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The Effectiveness of Development Aid:

Measured as the variation in height among Malawian children

Viktor Johansson (22392) and Erik Rockborn (22565)

Abstract

We examine the effectiveness of development aid on the country of Malawi in Africa. The idea stems from a strong empirical correlation between economic development and body height. To measure this, we use the body height variation of children as dependent variable. As development aid data, we apply a dataset containing the number of aid-financed projects implemented in each of the 27 districts of Malawi over the past 20 years. For data on body height, we use the latest available DHS survey. To analyze the correlation, we use an OLS regression and control for different health and environmental factors. We find a positive correlation between financial aid and body height that becomes insignificant when controlling for social factors. Analyzing the potential reasons for this leads us to the problem of endogeneity, which we try to solve by using district population size as an instrument for number of aid projects. This regression shows the aid variable as insignificant. However, the result is inconclusive and points towards a slightly effective development aid. When questioning why this is, we reason regarding the difficulty of measuring the effectiveness of aid. On a more general level, we also analyze aid dependency, as well as incentive problems that allow this to occur.

Keywords: Aid effectiveness, Child malnutrition, Malawi.

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Examiner:	Martina Björkman Nyqvist

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Contents

1. Introduction

Africa is a region that has been the target of development aid projects for half a century. The concrete results of the development aid can in some countries be seen as growing income and higher average life expectancy of the recipient population. In other countries the growth has not been affected at all and in some cases the growth has actually fallen notwithstanding the increased amounts of development aid. Previous research disagrees regarding the actual effects of development aid and different countries and situations give different results. In other words, research has failed to give a collective conclusion about the effects of development aid on long-term growth in developing countries (Viederpass & Andersson, 2007).

One of the problems with measuring the impacts of development aid is the variety in the form and execution, as well as lacking of a comprehensive way of measuring the results (Roodman, 2007). Malnourishment measurements have been considered competent for analyzing socioeconomic and health related factors, precisely due to their comprehensiveness and comparability. Aspects such as body height or weight, especially among children, have been used to estimate the state of a developing country. One of the most comprehensive measurements of the development and well-being of people in developing countries is the body height variation of the population. This measure is sturdier and less dependable on timing than many other accessible measurements (Hoddinott et al., 2013). We focus on the height of children, since a reduced growth rate in children is especially expressive for the future height of the child.

Looking at the differences in height among human beings across the globe, there is considerable variation. Swedish men are among the tallest on the planet with their average height of 181 centimeters (Ribe, 2009), compared to Malawi men being of 164 cm in average height (Msyamboza, Kathyola & Dzowela, 2013). Comparing different regions across the world, it is clear that there is a connection between body height and economic development. In fact, it has been shown that body height can be used as an unaccredited measure of economic well-being (María-Dolores & Martínez-Carrión, 2009). For instance; in the middle of the 19th century the average height of Swedish men was 167 cm, similar to the height of Malawi men today. Hundred years later, Swedes

were on average 177 cm (SCB, 1969), just to slow down to today's number. This follows the economic development of Sweden quite accurately.

Concretely, our issue of interest is the following: how effective is development aid in increasing the living standard of recipient subjects in the short term, estimated by the variation of body height among beneficiary children? In other words, this study aims to examine the impact of development aid projects on the body height of children. We will test whether economic and social factors, such as the amount of development aid, can increase the height of a population. For this, we choose a small country in Africa, Malawi. The data is sorted on 27 different districts that have been subject to different numbers of development aid projects during a period of 20 years. We then run regressions on the data, incorporating other significant variables in order to identify what drives height differences.

2. Background

2.1. Effectiveness of Development Aid

One of the most well-cited articles in the field of development aid effectiveness is the Burnside & Dollar paper from year 2000. Burnside and Dollar suggests that if donors of foreign aid want to have a big impact on actual poverty reduction they need to emphasize the policies of the recipient country, especially the economic policies, more than what has empirically been done. Development aid risked to be lost on unproductive government spending if it was not matched with good policies and governance canalizing the aid (Burnside & Dollar, 2000).

Burnside and Dollar (2000) also suggest that since the prime interest of the donor often is to allocate the aid money in line with the specific interests of the donor, and not where it is most effective in increasing growth or reducing poverty, the correlation between development aid and growth is not as positive as expected. Countries with reformed economic policies, which according to the authors would attract more financial aid since they are more effective, are only marginally rewarded with more aid in reality (Burnside & Dollar, 2000).

Roodman (2007) tries to confront the general problem with diverging ideas in aid effectiveness studies. He emphasizes the difficulty when measuring actual results by looking at increased living standards and general economic wealth, and points to a fragility in most available studies. For example, changing the sample size or time horizon often completely changes the result of the studies. He suggests several explanations as to why the result is not straightforward, among others that aid is not fundamental for development in the same way that for example local politics, savings within the developing country and inequality are (Roodman, 2007).

Roodman (2007) also argues that one of the biggest problems with measuring development aid effectiveness is that it is very heterogeneous in its purpose and implementation. Development aid can be given to prevent and control outbreak of diseases, it can be designated as a loan to build a school or to feed starving children. At the same time, it can be channeled through corrupt governments, directly to the affected

people or through international humanitarian movements such as the Red Cross. It is therefore hard to make coherent conclusions about aid effectiveness in general, measured in economic development for the country as a whole (Roodman, 2007).

Easterly (2003) argues further that the measuring of aid effectiveness has been too narrow-minded in focusing on long-term profound changes. He suggests that smaller aid projects also can be effective and requests a broader perspective and other measurements of aid success from researchers. Also, he mentions the particular incentive problem that the agencies that distribute aid face, "spending one group of people's money on a different group of people" (Easterly, 2003, p. 39). The agencies are not supervised, and there is very little transparency for the general public. This is made possible due to the narrow growth focus, as well as an emphasis on quantity instead of quality aid (Easterly, 2003).

Looking at this research, it is clear that there are disagreements on how to effectively measure aid impact. The measurements of growth all rely on the idea that development aid exists to increase monetary measurements such as Gross Domestic Product (GDP) or purchasing power. Considering the research, this way of measuring effective development aid may not always be most appropriate. Because of this, we want to search for another indicator that potentially could capture more differences.

2.2. Body height as a measure of economic well-being

Body height has been regarded as a measurement of importance for a long time. More from an economic perspective, it has been shown that malnutrition indicators such as body height or weight, particularly when looking at children, also can be used in a broader sense to indicate economic well-being and deprivation. Reducing child malnutrition was one of the Millennium Development Goals of the United Nations. This goal aims to reduce people suffering from hunger by half between 1990 and 2015. Other Millennium goals concern factors such as maternal health, education and gender equality (UNDP, 2010).

