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Master Thesis International Economics

The Effect of Foreign Aid on Poverty

Evidence from a Quasi-Experimental Setting

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Abstract

This paper explores the relationship between foreign aid and poverty. A fuzzy Regression Discontinuity Design is applied in a quasi-experimental setting by exploiting the arbitrary threshold set by the International Development Association when determining a country's eligibility for aid. The sample includes 31 countries which at some point crossed the Gross National Income per capita threshold between 1987 and 2010. Total aid is found to decrease by approximately 41 percent after crossing the threshold. Following, this paper however fails to detect any significant relationship between aid and poverty. This result holds to a series of empirical validity and robustness tests.

Key Words: *Foreign Aid, Poverty, International Development Association, Regression Discontinuity*

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1. Introduction

The impact of foreign aid on recipient countries has been a much debated and researched topic in the area of developmental economics for the past decades. The issue has raised two opposing views most prominently defended by Jeffrey Sachs (e.g., Sachs 2012; Sachs 2014) and William Easterly (e.g., Easterly 2002; Easterly 2003; Easterly 2005) respectively. The first, supports the effectiveness of aid with regards to issues such as growth, education and poverty, while the second has criticized the use and benefits of aid.

This paper is concerned with the relationship of foreign aid and poverty. A question which has received much less focus compared to the much more researched issue of aid and growth. Typically, a reduction in poverty is seen as a natural result of increased growth. However, this paper addresses the possibilities that growth may not affect all groups of society equally and that aid may independently affect poverty. The current literature dealing with the question of aid and poverty has tackled the issues of endogeneity in various ways, some more convincing than others. Additionally, the research lacks a consistent and coherent finding of the effect of foreign aid on poverty alleviation. As such, the issue lends itself well to further research.

With regards to this paper, it is the first attempt (to the best of the author's knowledge) to tackle the issue of aid and poverty using a quasi-experimental setting. Specifically, this paper utilizes the rather arbitrary Gross National Income (GNI) per capita threshold set by the International Development Organization (IDA) when determining the eligibility for aid of a recipient country. Studies which have used the IDA threshold before include Knack, Xu and Zou (2014), Carnegie and Samii (2017), and Galiani *et al.* (2017). Contrary to this papers interest in poverty however, these previous studies investigated how other donors react to the IDA threshold, political liberalization, and the effect of aid on growth respectively.

Initially, the issue of foreign aid and poverty is explored using a simple Ordinary Least Squares (OLS) approach. However, in order to further deal with endogeneity issues this paper also employs a fuzzy Regression Discontinuity (RD) design. The study covers the period 1987-2010 and includes a sample of approximately 30 countries which crossed the IDA threshold at some point between those years. Here, the identifying assumption being that countries which cross the threshold are comparable to countries which are close to crossing it. The evaluation method is however unable to uncover a discernible relationship between foreign aid and poverty. The results are robust to using different poverty lines as well as different measures for the main variable of interest.

The remainder of the paper is ordered as follows. Section 2 reviews the previous literature in the aid-poverty debate. Section 3 introduces the IDA and the eligibility threshold while Section 4 covers the data and sample used. Section 5 includes the empirics of OLS while the RD design is introduced in Section 6 and the results follow subsequently in Section 7. Tests to determine the validity of the evaluation method as well as a series of robustness tests are conducted in section 8 and 9 respectively. Section 10 concludes.

2. Previous Aid-Poverty Studies

The following section provides an overview of the previous empirical research conducted concerning the matter of foreign aid and poverty. It should be noted that the field of research regarding poverty has been inspired to a large degree by the more traditional research concerning foreign aid and economic growth. Two influential studies addressing that matter being for example Burnside and Dollar (2000) and Rajan and Subramanian (2008). However, the ensuing literature review will exclusively cover studies which have explicitly attempted to study the more recent question of foreign aid and poverty.

Of course, a major obstacle in studying the impact of any variable is overcoming the issues related to endogeneity. First of all, though it is possible that foreign aid affects poverty, it may also be the case that poverty affects foreign aid. Second, even if foreign aid impacts poverty in some way, the two variables may also be affected by a third unknown variable which may also bias the results. Third, the presence of measurement error, in primarily the dependent variable, can also cause the obtained results to be biased. It is therefore clear that identifying the causal impact of foreign aid on poverty is a difficult task.

In light of the discussion above there are several studies concerning the question of foreign aid and poverty which have not attempted, in a convincing way, to correct for any endogeneity issues (e.g., Ijaiya and Ijaiya 2004; Masud and Yontcheva 2005; Connors 2012; Olofin 2013; Ugwuanyi, Ezeaku and Ibe 2017). For example, Ijaiya and Ijaiya (2004) exploit cross-sectional data from 1997 and regress a variable for poverty reduction on foreign aid and a set of control variables which aim to account social and political factors. In this case, the simple specification model estimated by OLS may suffer from multiple endogeneity issues of the ones outlined above. Additionally, Connors (2012) lags the main explanatory variable in order to liberate the specification of issues such as reverse causality which may bias the results. However, whether this successfully mitigates issues of endogeneity is highly questionable.

More sophisticated studies do however make a more persuasive effort in addressing the problem of endogeneity by implementing the use of Instrumental Variables (IVs) (e.g., Boone 1996; Kosack 2003; Nakamura and McPherson 2005; Bahmani-Oskooee and Oyolola 2009; Arndt, Jones and Tarp 2015). Being one of the earliest studies addressing the specific question of foreign aid and poverty, Boone (1996) instruments current foreign aid by recipient population, measures for economic policies, and lagged aid. Bahmani-Oskooee and Oyolola (2009) also instrument foreign aid with recipient population but also attempt to do so with a measure of a donor's interests. Though the chosen instruments may very well be relevant indicators for the instrumented variable, it is less certain whether they satisfy the necessary exclusion restriction. That is, the instruments are potentially also correlated with other variables which influence poverty other than through foreign aid. Population of the recipient country may for example also influence poverty by there simply being fewer resources per capita, thereby biasing the results downward. Additionally, economic policies or the interests of a donor may impact poverty through their effect on trade between the recipient country and the outside world.

Further attempts at addressing the issues of endogeneity and thereby identifying the causal relationship between foreign aid and poverty have included the use of Generalized Method of Moments (GMM) estimators (e.g., Nakamura and McPherson 2005; Chong, Gradstein and Calderon 2009; Alvi and Senbeta 2012; Mahembe and Odhiambo 2018). These dynamic panel models include instrumenting for foreign aid with both internal IVs, such as lagged values of aid, as well as external IVs, such as the ones discussed above. Of course, the addition of supplementary instruments requires further assumptions, and thus possibly implicates the validity of the exclusion restriction. Additionally, recent empirical studies suggest that the use of GMM estimators can severely bias the results due to the inclusion of many fragile instruments in finite samples, which is often the case in the studies mentioned here (Galiani *et al*., 2017).

Apart from endogeneity issues, certain other characteristics of previous empirical literature motivates additional research on the subject of foreign aid and poverty. A large selection of the previous research has for example not been able to employ a direct measure of poverty but have instead opted to use proxies such as infant mortality, education levels, or Gross National Product (GNP) per capita (e.g., Boone 1996; Arvin and Barillas 2002; Kosack 2003; Olofin 2013; Woldekidan 2015). Though the outcomes of these variables are also important to uncover, the choice of them have been motivated many times by the lack of available data on actual poverty measures. Furthermore, many previous studies have exclusively focused on

specific regions or countries, particularly Africa, which raises concerns whether the results hold for a broader collection of nations (e.g., Ijaiya and Ijaiya 2004; Olofin 2013; Woldekidan 2015; Ugwuanyi, Ezeaku and Ibe 2017; Mahembe and Odhiambo 2018). Ugwuanyi, Ezeaku and Ibe (2017) for example examine the issue in Nigeria while Woldekidan (2015) investigates the question in Ethiopia.

