each coefficient. All variables are measured as natural logarithms. Standard errors and t-statistics in the second-stage regression do not take into account results from the first-stage regression.

development countries. Nevertheless, it still holds that countries with greater initial GDP have higher levels of aggregate welfare and human development, even when dividing the countries by level of development.

Dividing the countries into the two subsamples does impact the significance and the signs of the pro-poor expenditure variables. While all the PPE indices are positive and significant in the full sample regressions, PPE is only positive and significant in low human development countries when utilizing $UPPE_{res}$/GDP and $BPPE_{res}$/GDP (Columns 4 and 5 of Table 6, respectively). In all the other regressions in Table 6 and 7, PPE is insignificant, and in some cases, the sign becomes negative. This result indicates that the positive effect of pro-poor

Table 7: Aid and HDI Regressions for Medium Human Development Countries (2SLS)

	(1)		(2)		(3)		(4)		(5)	
Variable	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	19.917***	24.969	-1.333***	-13.739	-1.584***	-13.222	-1.340***	-13.579	-1.343***	-13.624
	(0.798)		(0.097)		(0.194)		(0.099)		(0.099)	
Population	-0.609***	-18.777								
	(0.032)									
Egypt	1.592***	3.761								
	(0.423)									
Aid/GDP			-0.012	-1.625	-0.011	-1.424	-0.013	-1.652	-0.012	-1.660
			(0.007)		(0.007)		(0.008)		(0.008)	
GDP0/capita	-1.339***	-17.178	0.122***	8.881	0.126***	9.172	0.128***	9.369	0.128***	9.412
	(0.078)		(0.014)		(0.014)		(0.014)		(0.014)	
UPPE/GDP			0.018	1.394						
			(0.013)							
BPPE/GDP					0.003	0.258				
					(0.017)					
$UPPE_{res}$/GDP							-0.001	-0.382		
							(0.002)			
PPE_{res}/GDP									-0.007	-0.639
									(0.011)	
Adjusted R^2	0.707		0.440		0.435		0.444		0.444	
f-statistic	194.241		62.177		61.055		61.350		61.510	
N	241		235		235		235		235	

Note: *Significant at the 5-percent level, **Significant at the 1-percent level, and ***Significant at the 0.1-percent level. Numbers in parenthesis represent standard errors for each coefficient. All variables except Egypt are measured as natural logarithms. Standard errors and t-statistics in the second-stage regression do not take into account results from the first-stage regression.

expenditure on aggregate welfare is not robust when considering only low human development or only medium human development countries.

For nations with low human development, the foreign aid variable continues to be significant and negative, regardless of which PPE index is included in the regression. In fact, the coefficients are more negative than the coefficients for the full sample, ranging from -0.086 (Table 6, Column 2) to -0.090 (Table 6, Column 5). The greater negative magnitude on the aid variable implies that foreign aid causes HDI to decrease by a greater amount in countries with low levels of human development than in all developing countries. For nations with medium human development, the aid variable continues to have a negative coefficient regardless of the PPE index utilized. However, these coefficients are insignificantly different from zero. Foreign aid, therefore, appears to have no significant impact on HDI in medium human development countries.

VI. Conclusion

This paper examined the impact of foreign aid on aggregate welfare, as measured by the Human Development Index (HDI), in developing countries. Following empirical models developed in previous research examining the effect of aid on HDI, the model utilized in this study included control variables for initial GDP and pro-poor government expenditure. This study also sought to determine if macroeconomic policies influence the impact of foreign aid on aggregate welfare by including a policy index as well as an interaction term between aid and policy in the empirical model. Since the direction of causation between foreign aid and HDI is unclear, two-stage least squares (2SLS) estimation was utilized to control for the endogeneity of aid. Hence, foreign aid values were estimated in the first-stage equation, and then these predicted values for aid were utilized to estimate HDI in the second-stage equation.