Even looking away from the cases of extreme hunger, taller children tend to show more desirable skills and traits later in life, both physiologically and socially. Examples are

better cognitive skills and a lesser likelihood to show medical impairments. Taller children also tend to be less likely to live in poverty later in life. Thus, it is obvious that the body height of children is a very important measurement, and that it can be regarded as a summary measure of many different social and medical factors (Hoddinott et al., 2013).

In fact, malnutrition measurements may work better than some of the more classic measurements such as GDP or household spending as an indicator of development. One of the main problems with monetary measurements when comparing different populations is the subjectivity of money conversion. When comparing different countries, or especially regions within a country, finding a common measuring limit for poverty can be difficult. There may be regional differences in general pricing and subsequently the amounts of money needed for daily life. Yet allowing for this fact will often make the comparisons inconsistent and subjective. Also, the available monetary data is commonly based on household level and there is often no way of allocating the well-being of each individual member. There may also be significant public goods, such as access to drinking water, that contribute to the well-being of one specific village but that are not captured in the monetary measurements (Heltberg, 2009).

One of the advantages of using height rather than weight, as an indicator of economic welfare, is that body weight is much more volatile, and thus a poorer indicator of general well-being (Heltberg, 2009). The World Health Organization shares this view to the extent that it often uses height indicators to assess the general socio-economic status of a country. More specifically, WHO uses the height-for-age in these calculations, since this measurement eliminates the natural height differences in different age groups. The height-for-age is then standardized with zero as the median and transformed into a z-score for comparative measures (HAZ). This allows the individual score to be compared to the median height, or in this case the WHO growth standard. The comparison is usually stated in the number of standard deviations a child is differing from the growth standard graph (de Onis & Blössner, 1997).

The term stunting rate is most commonly used when describing a child with an impaired growth. This well-established indicator represents a cut-off point for chronic malnutrition, and is thought to be the limit where the impaired growth is proven to have

a more chronic and severe impact. It is defined as a child being more than two standard deviations shorter than the WHO growth standard median, based on children under five years of age and from totally different ethnic and cultural backgrounds. This term is of high importance for the study, and because of this we analyze it further (de Onis & Blössner, 1997).

The question at stake is if the environmental component of body height can be separated from the inherited component. This is crucial when conclusions are made about the reasons for impaired growth. Several studies have been made on this specific topic. One central paper (Grummer-Strawn, Reinold, & Krebs, 2010) compares growth for preschool children in two groups: children from different ethnic backgrounds but from the same socio-economic groups, and children of one ethnicity but from different environmental backgrounds. The study concludes that there is a much larger difference between children from different socioeconomic backgrounds, to the extent that the ethnic factor may even be negligible. Other articles also confirm this, one stating that "all children have the potential to grow similarly, regardless of their ethnic group or place of birth, if they are in a healthy environment and receive adequate nutrition" (Grummer-Strawn, Reinold, & Krebs, 2010, p. 4). This is a very strong statement that leads us to feel confident in our socio-economic approach focusing on the environmental factors, avoiding a more medical focus on the inherited component (Grummer-Strawn, Reinold, & Krebs, 2010).

This is also an important reason to look at child height and not adult data. The inherited component becomes more important as the child grows, and thus the analysis becomes difficult. It has also been shown that taller children are very likely to grow up to be taller adults. Another important reason is that adult growth potential is highly dependent on environmental factors in the early childhood, and is a worse proxy for current well-being (Case & Paxson, 2006). This is also an important statement that raises the question of catch-up.

Several studies have been investigating if stunting is chronic and remains for life, or if catch-up is possible, if the environment were to improve. One thing that all papers in our research agree on is the less restrictive assumption that catch-up is very difficult, and in many cases impossible. What is often needed is a complete change of the environment,

which is very rarely possible. For example, children being adopted into families in other richer countries have been showing some degree of catch-up (Golden, 1994). This is a topic where further research is needed, but since our focus is more of the economic nature we will leave it open.

We also need to clarify an important theoretical distinction. Stating that the ethnic component is negligible for the variation of population growth does not imply that the genetic factor will be unimportant on an individual level. Misunderstandings often arise when discussing heritability, where the population variation is confused with the individual subject. This can be exemplified in this previous argument. Declaring that none of the variability in the growth of preschool children is due to genetic factors does not automatically imply that genetics is unimportant in measuring body height for a single individual (Silventoinen, 2003).

It is important to emphasize that genetics definitely will have an impact on the difference of children body height for the individual person. In countries where the stunting prevalence is low (e.g. due to a more favorable economic state), there will still be individual differences in body height, mainly due to genetic components. However, in poorer regions, the environmental factors tend to take over and be the main cause of differences in body height. To conclude, it is important to consider that the causes of height variance can be different depending on the society, culture and context in which they are observed (Silventoinen, 2003).

What causes have been shown to increase or decrease the likelihood of stunting? The first important point to make is that this is contingent on the age of the child. One study has shown that the driving factors and implications of growth failure changes significantly as the child ages. Underdevelopment at birth is mainly connected to maternal factors. In the age group between 6 months and 2-3 years the main influence is exposure to infectious diseases and dietary choice for the baby. After this, the social aspects of the household becomes more important, for example access to food or water (Martorell, Beaton, Kelly, Kevany & Mason, 1990).

There are several potential problems when measuring the relationship between GDP and height. For example, economic growth may not reach the people most in need of it, or the public health services may not improve with growth. Also, there may be a general

lack of information about health and nutrition practices in households that may persist even with an increased general income (Smith & Haddad, 2002). An example of this is a study of Indian children that fail to find significant evidence of a relationship between economic growth and improved childhood nutrition. Instead, what is needed is monitored investment in health interventions (Subramanyan et al., 2011).

2.3. Political system of Malawi

Malawi is one of the poorest countries in the world. Highly dependent on foreign development cooperation funds and generous granters of loans the GDP per capita doubled from $349.6 in 1990 to $722.4 in 2010. This is equivalent to an on average GDP per capita growth of 3.9% per year, a relatively strong growth rate partly due to high agricultural production (World Bank, 2014)(Mussa & Pauw, 2011). However, half of the population of 17 million inhabitants still lives in extreme poverty and recurrent natural disasters and flooding keep slowing down the progress in a country already tormented by tropical diseases such as malaria. A HIV epidemic is continuously agonizing the country where at least every tenth person is infected by the deadly disease (CIA, 2015).

Even though elections are held, widespread corruption is still harming the country on several levels. Except for slowing down growth, corruption and the lack of transparent democracy has made donors freeze payments of aid at several occasions. In 2013, Malawi was put on the world map when the huge corruption scandal "cashgate" unveiled. 32 million dollars, or one percent of the country's GDP, disappeared from the country in a matter of six months (The Economist, 2014).