Perhaps central for the motivation of this study, the previously obtained results with regards to the impact of foreign aid on poverty remain highly inconclusive. Of the outlined previous research, two studies found a negative relationship between foreign aid and poverty reduction (e.g., Ijaiya and Ijaiya 2004; Olofin 2013) while four studies found that foreign aid has a positive impact on poverty alleviation (e.g., Bahmani-Oskooee and Oyolola 2009; Alvi and Senbeta 2012; Arndt, Jones and Tarp 2015; Mahembe and Odhiambo 2018). However, a large share of prior research has not been able to identify a significant effect of foreign aid on poverty (e.g., Boone 1996; Nakamura and McPherson 2005; Chong, Gradstein and Calderon 2009; Connors 2012; Azam, Haseeb and Samsudin 2016; Ugwuanyi, Ezeaku and Ibe 2017), while others have produced distinct results in the same study (e.g., Arvin and Barillas 2002; Kosack 2003; Masud and Yontcheva 2005). Kosack (2003) found for example that foreign aid positively affects poverty reduction in democracies while negatively so in autocracies.

Considering the discussion above it is worth reiterating the contributions of this paper. First and most importantly, this is the first study which exploits a quasi-experimental setting in order to investigate the impact of foreign aid on poverty. In doing so, this paper tackles the issues of endogeneity from a new perspective compared to previous research and may therefore shed new light on the issue. Second, compared to a share of the prior studies this paper will utilize direct measures of poverty and not rely on previously used proxies such as infant mortality, primary education and life expectancy. Lastly, as much as the identification strategy allows, the results obtained in this paper will not be based on a particular geographic region or country. All in all, this paper hopes to extend the collective knowledge of the impact of foreign aid on poverty and perhaps bring the literature one step closer to identifying the causal effect.

3. International Development Association

The IDA is a branch of the World Bank which aims to reduce poverty by providing both loans and grants to recipient countries. Among the explicit goals of the organization are to boost economic growth, reduce inequalities, and improve living conditions (World Bank, 2017). It serves as a complement to the International Bank for Reconstruction and Development (IBRD)

by offering funds with low, or in many cases, zero interest rates. The organization is overseen by a total of 173 shareholder countries which together determine the resources allocated to the branch. Donations are reviewed every three years and the 18th, and most recent, replenishment of IDA resources was finalized in December 2016 (World Bank, 2017). The current period lasts until June 2020 and offers a total of $75 billion to a range of various projects in recipient countries.

Of course, the IDA oversees a limited pool of resources and funds must therefore be allocated where they are deemed to be most necessary. In order to do so, recipient eligibility is based on two criteria. First, a country must display a certain degree of relative poverty, measured in this case by GNI per capita. With regards to IDA funding, a country is judged to be poor if GNI per capita is below a certain predetermined threshold. This threshold is updated annually to take into account for inflation. The current GNI per capita cut-off is measured at $1,165. The historical evolution of the threshold is displayed in the figure below.

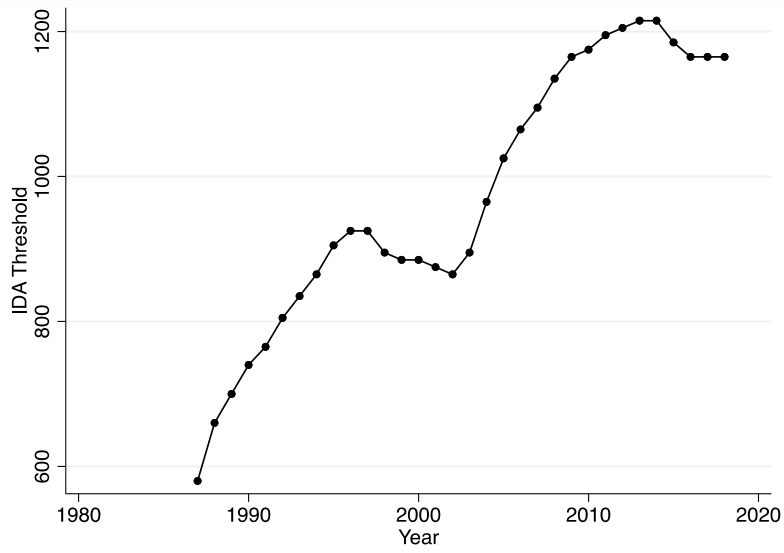

Figure 1 Historical evolution of IDA threshold in current US$, 1987-2010. Data collected from Galiani *et al.* (2017).

The second parameter taken into account in order to determine recipient eligibility is the creditworthiness of the potential borrower. Specifically, a country is eligible for IDA support if it is judged to not uphold a level of creditworthiness which allows it to borrow on market terms, or alternatively through the IBRD. It should be noted that certain researchers have remarked that exactly how the World Bank determines the creditworthiness of a country is highly confidential (e.g., Moss and Majerowicz 2012).

There are exceptions to the above two criteria. A country which resides under the income threshold but is deemed to be creditworthy can in some cases be judged to be non-

eligible for IDA support. A current example of this is China. Contrastingly, countries which may find themselves above the income threshold but are not creditworthy can be eligible. Bolivia is an example of this. Additionally, small island economies, with populations of less than 1.5 million people, are usually considered to be eligible for IDA funding. This is in large part due to their perceived vulnerability to shocks of different kinds (Knack, Xu and Zou, 2014). Examples of this are Kiribati, Samoa, and Solomon Islands.

Given the criteria described above, the IDA currently offers assistance to 75 countries. The majority of these countries are recipients of IDA only while 16 countries are so called blend countries. Blend countries are ones which are IDA eligible but also creditworthy. Additionally, 14 countries are defined as small island economies, as discussed above.

Graduation from the IDA program is in general initiated once a country has crossed the income threshold and is deemed creditworthy. However, as the IDA replenishment periods cover intervals of three years countries that become ineligible within a period do not begin graduation until the following one (World Bank, 2010). The subsequent period is then characterized by reduced lending volumes and accelerated repayment schedules (Galiani *et al.*, 2017). Because of this, aid received by the IDA does not decrease immediately once a country has passed the GNI per capita threshold. Of course, crossing the IDA set threshold does not imply that aid from other donors decreases either. Depending on the reaction of other donors, total aid received may fall, remain unchanged, or even increase in order to stabilize the amount of aid received. The implications of this will determine the plausibility of the evaluation method used in this paper.

4. Data and Sample

4.1 Data

The main dependent variable in this paper is poverty. Following influential literature, this paper adopts three separate measures of poverty which include the Poverty Headcount Index, the Poverty Gap, and the Squared Poverty Gap.[1] All three measures have been collected from the

[1] Previous studies utilizing all three measures are Chong, Gradstein, and Calderon (2009) and Alvi and Senbeta (2012). Other studies which just investigate the Poverty Headcount Index are Nakamura and McPherson (2005), Bahmani-Oskooee and Oyolola (2009), Connors (2012), Arndt, Jones, and Tarp (2015), and Azam, Haseeb and Samsudin (2016).