This study finds that for the entire sample of developing countries, higher levels of foreign aid decrease HDI. This contradicts the empirical results of Mosley, Hudson, and Verschoor (2004), Gomanee, Girma, and Morrissey (2004), and Gomanee, Morrissey, Mosley, and Verschoor (2005). The negative relationship holds when looking only at countries with low human development, while aid has an insignificant impact on HDI in countries with medium human development. The study also finds that macroeconomic policies such as inflation, trade openness, and budget surpluses do not impact a country's level of human development when controlling for real per capita income and pro-poor government expenditures. This study, therefore, is unable to test whether BD's finding that aid is more effective at increasing growth in countries with pro-growth economic policies is also true for aid's effectiveness at increasing aggregate welfare.

The negative relationship between foreign aid and HDI for the entire sample and for nations with low human development presents an unexpected result, especially considering the positive relationship found by Gomanee, Morrissey, Mosley, and Verschoor (2005). If greater aid does cause HDI to decrease, it would suggest that donors should stop providing assistance to developing countries since this aid will hinder, rather than promote, development. Before this conclusion is adopted, however, future research must be conducted to further investigate this inverse relationship between aid and HDI. As previously mentioned, one possible explanation could be omitted variable bias, in that a theoretically significant variable is missing from the model. For instance, Dalgaard, Hansen, and Tarp (2004) demonstrate that controlling for the percentage of a developing nation located within the tropics causes the aid variable to become insignificant in influencing GDP growth. It might be the case that controlling for the percentage of a nation located within the tropics similarly impacts the significance of the aid variable in

predicting HDI. Other socio-economic variables, such as corruption, inequality, armed conflict, or military expenditure could also negatively influence the HDI level of a developing country. Unfortunately, all of these variables were not included in this study due to limited data availability. Future studies would hopefully consider some of these variables when testing for the effectiveness of aid on aggregate welfare.

Limited data availability in general may also have impacted the relationship between aid and HDI. Due to missing data, this study could only consider data that was averaged across five periods from 1980-2000. Future studies analyzing aid effectiveness would definitely benefit from more full and complete data. The adoption of the Millennium Development Goals in 2000, the convening of the Monterrey Conference, and the creation of the Millennium Challenge Account in 2002, along with recent calls for increased foreign aid have undoubtedly affected the environment in which aid is now donated to developing countries. Extending the data past 2000 to reflect this new donor attitude might affect the results of this study. In addition, this study considers a general measure of foreign aid by looking at official development assistance. Since different types of aid, such as bilateral assistance or aid from nongovernmental organizations that is tied to a particular project, may have differing impacts on aggregate welfare, future research should address how the type of aid impacts its effectiveness.

Treating other variables beyond aid as endogenous may also impact the relationship between development assistance and aggregate welfare. In particular, the pro-poor expenditure index may be endogenous to the model. Donors may extend greater amounts of aid to countries which spend larger portions of their budgets on pro-poor sectors of the economy. In addition, foreign aid may "crowd out" pro-poor expenditure if governments receiving development aid reduce their spending in response. The small but negative relationship between foreign aid and

PPE illustrated in Appendix III suggests that some "crowding out" may, in fact, be occurring. Future research, therefore, should control for the endogeneity of pro-poor expenditure in order to take into account these two possibilities.

Despite the negative relationship between foreign aid and aggregate welfare, this study does suggest that increased pro-poor expenditure in developing countries does improve aggregate welfare. However, increasing aggregate welfare and decreasing extreme poverty in persistently impoverished countries are goals which cannot be accomplished through one line of action. While previous research indicates that foreign aid can play some role in increasing growth and aggregate welfare, these past studies are not robust to all specifications. By controlling for the endogeneity of foreign aid through two-stage least squares estimation, this study further questions the robustness of the results of past research. In the end, the lack of conclusive results regarding aid's overall effectiveness on welfare illustrates the difficulty in making a general conclusion across such a wide-array of unique and dissimilar countries. Foreign assistance, under some circumstances, will likely improve the livelihood of individuals living in extreme poverty. However, numerous issues, including many non-quantifiable ones such as natural disasters or political climate, factor into whether or not development aid is effective in recipient countries. Therefore, because of the underlying diversity both between and within developing countries, foreign aid is not a one-size-fits-all solution to the problem of extreme poverty in the developing world.