In order to examine the situation in Malawi further, we consider the global measurements available for corruption. Note that we are focusing on the numbers for 2010, since this is the period of our aid data. In Transparency Internationals (2010) yearly Corruption Perceptions Index measuring the corruption in the public sector, Malawi takes position 85 out of 178 measured countries. This actually places Malawi in a better position in the index than most other Sub-Saharan African countries, such as Zambia, Ethiopia, Uganda and Republic of Congo (Transparency International, 2010). Notably, all these four countries have higher or even considerably higher GDP per capita than Malawi (World Bank, 2014). However, the corruption is on the increase in the Malawi.

Comparing with the first time the country was measured by Transparency International in 1998, Malawi's score has constantly deteriorated according to the Corruption Perception Index. In fact, Malawi's recent negative development is distinctive compared to neighboring countries.

3. Previous research

One study by Dionne, Kramon and Roberts (2013) uses the same aid data to understand if and when development aid is effective. They examine what is the primary driver of deciding how aid gets allocated, thinking that there may be a difference between need allocation and political favoritism. Adding to previous studies, they compare different aid sectors such as health or education. This stands in contrast to the classic idea of looking at macroeconomic growth measurements. Their idea is to first examine what decides the allocation of aid, and then carefully assess the impact of aid. Looking at the issue of allocating aid, they find that need is not a significant factor when considering all sectors. Furthermore, health and education aid projects in particular appear to be more successful than other types of development aid, both in allocation and effectiveness. The reasons may be that there is a higher transparency in the allocation of these sectors, or that the donors in these fields are more careful in noticing their aid being used inaccurately (Dionne, Kramon & Roberts, 2013).

In a paper by Benin, Makombe and Johnson (2014), the authors examine many different factors affected by development aid. They focus on agricultural aid and food production in Ghana. They consider the poverty rate and its distribution, as well as the price index and food production. Stunting rate is also used as one of several different measurements to evaluate the development aid effectiveness, along with for example the weight of the child. This is one of few studies that focus on stunting rate as a way of evaluating aid effectiveness. They find that the stunting rate successfully decreased between 2003 and 2008, while for example the prevalence of wasting instead slightly increased. Considering the gender aspect of the children, stunting as well the other malnourishment measurements show a worse outcome for boys than for girls (Benin, Makombe & Johnson, 2014).

A more recent study (De & Becker) from March 2015 uses the same dataset as the one we analyze to examine the effectiveness of development aid in Malawi. Many reports have shown that the development aid should be allocated to the countries that can make more use of it, and that possess better policies to handle the resources. The study examines the general effectiveness of development aid by looking specifically at three different sectors of aid; health, education and water. This is measured more specifically

by looking at disease severity (Health), diarrheal illness (Water) and school exposure (Education). The paper concludes by theorizing around the issue of assignment, and specifically on how to decide the effectiveness of projects. They end with a warning about analyzing development aid effectiveness purely on the basis of GDP, and suggest instead to focus on the specific field that it is given to. For example, water aid should be allocated to the area with the highest prevalence of infectious disease or diarrheal illness. They do not reach a conclusion on the question of corruption and whether the aid is funneled to the right organization or stuck somewhere along the line, but note that in general the aid seems to be effective in reducing poverty (De & Becker, 2015).

An article published at Harvard University by Jayachandran and Pande (2013) uses height-for-age as a dependent variable when explaining why India shows such a persistently high stunting rate, even though the country has experienced decades of tremendous economic growth. In order to do this, they compare children from India and Africa, and regress body height variation on many different factors. Interestingly enough, they find that the height advantage of the African children has a more cultural reason. The height difference does not exist when looking at first-borns. In fact, for this group the Indian children have an advantage. However, for the subsequent births the relationship changes. They find that a reason for this is the social preference of having sons in India, which leads families to keep trying to conceive until giving birth to a son. At the same time, the daughters that the families have are comparatively worse off than their male siblings, as a way of "conserving resources in anticipation of having another child to try for a son" (Jayachandran & Pande, 2013, p. 18).

4. Method

We aim to examine what impact development aid projects have on the height of children on a district level in Malawi, Africa. This implies that we have to use some variation of the body height as a dependent variable. Since we want to examine the height variation across the population, we use the standardized height-for-age z-score (HAZ) as our dependent variable. The idea is that height variation should work as an indicator for many different social and health related factors. In our dataset this variable indicates the number of standard deviations that the individual is deviating from the World Health Organization growth mean (zero), times 100. A HAZ lower than -200 thus indicates that the individual is stunted, since this is equivalent to being two standard deviations lower than the WHO growth median.

In the study, we use the most recent Demographic and Health Services (DHS) survey data on Malawi (NSO, 2011). This survey data contains information about every mother in the interviewed households and all her children. There were a total of 72,301 children in the dataset, of which 4,586 were under five years old and agreed to be measured for weight and height. This is the total subset we will be using. It is important that we include many different control variables that we theorize could affect the body height variation of a child, including medical, social and economic factors. These factors are all part of the DHS dataset.

As our main independent variable, we are using a dataset focusing on the total amount of development aid given to Malawi between 1990 and 2011 (Peratsakis, Powell, Findley, Baker & Weaver, 2012). The numbers from 2011 are not considered since the rest of the data is from 2010. The data is sorted on 27 of the 28 districts of the country, where the district Likoma is excluded due to its totally different characteristics as a small island secluded from the other areas. The dataset contains information on the number of projects during this time, as well as monetary disbursements and type of project. The separation on districts allows us to have a reasonably high cluster sample size in regards to development aid. We have then matched the DHS districts with the dataset on development aid. It is rare to have representative data on such a local level as districts, something that allows us to measure finer differences within one country.

5. Empirics

5.1. Ordinary Least Squares regression

Hypothesis to be tested: Does additional development aid projects affect the body height of children under the age of 5? If body height can function as a comprehensive measurement of different social and medical factors and our sample is representative, we hope to find taller children in districts that have received more development aid projects. Since many aid projects are aimed at improving long-term social development, we believe that the impact is measurable many years after the end date of the project.

We start by using an ordinary-least-square (OLS) regression to analyze the impact of development aid on stunting rate, including various control variables. As an indicator for development aid, we use the total number of projects for each region during the specified time period. We base the decision of which control variables to include on our own theories, supported by previous research in the field. This is also reflected in the method of incorporating the variables in different levels or "waves." We believe that these three waves should satisfactorily control for the most important factors.

$$HAZ_i = \beta_0 + \beta_1 finanaid_i + \gamma_i agedummies_i + \delta_i child_i + \delta_i maternal_i + \delta_i social_i + \varepsilon_i$$

$$H_0: \beta_1 = 0$$
$$H_1: \beta_1 \neq 0$$

Our idea is to examine whether financial aid can affect body height variation. Thus, our null hypothesis is that there is no correlation between development aid and the height-for-age z-score among Malawian children.

HAZ_i is the dependent variable reflecting height-for-age, standardized around the mean of zero; $agedummies_i$ are dummies for the age of the child; and $child_i$, $maternal_i$ and $social_i$ are the different waves of control variables. For a compilation of the different variables, see Table 1. For descriptive statistics regarding statistics such as the mean and standard deviations of the variables, see Table 2.