World Bank poverty dataset, PovcalNet, and are measured at a poverty line of $1.9 a day.[2] Data is available tri-annually and covers 163 countries.[3]

The motivation to use three alternatives in this study is based on the respective strengths and weaknesses of each individual measure. The Poverty Headcount Index measures the proportion of a population within a country which lives below a set poverty line (Haughton and Khandker, 2009).[4] As a review of the literature reveals, it is the most commonly used measure of poverty. Despite its popularity however, the index does possess certain drawbacks. Specifically, it ignores the distribution of the poor and considers everyone below the poverty line to be equally poor. In practice it does thus not distinguish between an individual just below the poverty line and an individual with no income at all, even though their respective realities are most likely very different. The Poverty Gap Index does attempt to remedy this shortcoming. This second measurement is defined as the mean shortfall from the poverty line, expressed as a proportion of the poverty line (World Bank Institute, 2005). Here, everyone above the poverty line is assigned a gap equal to zero while on the other hand, the measure considers the distribution of individuals below the poverty line to a larger extent than the Poverty Headcount Index. The Squared Poverty Gap Index follows the reasoning of the second measure but gives more weight to the poorest of the poor. This index can thus in some case better represent the severity of poverty. Another main benefit of this measure is that it can reflect the change in poverty if money is transferred from those just below the poverty line to those very far beneath it.[5]

Following previous literature, this study adopts the standard measurement of foreign aid, defined as the ratio of total net Official Development Assistance (ODA) and GNI.[6] Data is retrieved from the Organisation for Economic Co-operation and Development – Development Assistance Committee (OECD-DAC).[7] ODA includes both grants and loans with the condition that grants make up at least 25% of assistance. Importantly, ODA only includes aid which is

[2] http://iresearch.worldbank.org/PovcalNet/povDuplicateWB.aspx

[3] Poverty measures in China, India, and Indonesia display regional poverty and are thereby excluded from the dataset. Lebanon is recorded to have a poverty incidence of 0 throughout the whole time period studied. As this is highly unlikely, the country has been excluded from the dataset.

[4] It is worth noting that this paper uses the standard international poverty line of $1.90 a day (2011 PPP) rather than any nationally set thresholds.

[5] Though these measures attempt to reflect the incidence of poverty in a country there are of course those who argue that poverty is not only a matter of income and any measurement of poverty should thus reflect a more holistic approach. However, this paper will leave such discussion to another forum.

[6] Previous studies employing the same measurement are for example Boone (1996), Chong, Gradstein, and Calderon (2009), and Alvi and Senbeta (2012).

[7] www.oecd.org/dac/stats/idsonline

explicitly allocated to improve human or economic welfare and thus excludes any sort of military assistance (Boone, 1996).[8] Data is available annually for 217 countries.

Data on GNI per capita is collected from two different sources. First, data is downloaded from the World Bank's World Development Indicators online database.[9] However, as some authors acknowledge (e.g., Dykstra *et al.* 2014; Carnegie and Samii 2017) these values are regularly updated and revised up to four times a year. Though the revisions are generally minor and do not affect the magnitudes of the values to a large extent they do have a peculiar effect considering the importance of the specific values in this setting. That is, a revised GNI per capita value for a country may cause a country to be identified as above the IDA threshold when it was previously thought to be below the threshold for a given year. Therefore, in order to accommodate the importance of the values around the threshold, I also impute GNI per capita values from original published PDF's from the Worlds Bank.[10] This diverts from Knack, Xu and Zou (2014) and Galiani *et al.* (2017) who assume that the changes have no large effect on the data. Both sources measure the variable of interest using the Atlas Method in current US dollars.

It is worth highlighting the benefits and drawbacks of each GNI per capita source. The original PDF's correspond to the values which the IDA and other organizations most likely adhered to when determining which countries were to receive aid and how much. This may be the most vital factor. However, the values do fluctuate more than what can be considered optimal and may be a result of their relatively preliminary nature. Also, the original PDF's provide fewer observations. The drawbacks of the original values are instead the benefits of the revised ones. They follow a smoother pattern and there are observations for more years and countries. However, as mentioned, they do not correspond to the levels most likely used by the IDA to determine threshold status.

Lastly, the data is divided into eight three-year periods for the following two reasons. First, data on the dependent variable, poverty, is only available tri-annually. Second, and more importantly, the IDA allocates funds according to three-year replenishment periods (as discussed above). Therefore, countries which were eligible in the beginning of a period commonly received aid throughout the whole period even if they were to become ineligible

[8] Other measurements of aid have been used in the past. Chong, Gradstein, and Calderon (2009) also consider Effective Development Assistance (EDA) as it excludes any aid given as technical assistance (aid which must be used to employ resources from the donor country). However, the correlation between ODA and EDA has been found to be very close and the difference matters little in practice (e.g., Ovaska 2003; Easterly 2003).
[9] http://databank.worldbank.org/data/reports.aspx?source=2&series=NY.GNP.PCAP.CD&country=
[10] These are available here https://openknowledge.worldbank.org/handle/10986/2124

during the replenishment period. The periods in this paper roughly coincide with the IDA replenishment periods.[11]

4.2 Sample

The sample of countries included in this paper are those that have been identified to cross the IDA threshold during the period 1987-2010. This is motivated by the plausibility that countries which have just crossed the GNI per capita eligibility threshold should in principle be similar to countries which are close to crossing the threshold (and do so within a reasonable time frame).

Table 1a and 1b display the sample of countries using the original and revised versions of the WDI's respectively. The tables show the countries and years of the first as well as last crossing of the IDA threshold from above. Following Galiani *et al.* (2017) this paper ignores crossings from above. The first sample includes 31 countries while the second sample includes 33 countries. Notably, the two samples differ quite a lot. Both the years at which countries cross as well as which countries are recorded to cross the threshold between 1987 and 2010 vary significantly between the two samples. This highlights the importance of using the most plausible source when attempting to identify the causal effect.

Table 1a Sample Countries and Years of Crossing the IDA Threshold (Original)

Country	First Crossing (Last Crossing)	Country	First Crossing (Last Crossing)
Albania	2001	Macedonia FYR	1997
Angola	2004	Maldives	1994
Armenia	2003	Moldova	2006
Azerbaijan	2005	Mongolia	2007
Bhutan	2006	Nigeria	2008 (2010)
Bolivia	1996 (2006)	Papua New Guinea	2009
Cape Verde	1988 (1992)	Philippines	1993
Cameroon	2006 (2008)	Samoa	1991
Congo Rep.	2007	Sao Tome and Principe	2010
Djibouti	2001 (2009)	Sri Lanka	2003
Egypt Arab Rep.	1997	Sudan	2009
Georgia	2004	Timor-Leste	2007
Ghana	2010	Turkmenistan	2001
Guyana	2003	Ukraine	2003
Honduras	2001	Uzbekistan	2010
Kiribati	1989 (2004)		

[11] Period 1 in the dataset runs between 1987-1989 which roughly corresponds to IDA8 which runs from 1 July 1987-30 June 1990 and so on.

Table 1b Sample Countries and Years of Crossing the IDA Threshold (Revised)

Country	First Crossing (Last Crossing)	Country	First Crossing (Last Crossing)
Albania	1998*	Lesotho*	2005
Angola	2005*	Moldova	2007*
Armenia	2003	Mongolia	2006*
Azerbaijan	2005	Nicaragua*	1999
Bhutan	2003*	Nigeria	2010
Bolivia	1997*	Papua New Guinea	2007*
Bosnia and Herzegovina*	1997	Philippines	1994*
Cameroon	2006*	Solomon Islands*	1997 (never)
Congo Rep.	2006*	Sri Lanka	2003
Cote d'Ivori*	2009	Sudan	2009
Djibouti	2006*	Timor-Leste	2006*
Egypt Arab Rep.	1996*	Turkmenistan	2003*
Georgia	2003*	Ukraine	2003
Ghana	2008*	Uzbekistan	2010
Guyana	2002*	Vietnam*	2010
Honduras	2001	Zambia*	2008
Kiribati	1991*		

*Country or year which differs from original sample.