Appendix I: Calculation of the Human Development Index

The Human Development Index is the average of three indices:

-A Life Expectancy Index: (Life Expectancy - 25) / (85 – 25)

-An Education Index: (2/3)*Literacy Index + (1/3)*School Enrollment Index

-Literacy Index: Adult Literacy Rate / 100

-School Enrollment Index: Gross Enrollment Rate / 100

-GDP Index: (ln(GDP) – ln(100)) / (ln(40000) – ln(100))

Therefore, HDI = (1/3)*Life Expectancy Index + (1/3)*Education Index + (1/3)*GDP Index

Appendix II: Countries Included in this Study
Countries are classified according to their HDI value in 2000

Low Human Development Countries (HDI < 0.5)

Latin America and Caribbean
Haiti

Middle East and North Africa
Yemen

South Asia
Nepal

Sub-Saharan Africa
Benin
Burkina Faso
Burundi
Cameroon
Central African Republic
Chad
Côte d'Ivoire
Ethiopia
Gambia, The
Guinea
Kenya
Madagascar
Malawi
Mali
Mauritania
Mozambique
Niger
Nigeria
Rwanda
Senegal
Sierra Leone
Tanzania, U. Rep. of

Medium Human Development Countries (0.5 ≤ HDI < 0.8)

East Asia and Pacific
China
Fiji
Indonesia
Lao People's Dem. Rep.
Mongolia
Myanmar
Papua New Guinea
Philippines
Solomon Islands
Thailand
Vietnam

Europe and Central Asia
Albania
Azerbaijan
Belarus
Georgia
Kazakhstan
Kyrgyzstan
Moldova, Rep. of
Russian Federation
Tajikistan
Turkey
Ukraine

Latin America and Caribbean
Belize
Bolivia
Brazil
Colombia
Dominican Republic
Ecuador
El Salvador
Guatemala
Guyana
Honduras
Jamaica
Nicaragua
Paraguay
Peru
Venezuela

Middle East and North Africa
Algeria
Egypt
Iran, Islamic Rep. of
Jordan
Lebanon
Morocco
Syrian Arab Republic
Tunisia

South Asia
Bangladesh
India
Pakistan
Sri Lanka

Sub-Saharan Africa
Botswana
Comoros
Congo, Rep. of
Ghana
Guinea-Bissau
Lesotho
South Africa
Sudan
Swaziland
Togo
Uganda
Zambia
Zimbabwe

Appendix III: Aid and PPE Regressions

	(1)		(2)	
	Dependent = UPPE/GDP		Dependent = BPPE/GDP	
Variable	Coefficient	t-statistic	Coefficient	t-statistic
Constant	6.506***	22.030	0.901***	19.591
	(0.295)		(0.046)	
Aid/GDP	-0.035	-1.617	-0.007*	-2.016
	(0.022)		(0.003)	
Adjusted R^2	0.004		0.008	
f-statistic	2.614		4.065	
N	378		378	

Note: *Significant at the 5-percent level, **Significant at the 1-percent level, and ***Significant at the 0.1-percent level. Numbers in parenthesis represent standard errors for each coefficient. All variables measured as natural logs.

Appendix IV: First-Stage Regression with Individual Policy Variables

Variable	Coefficient	t-statistic
Constant	18.491***	17.057
	(1.056)	
Population	-0.530***	-9.402
	(0.056)	
Egypt	1.604***	4.157
	(0.386)	
GDP0/capita	-1.389***	-18.195
	(0.076)	
Inflation	0.204	1.823
	(0.112)	
Openness/GDP	0.005	1.967
	(0.003)	
Budget/GDP	-0.010	0.556
	(0.016)	
Adjusted R^2	0.796	
f-statistic	104.927	
N	168	

Note: *Significant at the 5-percent level, **Significant at the 1-percent level, and ***Significant at the 0.1-percent level. Numbers in parenthesis represent standard errors for each coefficient. All variables except Egypt, Openness/GDP, and Budget/GDP are measured as natural logs.

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