The first wave includes factors that concern the individual child; such as for example age, sex or weight. The factors age and female allow us to measure whether stunting risk increases or decreases for different genders and age groups. This is possible when using a standardized measurement as dependent variable, such as height-for-age. If we had used for example body height in centimeters instead, these variables would not have been very informative, since they would have contained the natural progression of height over different ages as well as the natural height difference between boys and girls. Thus, we put an extra focus on growth, and incorporate dummy variables for every age from 0 to 4. This is also based on the previously mentioned statement by Martorell et al., (1990) that malnourishment in different age groups may have different reasons and implications, something that we will be able to identify with this approach. We also include the birth weight of the child, since this most likely will have an impact on stunting rate, especially for exceptionally low birth weights. Because of this, we include a dummy variable stating a low birth weight. The idea of including the hemoglobin level is that it captures many different health related problems (Antelman et al., 2000). This allows us to incorporate potential issues that we do not have specific data for.

The second wave contains maternal factors such as the education level or the body height and weight of the mother. Including maternal factors is crucial when examining child health factors, since it can capture both genetic factors and for example social hygiene practices. Incorporating a dummy variable for low maternal weight aims to capture both a socio-economic and health aspect; where if a mother has been severely undernourished it likely impacts the child. The same argument can be said about maternal height, but since this variable is continuous it should also capture genetic height correlations on the individual level. The maternal education is a variable often included, since it can work as a proxy for many other potentially important factors such as literacy.

The household factors included are the wealth index and a variable for being enrolled in a food support program. The food support enrollment is a dummy variable for being registered for the service. This can act as a social status indicator, emphasizing on the hunger problem per se. The wealth index is an important factor in our case, since it identifies all sorts of different socio-economic factors relevant for the household, ranging from disposable income to water access or electricity. This index is normalized in Malawi, which makes it convenient when analyzing more nuanced differences of stunting

on a domestic level. It is then divided into five quintiles with similar-sized groups for the whole country. This allows for different analysis without access to data on for example individual household expenditure.

We also considered including some ethnic or religious factor in the third wave. However, from previous research we did not find any clear indicators of a specific group being discriminated on these grounds. Thus, we chose to exclude this on the basis that wealth index also can capture some discrimination grounds.

TABLE 1
VARIABLE LIST

Variable	Variable Name	Definition	Source
HAZ	Height-for-age z-score	Standardized height-for-age (x100), around the mean of 0	DHS
stunted	Stunted	Dummy if the child is stunted	DHS
finanaid	Financial aid	Number of total aid projects per district between 1990 and 2010	CCAPS, AidData, Government of Malawi
female	Female	Dummy if the child is female	DHS
age	Age group	Dummy variables for every age group, where age_1 denotes a child being between 1 and 2 years old	DHS
low_birthweight	Low birthweight	Dummy if the child had a birthweight of less than 2500 grams	DHS
child_anemia	Hemoglobin level	Discrete variable that assumes 0-3 depending on hemoglobin level, (non-anemic, mild, moderate, severe anemia)	DHS
educ_low	Maternal education level	Dummy if the mother has only primary school or lower as highest achieved education level	DHS
mother_height	Maternal height	Maternal height in millimeters	DHS
low_mother_weight	Maternal weight	Dummy if the mother weighs less than 40 kilos	DHS
wealth_index	Wealth Index	WHO Wealth Index quintile, based inside Malawi	DHS
food_support	Food support program	Dummy for being enrolled in a food support proram	DHS

TABLE 2
DESCRIPTIVE STATISTICS

Variable	Obs	Mean	Std. Dev.	Min	Max
HAZ	4586	-177.6243	158.1552	-598	574
stunted	4586	.464239	.4987739	0	1
finanaid	4586	49.78849	22.07675	19	123
female	4586	.5043611	.5000355	0	1
age_0	4586	.1840384	.3875577	0	1
age_1	4586	.2269952	.4189351	0	1
age_2	4586	.2021369	.4016376	0	1
age_3	4586	.2008286	.4006638	0	1
age_4	4586	.1860009	.3891498	0	1
low_birthweight	2981	.0969473	.2959357	0	1
child_anemia	3980	1.077387	.922229	0	3
educ_low	4586	.8656782	.341035	0	1
mother_height	4541	1562.4	61.90894	1070	1950
low_mother_weight	4583	.0117827	.1079184	0	1
wealth_index	4586	2.869385	1.332978	1	5
food_support	4586	.0207152	.1424448	0	1

5.2. Endogeneity problem

It is important to make a note on the concept of endogeneity, in other words a correlation between the independent variables and the error term. This can be caused by both omitted variable bias and reversed causality. In our model, the aid variable is especially susceptible to reversed causality. To understand this, we consider the different reasons for giving aid to a certain district. The endogeneity problem arises because the donor can decide whom to assign the money to. For example, a district may receive a larger share of development aid for extraordinary policy change or good recent development with subsequent low stunting rate. This implies that the good economic policy has caused an increase of aid, and not the other way around. On the other hand, and perhaps more common, an acute crisis in the country may lead to increased aid. This is a typical example of reversed causality, which implies that we can prove correlation but not causality. In this case the exact relationship does not really matter, the important thing is that the causality might go from stunting to aid allocation. Corruption further decreases the transparency of the decision making when assigning aid projects, and worsens any potential endogeneity.

Omitted variable bias is another potential problem when using OLS. In this case, there may be for example maternal factors affecting the stunting rate, for example the ability to raise a child. Not including all variables will lead to inconsistency and bias of the regression, if the coefficients are also correlated with the dependent variable. This is one reason why it is crucial to include many control variables. However, in our case we do not consider the risk of omitted variable bias as severe.

5.3. Instrument variable

One of the most common ways of handling the endogeneity problem is using an instrument. The idea of using an instrument variable is to isolate the change in stunting rate that occurs solely due to change in financial aid and not due to factors included in the error term. Because of this we also do a second regression, addressing these problems. The 2-Stage Least Squares instrument variable analysis will be useful, as long as we can identify a valid instrument. Our idea is to use the population of each district as an instrument for development aid. This approach allows us to avoid the problems of endogeneity otherwise seen in the OLS, as long as the instrument is valid. In order to

touch upon many of the recent controversies when using instrument variables, we need to carefully motivate why we use the population in this case.

Two assumptions are needed in order for this strategy to work satisfactorily. The instrument variable needs to be correlated with the endogenous regressor, in this case the number of aid projects. This is also known as the relevance requirement. The second assumption is that the instrument variable has to be exogenous in the model, implying it cannot be correlated with the error term u_i.