4.3 Descriptive Statistics

Table 2 Descriptive Statistics

	Below Threshold Original	Above Threshold Original	Below Threshold Revised	Above Threshold Revised
Headcount Ratio	0.260	0.207	0.305	0.218
	(0.186)	(0.197)	(0.194)	(0.210)
Gap	0.0946	0.0754	0.118	0.0844
	(0.0860)	(0.0963)	(0.101)	(0.109)
Squared Gap	0.0488	0.0393	0.0637	0.0463
	(0.0516)	(0.0619)	(0.0673)	(0.0724)
GNI per capita	710.5	1,364	703.2	1,349
	(307.3)	(910.7)	(305.7)	(909.7)
ODA/GNI	0.0874	0.0800	0.0991	0.0750
	(0.0750)	(0.0819)	(0.103)	(0.0703)

Mean values on top and standard deviation in parentheses. Original sample includes 31 countries while revised sample includes 33 countries.

Table 2 displays descriptive statistics of the two separate samples divided between whether a country-period was above or below the IDA threshold for that given period. The main figures present means while the standard deviations are displayed in parentheses. It is worth noting that all three variables measuring poverty decrease once a country-period crosses the threshold while at the same time total foreign aid, measured by the ratio between ODA and GNI,

decreases as well. From a simple comparison of means it would thus seem that crossing the threshold, decreases the amount of aid received, while at the same time decreasing the incidence of poverty. Of course, this reasoning exempts any discussion of endogeneity which will be dealt with below.

5. Ordinary Least Squares

5.1 Regression Specification

Before proceeding with applying an RD design it is worthwhile to investigate the null hypothesis that foreign aid has no effect on poverty within a simple OLS framework. This allows for a later comparison of both the two estimation strategies as well as the results obtained using either one. The relationship between foreign aid and poverty is first examined by the regression equation below.

$$Pov_{i,s} = \alpha + \beta_1 Aid_{i,s-1} + \boldsymbol{X}_{i,s-1} + \gamma_i + \delta_s + \varepsilon_{i,s} \quad (1)$$

Here, the chosen measure of poverty in period *s* is regressed on the variable $Aid_{i,s-1}$, which measures the log ratio of average total aid to GNI in period *s-1*. It is worth reiterating that each period *s* includes three non-overlapping years. Therefore periods *s* and *s-1* span a total of six years. The equation also includes a set of control variables which have been used most frequently in previous aid-poverty studies. These include population, trade, investment, education and inequality which have all been accessed through the WDIs database. Trade is measured by the sum of exports and imports of goods and services as a share of GDP while investment is measured by the gross capital formation as a ratio of GDP. Education is measured by gross primary school enrollment ratio. Finally, inequality is measured by the Gini coefficient. All variables are logged and lagged one period. Indices *i* and *s* represent countries and (non-overlapping) periods respectively. The specification also includes country and period fixed effects.

5.2 Results

The results are displayed in the table below.[12] Columns 1 through 3 show the three separate measures of poverty respectively using an international poverty line of $1.9 a day. All estimations include the five previously discussed control variables as well as country and year fixed effects. This is to allow for heterogeneity between countries and periods. As can be seen from Table 3, a significant result between foreign aid and poverty is found when poverty is defined as the Headcount Ratio. Specifically, a one percentage increase in foreign aid decreases poverty by 0.00049 percentage points. In, contrast no significance is found when using the two alternative definitions of poverty.

Table 3 OLS Results

	(1) Headcount Ratio	(2) Gap	(3) Squared Gap
$Aid_{i,s-1}$	-0.049*	-0.015	-0.005
	(0.025)	(0.015)	(0.010)
Constant	6.464**	3.625***	2.289***
	(2.609)	(1.238)	(0.773)
Observations	58	58	58
R-squared	0.97	0.97	0.96
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes

Dependent variables are Headcount Ratio, Poverty Gap and Squared Poverty Gap respectively. Robust standard errors in parentheses and clustered on country level. *** p<0.01, ** p<0.05, * p<0.1

Irrespective of the results found above however, the simple OLS approach does include certain potential problems. Particularly limitations with regards to issues of endogeneity. Firstly, it is possible that the estimations suffer from measurement error, specifically in the dependent variables. That is, the measures of aid are no exact figures and may very well be imprecise observations of the variable of interest particularly considering that they are aggregated values from a variety of sources. Resulting is a potential bias toward zero. Secondly, rather than foreign aid affecting poverty it is possible that the reverse relationship exists, that poverty affects the amount of foreign aid. Explicitly, a probable scenario is that an increased

[12] The regression specification is only applied on the original sample of countries and not the revised version. This is because the relevance of the revised sample of countries in the RD design is not found to hold. This is further discussed in a subsequent section.

degree of poverty would result in a larger magnitude of received aid. This would in that case bias the results upwards. Even though a lagged value of aid somewhat addresses this issue, it does most likely not mitigate the problem completely due to the longevity of poverty patterns. Resultingly, the two identified issues of endogeneity can cause the estimated coefficients to be smaller in negative magnitude than what the true relationship entails. In order to address these issues, as well as take advantage of the specific setting the IDA threshold reveals, an RD design is considered below.

6. Regression Discontinuity

6.1 Empirical Design

As discussed above, the IDA uses a GNI per capita threshold (among other factors) to determine IDA eligibility. This rather arbitrary cutoff lends itself well to an investigation in the RD framework. Thus, the sample of countries included in this paper are those that have been identified to cross the IDA threshold during the period 1987-2010. As discussed above, this is motivated by the plausibility that countries which have just crossed the GNI per capita eligibility threshold should in principle be similar to countries which are close to crossing the threshold (and do so within a reasonable time frame). Therefore, the setting for this paper can be considered to be a quasi-experimental one. Specifically, allocation to treatment between country-periods is controlled for by the threshold value while the setting lacks random assignment typical of an experimental study.

However, as IDA eligibility is also determined by for example creditworthiness, it is important to acknowledge that the GNI per capita cutoff is not applied as a definite rule. That is, countries above the threshold may still receive funding. Additionally, funding is not abruptly ended once a country turns ineligible, but rather is phased out in a gradual process. These characteristics result in the existence of crossover country-periods, that is treated country-periods above the threshold, which is why a fuzzy RD design must be considered.

Regarding the applicability of the evaluation method it is important to consider certain conditions (Jacob *et al.*, 2012). First, the assignment variable cannot be influenced by the treatment. Specifically, aid received by a country cannot influence their GNI per capita. As illustrated below in the regression specification, aid is lagged one period and GNI per capita two periods in order to satisfy this condition. As such, GNI per capita is measured prior to the disbursement of aid. Second, an RD design requires the assignment variable, GNI per capita in this case, to be exogenous. While graduating from the IDA is most likely endogenous, as it is

affected by a range of country characteristics as discussed previously, simply crossing an arbitrary threshold can be considered exogenous. This is also discussed in Galiani *et al.* (2017).