The idea is that population size should be correlated with the number of projects that a district receives. We also believe that the population size in every district does not impact the height-for-age in the district directly, nor the other way around. This implies that the only way that population size affects height variation should be through the effect on financial aid allocation. Compared to classic instrument regressions of using growth as dependent variable, the exogeneity assumption seems more logical in our case. Using population seems less likely to affect body height than for example GDP per capita, since it is more sturdy and conclusive. It also helps that our regression is based on a within-country level instead of a cross-country analysis.

All our results are clustered on the district level. This is done throughout all regressions, in order to allow for any correlation inside groups of observations. In our regression, the development aid variable does not vary across individuals from the same district. This is because the aid data is collected on a more aggregate level than the individual survey data. The model thus fails the assumption of sampling independence on the individual level, and the standard errors need to be adjusted for this. This is the reason for the district-level clustering.

6. Results

6.1. Ordinary Least Squares regression

TABLE 3
OLS REGRESSIONS

VARIABLES	(1) HAZ	(2) HAZ	(3) HAZ
finanaid	0.392**	0.274*	0.220
	(0.151)	(0.141)	(0.130)
female	26.96***	26.92***	26.48***
	(5.905)	(5.668)	(5.899)
age_1	-88.05***	-88.17***	-88.56***
	(10.37)	(10.96)	(10.93)
age_2	-106.6***	-107.9***	-108.2***
	(12.91)	(13.14)	(12.90)
age_3	-99.48***	-103.4***	-103.1***
	(11.11)	(11.90)	(11.64)
age_4	-89.60***	-93.11***	-94.11***
	(13.80)	(14.38)	(14.17)
low_birthweight	-33.09***	-26.52**	-25.99**
	(11.47)	(10.69)	(10.27)
child_anemia	-15.34***	-15.24***	-13.21**
	(4.902)	(4.887)	(4.966)
educ_low		-24.74***	-12.99*
		(7.073)	(7.056)
mother_height		0.517***	0.499***
		(0.0680)	(0.0681)
low_mother_weight		-55.02***	-53.10***
		(18.54)	(17.84)
food_support			-37.19**
			(15.05)
wealth_index			10.57***
			(2.609)
Constant	-111.0***	-891.1***	-903.6***
	(14.75)	(105.4)	(101.6)
Observations	2,540	2,523	2,523
R-squared	0.061	0.112	0.121
F test	14.53	20.77	23.91

Robust standard errors in parentheses
Clustered on district level
*** p<0.01, ** p<0.05, * p<0.1

When considering the results, we find that the variable containing the number of development aid projects starts out as significant but changes through the regressions, as seen in Table 3. It has the expected sign, which in this case implies that more aid projects in fact increases the height-for-age z-score (HAZ). The coefficient is however quite low, at least when looking at the impact of one additional aid project. Considering the fact that many districts have up to 100 projects, it is still a result with economic meaning. However, since the result is not significant, we fail to reject our null hypothesis.

Looking at the other variables we see that boys in general show a lower HAZ than girls. This is consistent with earlier work where boys are showing a higher prevalence of being stunted (Wamani et al., 2007). The age dummy variables show that older children display lower HAZ than newborns. This effect is quite dramatic, where only about ten percent of all stunted children belong to the youngest age group. The rate is disproportionately low, since the age groups contain close to the same number of individuals. Thus, if stunting was evenly distributed, stunting rate should contain 20 percent from each age group. This is most likely due to two reasons. First, the possible variance in body height should increase as the child ages. Also, malnourishment in the lowest age group is mainly caused by maternal factors, and would indicate that the stunting occurring in Malawi often increases around the period when the child transits from breastfeeding to solid food.

It is also shown that children born with a low birth weight show lower HAZ, which emphasizes the importance of the nutrition of the mother before birth. The correlation between being born with a low birth weight and being stunted is however less than ten percent. Children that show a lower hemoglobin value also tend to show lower HAZ. This becomes especially true when the individual is severely anemic. Hemoglobin level is a measurement indicating several health-related issues, and a blood test can be indicative of both nutritional deficiencies and infectious diseases. It can thus work as a collective measurement for many different medical problems (Antelman et al., 2000).

When including the next wave of maternal factors, several variables are important. The education level of the mother is critical. It turns out that a low education of the mother leads to a lower HAZ, especially if she has not finished a higher education than primary school or has no schooling at all. This is in fact true for about 85 percent of the

population. Thus, it may be more reasonable to state that children having a mother that finished secondary school are very fortunate regarding the stunting risk.

Both the height and the weight of the mother are significant factors impacting the child's HAZ. For weight, there appears to be a tipping point at about 40 kilos where, if the mother weighs less, HAZ of the child is severely decreased. The height of the mother is also highly significant, where a shorter mother decreases the HAZ.

The wealth index is as previously noted a measurement for household and socioeconomic factors. This works as a collective measurement, just like the hemoglobin level did for health, to examine many different factors. The wealth index is a very significant factor. When considering the coefficient for food support, we note something interesting. It is in fact negatively correlated with HAZ, which implies that being enrolled in the support program actually decreases the height-for-age of the child. In this case, the food support program most likely acts as a proxy for hunger in general.

Using the height variation as a dependent variable gives continuously low R-squared values. This may not be much of an issue, nor a surprise, since measuring the variance of body height contains less variation than using the real height data. When regressing on the actual body height in centimeter instead of the variance, the value is much higher. This can be explained by the fact that age and gender is very significant in explaining height in general. However, using our dependent variable these factors are per definition already controlled for. Thus, there appears to be no problems with our data, but instead a pure matter of measuring technique. Also, body height is affected by genetic factors on an individual level, making it hard to get very exact values.

When adding waves of factors, the significance level of aid decreases, and it ceases to be significant when adding wealth factors. This is interesting and needs to be analyzed further. The fact that wealth index, when added, makes financial aid insignificant suggests that these two variables try to explain some of the same variance. This implies that development aid is insignificant, but it could also be that aid impacts height through the wealth index. Since height-for-age works as a comprehensive measurement for many other factors, it is likely that its coefficient would decrease when adding these factors to the regression. Because of this, we cannot make the immediate conclusion that aid is

non-effective. Additionally, we are aware of the possible reversed causality. We thus have several reasons to doubt the OLS regression and look for more evidence.

6.2. Instrument variable

In order to investigate whether financial aid is effective, we consider the result of the first stage of the 2SLS regression

TABLE 4
FIRST STAGE 2SLS

VARIABLES	(1) finanaid
female	0.344
	(0.374)
age_1	-0.0613
	(0.589)
age_2	-0.229
	(0.587)
age_3	-0.0667
	(0.506)
age_4	-0.584
	(0.742)
low_birthweight	-0.263
	(0.941)
child_anemia	0.307
	(0.432)
educ_low	-1.329
	(0.982)
mother_height	0.00538
	(0.00596)
low_mother_weight	-1.595
	(2.164)
food_support	-1.515
	(1.191)
wealth_index	1.208**
	(0.496)
population	7.60e-05***
	(8.54e-06)
Constant	5.104
	(11.24)
Observations	2,523
R-squared	0.761
F test	19.58

Robust standard errors in parentheses
Clustered on district level
*** p<0.01, ** p<0.05, * p<0.1

Considering Table 4 the population and financial aid appear to be very correlated. This suggests that the model likely fulfills the instrument requirement of relevance. More financial aid is given to districts with a higher population. However, the wealth index is also significant in the first stage, and it appears as if more aid is given to districts that are already rich. This explanation arguably makes little sense. More likely is that we once again need to consider the possibility of reversed causality, where additional aid projects have helped to increase the wealth of the districts. This result can possibly point towards effective development aid, at least in increasing the wealth index. Thus, it is likely that financial aid increases height-for-age z-score through the variable wealth index. To confirm this, we analyze the 2SLS results.

TABLE 5
SECOND STAGE 2SLS

VARIABLES	(1) HAZ	(2) HAZ	(3) HAZ
finanaid	0.177	0.0846	0.0698
	(0.138)	(0.140)	(0.133)
female	27.27***	27.21***	26.70***
	(5.799)	(5.579)	(5.795)
age_1	-87.82***	-87.92***	-88.38***
	(10.21)	(10.76)	(10.71)
age_2	-106.7***	-107.9***	-108.3***
	(12.64)	(12.86)	(12.63)
age_3	-99.28***	-103.1***	-102.9***
	(10.90)	(11.66)	(11.38)
age_4	-89.45***	-92.98***	-94.03***
	(13.47)	(14.04)	(13.83)
low_birthweight	-33.06***	-26.49**	-25.96**
	(11.43)	(10.65)	(10.19)
child_anemia	-15.25***	-15.15***	-13.10***
	(4.792)	(4.778)	(4.858)
educ_low		-25.52***	-13.36*
		(6.946)	(6.946)
mother_height		0.521***	0.502***
		(0.0670)	(0.0671)
low_mother_weight		-54.67***	-52.77***
		(17.65)	(17.00)
food_support			-37.36**
			(14.82)
wealth_index			10.80***
			(2.593)
Constant	-100.6***	-888.0***	-901.3***
	(13.26)	(103.1)	(99.29)
Observations	2,540	2,523	2,523
R-squared	0.060	0.112	0.121
Wald test	111.99	242.98	324.10

Robust standard errors in parentheses
Clustered on district level
*** p<0.01, ** p<0.05, * p<0.1

Looking at Table 5, we see that the part of financial aid that affects height-for-age through population is insignificant. This is interesting considering that we know that both wealth index and population are positively correlated with financial aid, and that wealth index is positively correlated with height. In other words, aid appears to increase the wealth in the district, and subsequently the height-for-age. However, when looking at the aid effect through population, the effect on height-for-age is zero. How can we analyze this seemingly confusing fact?

One reason might be that our instrument is imperfect. The southern region of Malawi is poorer than other parts of the country. One reason for this could be land scarcity, which potentially affects the country severely since agriculture is a big source of income (Mussa & Pauw, 2011). At the same time, population density is most severe in urban areas, which makes any possible correlation unclear. It is also known that Malawi is a relatively equal country in terms of income, which further would speak in favor of our instrument. If there is in fact a negative correlation between population size and wealth index, our exogeneity assumption fails. Practically, this would imply that two contradicting forces would affect the wealth of districts with a high population. First, development aid would make the districts richer, since they receive more aid projects. At the same time, the land scarcity would lead to overpopulation and therefore imply a negative effect on wealth index. This relationship would explain all regression results, and it does imply that aid in fact works. We do acknowledge that the instrument might be imperfect, but we still think it offers interesting insights to the analysis. Future research should aim to find a more valid instrument.

7. Analysis

Analyzing the result is interesting in many aspects. The regression points towards the difficulty in measuring the impact of development aid. The analysis will consider the implication of the result, and ask if it in fact can be viewed as development aid working. In order to do that, we will have to evaluate possible limitations of the study. We will then proceed to discuss the impact of corruption and policy decisions as important factors when analyzing aid effectiveness. To conclude, we will investigate the problems of aid allocation from the perspective of the donor.

7.1. Data and source of errors

We decided to concentrate on analyzing the number of development aid projects. We are aware that our cluster size of the different districts and thus the variation in aid data is relatively low, even though Malawi is one of a few countries that is representative on the finer district level instead of the broader region level. This is obviously not ideal, but it is an effect of the design of the survey. Practically, this could make the standard errors incorrect, but since the cluster size is reasonably big we do not go further to solve this potential problem. Preferably, it would be useful to know the exact monetary sum that has been allocated to every individual in the set, something that is obviously hard to measure.

One idea could also be to use other dependent variables, for example the height of the mother. When using body height of children, we face the potential problem of some aid projects taking place years before the children were born. Since many projects aim to affect the policies or culture of the population long-term, for example by improving hygiene practices, we think that the effect from aid projects will be visible even many years after the project took place. Also, using the maternal body height would increase the noise from the inherited and genetic factors, as mentioned earlier.

As noted, stunting rate is as a relatively static measurement, less sensitive to short-term volatility. This is often helpful, since it avoids the randomness in the day-to-day fluctuations of for example child weight. However, it can also make it less suitable as an indicator of short-term research. To exemplify, height measurements may be less useful

when analyzing very small differences of economic improvement, and the variation of number of projects in our dataset may possibly be too small to be observed.

Another important enquiry worth further reflection is if it is even possible to see a real change in body height in the relatively short period of time that this paper examines. The earliest data is derived from projects being undertaken in the beginning of the nineties. All of the health data on for example wealth levels and the weight of the mother were collected in 2010. In other words, there has been at most two decades in which the average height has had a chance to increase. Is this period applicable to be able to make comprehensive conclusions using the stunting rate as a measure of relevance? We would say that it is. Looking at previous studies, we see evidence that change in malnutrition factors due to new economic situations in fact can be fast paced. In one case, Cambodia managed to decrease its stunting rate by ten percentage points in one decade (Ikeda, Irie & Shibuya, 2013).

At the same time, many projects are closer to the date of measurement than that. Projects taking place the same year as the survey was undertaken have only had a few months to change the stunting rate of the child being affected by the project, either directly or through the mother. However, despite being a relatively static measurement, even stunting can be affected in a relatively short period of time. For example, if health aid was given to a district to support malaria vaccine for one year, we could expect an impact on the stunting rate in a comparatively short time spectrum. The same argument applies to certain nutritional packages sent to young mothers or children. This suggests that it is important to consider both relatively fast and slow changes on stunting rate that can be derived from development aid.

7.2. Corruption and policies

We have analyzed our regression and seen that development aid can be effective to some extent in Malawi. Some factors, like the policies or corruption in the country, are hard to quantify and compare, but they still need to be discussed in order to have the full picture. Research has shown that the country-specific factors, such as policies or political environment, are very important aspects. This may be especially true when looking at the effectiveness of aid, since the funding otherwise faces a risk of disappearing into the wrong hands. Since we conduct our regression on a national level where we suggest that

the policies at stake are generally the same, we do not include such factors in our regression. However, if we want to consider the case of Malawi in an international context and make a broader outlook, we need to examine the policy and country-specific factors in the analysis.