A premise of this empirical strategy is that the relationship between a country's income and poverty rate is relatively smooth and continuous. That is, high-income countries experience a low incidence of poverty while low-income countries experience more poverty. As such, countries with similar income levels should have similar rates of poverty. The IDA threshold however makes a significant distinction between seemingly similar countries. That is, countries with similar incomes may be categorized very differently. Bearing this in mind, the RD design unveils a Local Average Treatment Effect (LATE), the treatment effect of those close to the cutoff, rather than a (global) average treatment effect. All in all, the evaluation method allows this study to test the null hypothesis that foreign aid has no effect on poverty.

6.2 Regression Specification

Following the discussion above, the main regression specification is a direct application of the fuzzy RD design. The poverty rate within a country (and period) is regressed on a function of GNI per capita used to determine IDA eligibility and the amount of aid received in that period, and tests for a discontinuous jump in outcomes at the threshold. Considering the nature of the fuzzy RD design this paper investigates the issue both using the full sample as well as employing a specific bandwidth around the threshold. The optimal bandwidth is found using the method proposed by Imbens and Kalyanaraman (2012) which minimizes the Mean Squared Error (MSE).

The nature of fuzzy RD leads to a 2SLS estimation strategy. Here, the first stage identifies a discontinuity and illustrates whether the allocation of aid experiences a jump at the threshold.

$$\begin{aligned} Aid_{i,s-1} = \alpha + \beta_{01} GNI_{i,s-2} + \beta_{02} GNI_{i,s-2}^2 + \cdots + \beta_{0p} GNI_{i,s-2}^p \\ + \pi Cross_{i,s-2} + \beta_{11} GNI_{i,s-2} Cross_{i,s-2} + \beta_{12} GNI_{i,s-2}^2 Cross_{i,s-2} \\ + \cdots + \beta_{1p} GNI_{i,s-2}^p Cross_{i,s-2} + \gamma_i + \delta_s + \eta_{i,s} \end{aligned} \quad (2)$$

The dependent variable in the first stage regression is the log ratio of average total aid to GNI in period *s-1* denoted by $Aid_{i,s-1}$ in the expression above. It is later the main explanatory variable in the second stage regression which explains lagging the aid variable by one time period. That is, aid is not expected to have an immediate impact but rather a delayed one. $GNI_{i,s-2}$ represents the log value for GNI per capita which determines eligibility in the following period. In practice

this occurs in year *t-4* of period *s* (or year *t* of period *s-1*). It has been centered around the log IDA threshold, measured in GNI per capita, for that year and is thus the assignment variable of the fuzzy RD design. Countries below the threshold will have negative values while countries above will have positive. The variable is lagged two time periods to allow for the time it most likely takes for the IDA and other donors to adjust their aid schedule. The variable $Cross_{i,s-2}$ is a dummy which takes the value 1 if the country crossed the IDA threshold at some point in the previous period and 0 otherwise. It is also the IV used in the second stage. The reasoning for the two-period lag is similar to the short previous discussion. That is, total aid is not expected to adjust immediately but rather only when donors have had time to respond. Additionally, the regression also controls for a polynomial function of $GNI_{i,s-2}$ as well as an interaction between the polynomial terms and the crossing dummy. This is included because estimating a non-linear process with a linear structure might lead to inappropriately attributing some effects to a discontinuity that in reality may just be a non-linear relationship. Additionally, the interaction terms allow for polynomials on both side of the cutoff (Lee and Lemieux, 2010). In practice however, the specification includes only linear and quadratic functions. Lastly, Equation 1 also includes country and period fixed effects, denoted by γ_i and δ_s respectively, in order to account for any unobserved heterogeneity. Indices *i* and *s* are defined as previously.

The second stage is given by Equation 3 below.

$$\begin{aligned} Pov_{i,s} = \alpha + \beta_{01} GNI_{i,s-2} + \beta_{02} GNI_{i,s-2}^2 + \cdots + \beta_{0p} GNI_{i,s-2}^p \\ + \pi Aid_{i,s-1} + \beta_{11} GNI_{i,s-2} Aid_{i,s-1} + \beta_{12} GNI_{i,s-2}^2 Aid_{i,s-1} \\ + \cdots + \beta_{1p} GNI_{i,s-2}^p Aid_{i,s-1} + \gamma_i + \delta_s + \eta_{i,s} \end{aligned} \quad (3)$$

The second stage regresses the chosen measure of poverty in period *s* on $GNI_{i,s-2}$, defined as above, and $Aid_{i,s-1}$, which is instrumented by the variable $Cross_{is-2}$. Indices in the expression above are defined in the same way as Equation 1. As the first stage, Equation 3 also includes a polynomial expansion of $GNI_{i,s-2}$ as well as an interaction between the polynomial terms and the aid variable. Similarly, the specification includes country and period fixed effects.

As mentioned in Section 2, several previous studies investigating the same issue have also used a 2SLS approach. However, this paper contributes with several differences. First of all, the method of selection of countries included in the sample differs markedly where all included countries adhere to the specific requirement outlined previously. Second, the IV included in this paper, in the form of crossing the IDA threshold, has not previously been used

in an aid-poverty setting. Third, the regression specifications include polynomial and interaction terms which have not previously been used in the literature discussed in Section 2.

7. Results

7.1 First Stage

The results for estimating Equation 2 are found in Tables 4a and 4b below. The two tables correspond to the sample sourced from the original WDI's as well as the revised version respectively. The dependent variable in both tables and all columns is the log ratio of total aid and GNI. Additionally, the results are displayed both for the full sample as well as the optimal bandwidth found by minimizing the MSE.

The estimated coefficients in Table 4a demonstrate a consistently significant effect on aid after crossing the threshold. Specifically, crossing the threshold in period *s-2* is found to decrease aid in period *s-1* by between 41 and 48 percent (e^X-1). The results are robust to taking into account both the full sample as well as the optimal bandwidth (which was found to be within approximately 0.5 log points from the IDA threshold). Furthermore, significance at conventional levels remain even when incorporating quadratic functions of GNI and allowing for different intercepts between country-periods above and below the cutoff point. It is worth noting that the coefficient estimates produced here lie in between previously estimated results of the effect of the IDA threshold on aid. Using the same sampling method (but not the same sample), Galiani *et al.* (2017) finds that total aid decreases by approximately 59 percent when crossing the threshold, while Knack, Xu, and Zou (2014) find that aid is about 27 percent higher for countries below the cutoff point. Of course, total aid is far from seizing completely which confirms the discussions held above that the IDA threshold is in many cases just a suggestion of how a country is doing, rather than an absolute rule of which donors must adhere to.

The results displayed in Table 4b paint a much less convincing picture. Estimated coefficients are slightly lower than above and now a threshold crossing corresponds to a decrease in total aid between 34 and 39 percent. More importantly however is that the significance of crossing the IDA threshold has in principle disappeared. This suggests that crossing the threshold has no discernable effect on total aid received. The obtained results highlight the discussion held in a previous section. That is, it was most likely original WDI's which affected the amount of aid a country received rather than the ad hoc revised values. Due to the results found here, this paper will only proceed with the original sample of countries in the further analysis of the issue.

Table 4a First Stage Results for Original Sample

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Cross_{i,s-2}$	-0.656**	-0.616**	-0.525**	-0.568*
	(0.258)	(0.230)	(0.239)	(0.277)
$GNI_{i,s-2}$	-0.066	0.233	0.295	0.206
	(0.184)	(0.414)	(0.330)	(0.438)
$Cross_{i,s-2}$ x $GNI_{i,s-2}$	-0.244	-0.865	-0.199	-0.613
	(0.653)	(0.693)	(0.500)	(0.643)
$GNI_{i,s-2}^2$			0.353	-0.352
			(0.239)	(0.961)
$Cross_{i,s-2}$ x $GNI_{i,s-2}^2$			-3.360***	-1.669
			(1.167)	(2.291)
Constant	-2.311***	-2.093***	-2.332***	-2.055***
	(0.174)	(0.140)	(0.161)	(0.168)
Observations	108	76	108	76
R-squared	0.89	0.93	0.90	0.93
Period FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Dependent variable is the log ratio of average total aid to GNI. Robust standard errors in parentheses and clustered on country level. *** p<0.01, ** p<0.05, * p<0.1

Table 4b First Stage Results for Revised Sample

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Cross_{i,s-2}$	-0.483*	-0.486	-0.408	-0.484
	(0.253)	(0.310)	(0.242)	(0.350)
$GNI_{i,s-2}$	0.180	0.348	0.112	0.132
	(0.217)	(0.605)	(0.258)	(0.539)
$Cross_{i,s-2}$ x $GNI_{i,s-2}$	-0.734	-0.912	-0.272	-0.226
	(0.619)	(0.888)	(0.817)	(1.163)
$GNI_{i,s-2}^2$			-0.085	-1.683
			(0.196)	(1.467)
$Cross_{i,s-2}$ x $GNI_{i,s-2}^2$			-1.686	-0.262
			(1.711)	(2.788)
Constant	-2.246***	-2.312***	-2.302***	-2.182***
	(0.160)	(0.437)	(0.371)	(0.471)
Observations	140	92	140	92
R-squared	0.86	0.90	0.86	0.91
Period FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Dependent variable is the log ratio of average total aid to GNI. Robust standard errors in parentheses and clustered on country level. *** p<0.01, ** p<0.05, * p<0.1

7.2 Second Stage

The results for the second stage are depicted in the tables below. Table 5, 6 and 7 display Equation 3 for three different measure of poverty. The dependent variable in the respective tables are Headcount Ratio, Poverty Gap, and Squared Poverty Gap. All measures use an international poverty line of $1.9 a day. Foreign aid in period *s-1* is instrumented by the variable $Cross_{i,s-2}$ defined previously, while the interaction between aid and GNI per capita is instrumented with an interaction between crossing and GNI per capita. Columns 1 and 2 display results for the linear estimation while quadratic terms are added in Columns 3 and 4.

First, it is worthwhile to compare the estimated coefficients below to the ones obtained above by simple OLS. As discussed previously, the issues with OLS would most likely cause the results to display a smaller negative relationship than what reality entails. It is therefore comforting to acknowledge that all estimated coefficients, for all three separate measures of poverty, displayed in the tables below demonstrate a consistent pattern of being larger in (negative) magnitude compared to their OLS comparisons.

Though all estimated coefficients have the expected negative sign, that is aid reduces poverty, they are for the most part non-significant. The only significant poverty coefficient is found in Column 1 of Table 5 where the dependent variable is the Poverty Gap. Here, a one percent increase in foreign aid is found to decrease the poverty gap by 0.00036 percentage points. This effect is however minimal and only corresponds to a 0.37 percent decrease considering the mean poverty gap in the full original sample noted in Table 2. The underwhelming results thereby result in the failure to reject the null hypothesis that aid has no effect on poverty. This is similar to the results found by Boone (1996), Nakamura and McPherson (2005), Chong, Gradstein and Calderon (2009), Connors (2012), Azam, Haseeb and Samsudin (2016), and Ugwuanyi, Ezeaku and Ibe (2017).

Table 5 Second Stage Results for Poverty Headcount Ratio

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.074	-0.055	-0.077	-0.056
	(0.046)	(0.069)	(0.066)	(0.066)
$GNI_{i,s-2}$	-0.227	0.235	-0.135	0.365
	(0.149)	(0.741)	(0.316)	(0.828)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.090*	0.062	-0.070	0.103
	(0.050)	(0.234)	(0.098)	(0.260)
$GNI_{i,s-2}^2$			0.279	-0.218
			(0.355)	(0.975)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			0.105	-0.100
			(0.165)	(0.337)
Constant	-0.253*	-0.178	-0.261	-0.189
	(0.133)	(0.196)	(0.195)	(0.182)
Observations	108	76	108	76
R-squared	0.94	0.93	0.92	0.91
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Dependent variable is Poverty Headcount Ratio. Robust standard errors in parentheses and clustered on country level. *** p<0.01, ** p<0.05, * p<0.1

Table 6 Second Stage Results for Poverty Gap

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.036*	-0.034	-0.041	-0.039
	(0.020)	(0.034)	(0.032)	(0.032)
$GNI_{i,s-2}$	-0.049**	0.009	-0.165	0.127
	(0.025)	(0.124)	(0.145)	(0.379)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.126*	0.046	-0.063	0.0351
	(0.068)	(0.397)	(0.045)	(0.118)
$GNI_{i,s-2}^2$			0.070	0.079
			(0.193)	(0.399)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			0.037	0.017
			(0.084)	(0.132)
Constant	-0.123**	-0.111	-0.138	-0.125
	(0.060)	(0.096)	(0.096)	(0.090)
Observations	108	76	108	76
R-squared	0.92	0.91	0.88	0.89
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Dependent variable is Poverty Gap. Robust standard errors in parentheses and clustered on country level. *** p<0.01, ** p<0.05, * p<0.1

Table 7 Second Stage Results for Squared Poverty Gap

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.023	-0.023	-0.027	-0.029
	(0.014)	(0.023)	(0.021)	(0.021)
$GNI_{i,s-2}$	-0.033**	-0.015	-0.139	0.019
	(0.016)	(0.085)	(0.094)	(0.232)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.083*	-0.035	-0.049*	0.003
	(0.044)	(0.273)	(0.028)	(0.071)
$GNI_{i,s-2}^2$			0.007	0.131
			(0.133)	(0.220)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			0.012	0.039
			(0.056)	(0.068)
Constant	-0.076*	-0.079	-0.089	-0.092
	(0.043)	(0.066)	(0.064)	(0.061)
Observations	108	76	108	76
R-squared	0.90	0.89	0.85	0.88
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Dependent variable is Squared Poverty Gap. Robust standard errors in parentheses and clustered on country level. *** p<0.01, ** p<0.05, * p<0.1

8. Validity of the Evaluation Method

8.1 Density Around the Threshold

The validity of an RD design requires that subjects do not have precise control over the assignment variable. In this scenario, it thus means that countries should not be able to precisely manipulate their GNI per capita for a given year. If this were the case, countries just above the threshold would have an incentive to record a lower GNI per capita than the true value in order to receive more aid. Intuitively however, there are several reasons which suggest this is not the case. First, national governments are not in complete control of the GNI per capita estimates produced by the World Bank. That is, the organization takes into account multiple sources and does not rely completely on national statistics. Second, the IDA threshold is adjusted every year for inflation which makes it difficult for countries to predict at which level the cutoff point will actually be. Third, the IDA threshold is only one of multiple ways the IDA determines aid eligibility and thus solely having a GNI per capita is not always enough to garner more aid.

However, in order to formally test that this is not the case, McCrary (2008) suggests a density check around the threshold. A large jump or drop in the density of the assignment variable close to the cutoff would raise suspicion toward the validity of the RD design. The results from the density check are illustrated in Figure 2. The check is performed within a bandwidth of $1000 from the IDA cutoff.[13] As can be seen below, the results show no evidence of a higher density just below the threshold as would be suspected in the presence of manipulation. As such, the RD design seems to remain as a valid evaluation method.