During the past years, Malawi appears to have been affected by corruption. The aid has been frozen several times due to government officials putting money in their own pockets. However, we still get a slightly positive effect of financial aid on the stunting rate of Malawi's children. Even though corruption appears to exist and might be rising, aid seems to be effective on some level. One potential reason for this is that some types of aid, such as direct budgetary, are more likely caught in corruption than for example health or education aid. Most likely, if there would be less corruption, we would also expect development aid to be even more effective.

Interestingly, there seems to be less corruption in Malawi than many other sub-Saharan countries. Considering the previous research, it may seem that Malawi should receive more development aid in relative to other countries. However, there are many other country-specific factors than corruption that could affect the development aid effectiveness, which makes such far-reaching conclusions invalid.

Policies are important parts of the country-specific factors. However, there may be difficulties involved in measuring what is a good or bad policy. While there are easily accessible ways of measuring the transparency and economic freedom of a country, there are no clear-cut and conclusive measurements that would give a comprehensive view of the prevailing policies of the country. Even if we can examine the political landscape in a precise manner, comparing between different countries becomes difficult and out of context. What constitutes a good policy is also a highly theoretical question.

Malawi being highly dependent on foreign aid puts the country in a peculiar position. If the situation in Malawi would increase to the better, would the foreign aid donors then increase or decrease their funding? The answer to this question is not straightforward; if the donors would decrease the development aid, in the events of a remarkable development of policies and growth in wealth, this could lead governments to follow other incentives than what is best for the country in the long-term. In other words, even if the government is not self-serving or corrupt, they may still act to promote a

consistent flow of foreign aid, rather than strive for long-term economic growth and temporarily lose the incoming cash flow.

Many developing countries have been afraid of getting into the so-called "middle income-trap" where they through development aid have reached a certain level of wealth. When aid donors then withdraw their granting or generous loans, in light of these improvements, the government may feel that all that has been built up is at stake (The Economist, 2011). This creates an incentive of government inactivity that could be the cause as to why development aid is not as effective as expected, despite less corruption and better political and civil rights. In other words, it may be in the interest of even non-corrupt governmental officials not to improve the conditions of the country. The reason for this is that an improvement, paradoxically, could lead to an even worse situation for the country when donors pull back funding. This is also one of the reasons why it is hard to prove the direction of causality when measuring development aid impact. How does one solve the incentive problem?

7.3. Donor perspective

Considering the often-cited article by Burnside & Dollar (2000), one solution to the incentive problem could be to allocate development aid to the countries that are able to disburse it the best. If developing countries or districts with good economic policies would receive more development aid, this would be an incentive for developing countries to reform policies and improve governance. The paradox is that developing countries often lack the policies that they need to properly canalize the development aid to get out of poverty.

An interesting question arises if we consider the agencies distributing development aid, and the power that they possess. These agencies are sometimes not transparent and seldom monitored. They have an incentive to show fast and quantifiable results, not necessarily with the long-term wealth of the country's inhabitants in mind. This makes monitoring of the development aid projects crucial. When the actual effectiveness of the development aid is hard to measure, it becomes even harder to evaluate the actions of the subjects. Since research has shown that the most effective development aid often is long-term, this lack of transparency may actually help to decrease potential welfare.

8. Conclusion

This thesis focuses on the difficulties that arise when trying to measure development aid effectiveness. We try to combat these problems by using a malnourishment measurement, more specifically the variation in body height, as the dependent variable. The idea is to use this measure as a comprehensive indicator for many different health-related and economic factors.

Our idea is that the number of development aid projects should be positively correlated with the body height of children. In an OLS regression, we identify weak support for this when controlling for child-specific and maternal factors. When adding relevant household and social factors the financial aid is no longer different from zero. This leads us to consider a different regression method, in order to prove causality and not only correlation.

We decide to use district population as an instrument for the number of development aid projects, the endogenous variable. From the first stage of the 2SLS regression, we see that the effect from development aid on body height actually may occur through an increased general wealth. This may also explain why the aid factors' significance changed severely when adding the wealth variable. We interpret this as support for the effectiveness of financial aid. When considering the results from the 2SLS regression and controlling for the aid effect through population, the effect on body height is zero. This implies that we fail to reject the null hypothesis of no change. We suspect that the reason for this is a conflicting, negative effect affecting the high-populated districts and lowering the wealth, possibly due to land scarcity. If this is the case, we are obliged to admit that our used instrument could be imperfect in the context.

After analyzing the regressions and the potential reasons for them, we discover that the agencies themselves play an important role in the allocation of foreign aid. There is a lack of transparency and an apparent corruption that makes analyzing this process very complicated. We also identify two important incentive problems that contribute to make the analysis of aid effectiveness even more difficult. The agencies may be rewarded for canalizing aid to more short-term projects with more easily quantifiable results. We also mention the concept of aid dependency, where a country may act in a short-term

perspective to keep a constant cash flow of aid, rather than striving for long-term growth.

Many researchers agree on the fact that policies play a large role in deciding upon the effectiveness of development aid. Corruption is something that affects both the likelihood of receiving aid as well as the ability to utilize it effectively. We find that corruption in Malawi is on the rise, and that recent scandals have affected the reputation of the country negatively. However, many other sub-Saharan African countries are also heavily corrupted, some of them substantially more than Malawi. We theorize that different types of aid might be more susceptible to "disappearing" in corrupt governments, something future research on the subject can explore further.

We find that there is no consensus on how to best allocate aid, nor on its overall effectiveness. One well-cited article states that aid should be assigned to countries with preferable policies, which would lead to superior policies being an incentive for other countries to improve. Other researchers persist that aid to countries in times of crisis is effective, and that we have to be wary when measuring and analyzing the impact of different types of aid. Worth to mention is that the time frame of the Millennium Development Goals of the United Nations almost coincide with the aid time frame that we use. We therefore suggest that the data and empirical method that we have used can be developed further, in order to evaluate the goals in future research.

To conclude, we think that we have provided a valuable insight into the mechanisms of aid effectiveness and the usefulness of malnourishment measurements in this context. Measuring something as heterogeneous as aid effectiveness requires careful analysis, which becomes even harder when corruption and incentive problems disturb the process. Empirically, future research will have to find better-suited variables and instruments. In regards to this development we hope that we have come closer to a solution to the problem of evaluating development aid. The stunting rate measurement is useful when looking at both long- and short-term environmental changes, and we thus think that even with the fairly limited development aid data, the results that we present provide a useful base for future usage of malnourishment measurements in a broader context.