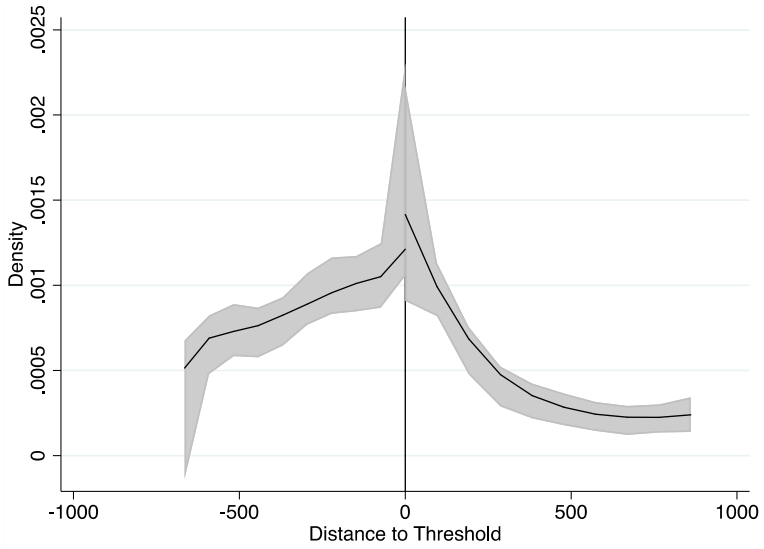

Figure 2 McCrary density test.

8.2 Balance Tests

The first stage conducted above observed a discontinuity in the amount of foreign aid a country received once it had crossed the IDA threshold at least two periods earlier. The crossing variable was then used as an IV to determine the effect of aid on poverty. However, in order for the RD design to be valid it must be the case that no other variables or country characteristics display a discontinuity at the same threshold. Therefore, Lee and Lemiux (2010) recommend a collection of balance tests. Specifically, it is useful to investigate whether other variables which may affect poverty also display a jump around the cutoff point. Rather than speculating which variables may affect poverty, this paper relies on the explanatory variables most commonly used in previous aid-poverty studies (and which were included as controls in the simple OLS).

The table below displays results of estimating Equation 1 with various dependent variables. Specifically, the variables are measures of population, trade, investment, education and inequality. As before, trade is measured by the sum of exports and imports of goods and services as a share of GDP, investment is measured by the gross capital formation as a ratio of

[13] This is similar to Galiani *et al.* (2017).

GDP. Education is measured by gross primary school enrollment ratio. Finally, inequality is measured by the Gini coefficient. All variables are logged and lagged one period.

Table 8 Balance Tests

	(1) Population	(2) Trade	(3) Investment	(4) Education	(5) Inequality
$Cross_{i,s-2}$	-0.049*	-0.094	-0.013	-0.056	0.064
	(0.028)	(0.080)	(0.108)	(0.035)	(0.138)
$GNI_{i,s-2}$	0.016	-0.039	0.034	0.087*	-0.101
	(0.038)	(0.058)	(0.114)	(0.043)	(0.121)
$Cross_{i,s-2}$ x $GNI_{i,s-2}$	-0.014	0.110	-0.110	-0.074	0.154
	(0.071)	(0.154)	(0.207)	(0.078)	(0.209)
Constant	14.770***	-0.559***	-1.932***	0.017	-0.827***
	(0.024)	(0.068)	(0.075)	(0.043)	(0.138)
Observations	121	114	98	115	58
R-squared	1.00	0.92	0.80	0.89	0.89
Year FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes

Dependent variable in each column is population, sum of exports and imports of goods and services as a share of GDP, gross capital formation as a ratio of GDP, gross primary school enrollment ratio, and Gini coefficient respectively. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Surprisingly, the results indicate that crossing the threshold at least two periods earlier had a significant negative effect on population. Of course, bearing in mind the high R-squared value it is plausible to assume that the rise in GNI per capita in the previous period may simply be a results of a lower population growth. Nonetheless, due to this finding, Equation 1 in the original first stage is repeated with an inclusion of a control variable for population. The first stage results (Table 4a) remain significant and the magnitudes of the estimated coefficients change very little. A table of results has been omitted for brevity. The remaining explanatory variables are not found to be significantly impacted by a country crossing the IDA threshold. Thus, the RD design seems to remain valid and a plausible identification strategy for this collection of countries.

8.3 Placebo Threshold

In order to assert that the IDA threshold is in fact a valid and a commonly used cutoff point for aid organizations it is worth investigating how the flow of foreign aid reacts at a false threshold. Here, I therefore investigate whether a placebo cutoff point for IDA has any explanatory power in determining the magnitude of foreign aid a country receives. Specifically, the false IDA

threshold is calculated to be half of the true cutoff point. Both the crossing variable and GNI per capita distance variables are also adjusted to take into account the new threshold. The sample of countries remains the same and the crossing dummy is therefore 0 for many country-period observations. Other than that, the specification is modelled as Equation 2.

The results are displayed in Table 9 below. As the estimated coefficients show, crossing the placebo threshold has no significance in determining the amount of aid. This supports the notion that the specific IDA threshold has a significant impact on the flow of foreign aid, as found above.

Table 9 First Stage with Placebo Threshold

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
Pl_Cross_{is-2}	-0.206	-0.424	-0.312	-1.052
	(0.318)	(0.570)	(0.364)	(0.653)
Pl_GNI_{is-2}	-0.131	-0.112	0.135	-0.321
	(0.221)	(1.074)	(0.292)	(0.870)
Pl_Cross_{is-2} x GNI_{is-2}	-0.680	-1.857	-1.202	-2.872
	(0.696)	(2.141)	(1.282)	(1.888)
$Pl\_GNI_{is-2}^2$			-0.301	0.482
			(0.257)	(2.057)
Pl_Cross_{is-2} x GNI_{is-2}^2			0.621	13.390***
			(1.183)	(4.702)
Constant	-1.866***	-0.927	-1.765**	-1.790**
	(0.619)	(1.044)	(0.695)	(0.819)
Observations	108	50	108	50
R-squared	0.87	0.77	0.87	0.81
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Dependent variable is the log ratio of average total aid to GNI. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

9. Robustness Checks

9.1 Alternative Poverty Lines

The baseline specifications above utilize a poverty line of $1.9 a day for all measures of poverty. This is because it is the most commonly referred to and used poverty line in the literature and public discourse concerning the incidence of poverty. However, PovcalNet also makes available the three poverty measures calculated using two alternative poverty lines, namely $3.5 and $5.5 a day. These two alternative poverty lines take into account more than just the extreme

poverty cases in a country. Therefore, they may reveal whether aid has had a significant effect on those who are still relatively poor, albeit not the poorest.

The results for the two alternative poverty lines are displayed in Tables 10-15 in the Appendix. All else remains the same in the six tables compared to the baseline specification. In general, the estimated coefficients point toward the same results as found in the baseline specification. That is, no relationship is found between foreign aid and poverty and the conclusion to fail to reject the null hypothesis is re-confirmed. This is found to hold true even when using different poverty lines which may capture a broader definition of poverty.

9.2 Proxies for Poverty

Much of the previous literature has not used direct measures of poverty but rather opted for regressing different proxies for poverty when investigating the relationship between foreign aid and poverty. Therefore, this paper also applies the RD design to the most commonly used proxies in the previous literature. These are infant mortality, life expectancy, and primary schooling used most notably by Boone (1996). Evidence of a significant relationship between these indicators and aid may point toward a weakness in the poverty measures themselves rather than evidence toward the ineffectiveness of aid in combatting poverty.