9. References

Antelman, G., Msmanga, G., Spiegelman, D., Urassa, E. J., Narh, R., Hunter, D. J. & Fawzi, W. W. (2000). Nutritional Factors and Infectious Disease Contribute to Anemia among Pregnant Women with Human Immunodeficiency Virus in Tanzania. *Journal of Nutrition*. 130*(8)*. pp. 1950-1957.

Benin, S., Makombe, T. & Johnson, M. (2014). Aid Effectiveness in Ghana - How's the L'Aquila Food Security Initiative Doing? (Discussion Paper No. 01359). Washington, DC: IFPRI.

Burnside, C. & Dollar, D. (2000). Aid, Policies and Growth. *American Economic Review*. 90*(4)*. pp. 847-868.

Case, A. & Paxson, C. (2006). Stature and Status: Height, Ability and Labor Market Outcomes. *Journal of Political Economic*. 116*(3)*. pp. 499-532.

Central Intelligence Agency (CIA). (2015). The World Factbook. Malawi. [Online] Available from: https://www.cia.gov/library/publications/the-world-factbook/geos/mi.html [Accessed: 16 May 2015]

De, R. & Becker, C. (2015). The Foreign Aid Effectiveness Debate: Evidence from Malawi, (Working Paper No. 6). Williamsburg, VA: Aid Data.

De Onis, M. & Blössner, M. (1997). *WHO Global Database on Child Growth and Malnutrition*. Geneve: World Health Organization.

Dionne, K. Y., Kramon, E. & Roberts. T. (2013). Aid Effectiveness and Allocation: Evidence from Malawi. Paper presented at the Conference "Research Frontiers in Foreign Aid" at Princeton University, April 26-27.

Easterly, W. (2003). Can Foreign Aid Buy Growth? *Journal of Economic Perspectives*. 17*(3)*. pp. 23-48.

Golden, M. (1994). Is Complete Catch-up Possible for Stunted Malnourished Children? *European Journal of Clinical Nutrition*. 48. pp. 58-70.

Grummer-Strawn, M., Reinold, C. & Krebs, N. F. (2010). Use of World Health Organization and CDC Growth Charts for Children Aged 0-59 Months in the United States. *MMWR Recomm Rep*. 59*(36)*. pp.1-15.

Heltberg, R. (2009). Malnutrition, Poverty and Economic Growth. *Health Economics*, 18. pp. 77-88.

Hoddinott, J., Behrman, J. R., Maluccio, J. A., Melgar, P., Quisumbing, A. R., Ramirez-Zea, M., Stein, A. D. Yount, K. M. & Martorell, R. (2013). Adult Consequences of Growth Failure in Early Adulthood. *American Journal of Clinical Nutrition*, 101*(5)*. pp. 1170-1178.

Ikeda, N., Irie, Y. & Shibuya, K. (2013). Determinants of Reduced Child Stunting in Cambodia: Analysis of Pooled Data from Three Demographic and Health Surveys. *Bulletin World Health Organization*. 91*(5)*. pp. 341-349.

Jayachandran, S. & Pande, R. (2013). Why are Indian Children Shorter than African Children? [Online] Available from: http://www.hks.harvard.edu/fs/rpande/papers/Indianchildrenheight.pdf [Accessed 20th February 2015]

María-Dolores, R. & Martínez-Carrión, J. M. (2009). The Relationship Between Height and Economic Development in Spain. A Historical Perspective. (Working Paper No. 0912). Espinardo: AEHE.

Martorell, R., Beaton, G., Kelly, A., Kevany, J., & Mason, J. (1990). Appropriate Uses of Anthropometric Indices in Children − Nutrition policy discussion paper No. 7. Geneve: United Nations.

Msyamboza, K., Kathyola, D. & Dzowela, T. (2013). Anthropometric Measurements and Prevalence of Underweight, Overweight and Obesity in Adult Malawians: Nationwide Population Based NCD STEPS Survey. *Pan-African Medical Journal*, 15*(108)*.

Mussa, R. & Pauw, K. (2011). Poverty in Malawi: Current Status and Knowledge Gaps. (Policy Note No. 9). Washington, DC: IFPRI.

National Statistical Office (NSO) and ICF Macro. (2011). *Malawi Demographic and Health Survey 2010*. Zomba, Malawi, and Calverton, Maryland, USA: NSO and ICF Macro.

Peratsakis, C., Powell, J., Findley, M., Baker, J. & Weaver, C. (2012). Geocoded Activity-Level Data from the Government of Malawi's Aid Management Platform [Dataset]. Washington D.C. AidData and the Robert S. Strauss Center for International Security and Law.

Ribe, M. (2009). Ett mått på spridning. *Välfärd*, 9, pp. 12-13.

Roodman, D. (2007). The Anarchy of Numbers: Aid, Development, and Cross-country Empirics. (Working Paper No. 32). Washington, DC: *Center for Global Development*.

Silventoinen, K. (2003). Determinants of Variation in Adult Body Height. *Journal of Biosocial Science*. 35. pp. 263-285.

Smith, L. & Haddad, L. (2002). How Potent is Economic Growth in Reducing Undernutrition? What Are the Pathways of Impact? New Cross-Country Evidence. *Economic Development and Cultural Change*. 51. pp. 55-76.

Statistiska centralbyrån (SCB). (1969). *Historical Statistics of Sweden*. Stockholm: Beckmans tryckeri.

Subramanyan, M., Kawachi, I., Berkaman, L. F. & Subramanian, S.V. (2011). Is Economic Growth Associated with Reduction in Child Undernutrition in India? *PLoS Medicine*. 8*(3)*.

The Economist. (2011). Asia's Middle Income Trap, 22nd Dec. Available from: http://www.economist.com/blogs/dailychart/2011/12/asias-middle-income-trap/ [Accessed: 15th May 2015].

The Economist. (2014). What a Job, 24th May. Available from: http://www.economist.com/news/middle-east-and-africa/21602745-voters-annoyed-corruption-scandal-may-have-ousted-joyce-banda-what-job [Accessed: 13th May 2015].

Transparency International. (2010). Corruption Perceptions Index [Online] Available from: http://www.transparency.org/research/cpi/overview [Accessed: 13 May 2015]

United Nations Development Programme (UNDP). (2010). *What Will It Take to Achieve the Millennium Development Goals? – An International Assessment*. New York: UNDP.

Viederpass, A. & Andersson, P-Å. (2007). Foreign Aid, Economic Growth and Efficiency Development. (Report No. 01). Karlstad: SADEV.

Wamani, H., Nordrehaug Åström, A., Peterson, D., Tumwine, J. K. & Tylleskär, T. (2007). Boys are More Stunted than Girls in Sub-Saharan Africa: a Meta-analysis of 16 Demographic and Health Surveys. *BMC Pediatrics*. 7*(17)*.

World Bank. (2014). GDP per Capita, PPP (current international $). [Online] Available from: http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?page=4 [Accessed 16th March 2015].