The results for these three dependent variables are displayed in Tables 16-18 in the Appendix. Unsurprisingly, the estimated coefficients paint a similar picture to the results found in the baseline specification. The identification strategy is unable to find a significant relationship between foreign aid and Human Development Indicators (HDIs). The use of alternative dependent variables thus further establishes the failure to reject the null hypothesis that aid has no effect on poverty.

10. Conclusion

The aim of this thesis is to shed new light on the issue of foreign aid and poverty. The motivation for further exploration of this question lies in the indecisive results found in the previous literature. That is, both a positive, negative and no relationship has been previously found between the two. Different from previous literature, this paper has exploited a quasi-experimental setting by utilizing the IDA threshold for aid eligibility. This method thereby takes an alternative route in order to tackle the typical endogeneity issues commonly present in economic studies.

By studying the period between 1987 and 2010 for a sample of 31 countries this paper applies a fuzzy RD design. The empirical strategy is however not able to find any significant results between foreign aid and poverty. Thus, this paper fails to reject the null hypothesis that foreign aid has an effect on poverty. This conclusion is robust to alternative poverty lines as well as alternative measurements of poverty. Despite the somewhat underwhelming results, it is in line with some of the previous literature, particularly influential contributions such as Boone (1996) and Chong, Gradstein, and Calderon (2009).

However, the non-existing relationship found in this paper does not exclude the possibility that aid does in reality affect poverty but perhaps does so on a disaggregated level. This study utilizes aggregated levels of aid and does therefore not take into account various forms of aid, such as conditional and unconditional aid or aid from specific sources. The empirical strategy used in this paper does not allow for exploring this alternative theory however. Additionally, it is fair to question the external validity of the results found in this paper due to the empirical method used. That is, the method required certain characteristics of the sample countries which does limit the number of countries used. As such, this paper disregards the poorest countries by only investigating the countries which at one point crossed the IDA threshold during the time period studied. Therefore, the conclusions found here should with caution be applied to other countries, such as the very poorest. It is possible that there exists a significant effect between foreign aid and poverty for the very poorest of countries. Again however, the quasi-experimental setting used in this paper could not be applied to investigate such queries.

Finally, given the discussion above, it is worth questioning whether the GNI per capita threshold set by the IDA is at the optimal level. It may be the case that countries close to the cutoff value only benefit marginally for every extra dollar of aid while poorer countries reap larger benefits. Based on the results found in this paper it could therefore be recommended for policymakers to investigate whether the level of the IDA threshold is set too high.

Appendix

Table 10 Second Stage Results for Poverty Headcount Ratio ($3.5 poverty line)

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.062	-0.014	-0.057	-0.009
	(0.053)	(0.062)	(0.070)	(0.042)
$GNI_{i,s-2}$	-0.099*	-0.227	-0.102	-0.542
	(0.051)	(0.220)	(0.313)	(0.691)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.250	-0.680	-0.0601	-0.186
	(0.168)	(0.675)	(0.095)	(0.228)
$GNI_{i,s-2}^2$			0.159	-0.607
			(0.401)	(1.142)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			0.044	-0.243
			(0.182)	(0.356)
Constant	-0.148	-0.005	-0.132	-0.002
	(0.156)	(0.174)	(0.204)	(0.120)
Observations	108	76	108	76
R-squared	0.95	0.95	0.95	0.96
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 11 Second Stage Results for Poverty Gap ($3.5 poverty line)

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.045	-0.030	-0.046	-0.030
	(0.030)	(0.041)	(0.043)	(0.037)
$GNI_{i,s-2}$	-0.068**	-0.017	-0.115	0.087
	(0.034)	(0.124)	(0.212)	(0.485)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.171*	-0.029	-0.055	0.019
	(0.101)	(0.395)	(0.066)	(0.153)
$GNI_{i,s-2}^2$			0.133	-0.255
			(0.245)	(0.536)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			0.048	-0.111
			(0.113)	(0.175)
Constant	-0.146*	-0.093	-0.147	-0.100
	(0.088)	(0.118)	(0.127)	(0.104)
Observations	108	76	108	76
R-squared	0.95	0.95	0.94	0.94
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 12 Second Stage Results for Squared Poverty Gap ($3.5 poverty line)

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.033	-0.028	-0.035	-0.030
	(0.021)	(0.032)	(0.031)	(0.031)
$GNI_{i,s-2}$	-0.050**	0.011	-0.113	0.145
	(0.024)	(0.104)	(0.154)	(0.372)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.126*	0.052	-0.048	0.040
	(0.070)	(0.333)	(0.047)	(0.116)
$GNI_{i,s-2}^2$			0.076	-0.115
			(0.181)	(0.399)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			0.030	-0.056
			(0.082)	(0.134)
Constant	-0.111*	-0.091	-0.116	-0.099
	(0.060)	(0.092)	(0.091)	(0.086)
Observations	108	76	108	76
R-squared	0.94	0.93	0.92	0.91
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 13 Second Stage Results for Poverty Headcount Ratio ($5.5 poverty line)

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.053	-0.020	-0.043	-0.024
	(0.046)	(0.055)	(0.061)	(0.039)
$GNI_{i,s-2}$	-0.078*	-0.275	-0.076	-0.664
	(0.040)	(0.212)	(0.253)	(0.501)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.191	-0.859	-0.043	-0.214
	(0.146)	(0.658)	(0.073)	(0.163)
$GNI_{i,s-2}^2$			-0.042	-0.195
			(0.372)	(1.128)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			-0.037	-0.101
			(0.156)	(0.359)
Constant	0.188	0.281*	0.217	0.260**
	(0.136)	(0.157)	(0.181)	(0.116)
Observations	108	76	108	76
R-squared	0.95	0.95	0.95	0.96
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 14 Second Stage Results for Poverty Gap ($5.5 poverty line)

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.049	-0.021	-0.046	-0.021
	(0.038)	(0.045)	(0.050)	(0.033)
$GNI_{i,s-2}$	-0.078**	-0.136	-0.106	-0.264
	(0.037)	(0.141)	(0.230)	(0.481)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.194	-0.404	-0.054	-0.093
	(0.119)	(0.438)	(0.071)	(0.156)
$GNI_{i,s-2}^2$			0.090	-0.328
			(0.293)	(0.724)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			0.024	-0.141
			(0.132)	(0.223)
Constant	-0.076	0.008	-0.066	-0.000
	(0.110)	(0.128)	(0.145)	(0.095)
Observations	108	76	108	76
R-squared	0.95	0.96	0.95	0.96
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 15 Second Stage Results for Squared Poverty Gap ($5.5 poverty line)

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.043	-0.025	-0.042	-0.026
	(0.030)	(0.039)	(0.041)	(0.033)
$GNI_{i,s-2}$	-0.066**	-0.056	-0.111	-0.037
	(0.032)	(0.113)	(0.199)	(0.435)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.167*	-0.153	-0.052	-0.020
	(0.097)	(0.357)	(0.062)	(0.139)
$GNI_{i,s-2}^2$			0.102	-0.252
			(0.240)	(0.520)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			0.035	-0.110
			(0.110)	(0.163)
Constant	-0.115	-0.059	-0.113	-0.066
	(0.087)	(0.110)	(0.121)	(0.092)
Observations	108	76	108	76
R-squared	0.95	0.96	0.95	0.95
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 16 Second Stage Results for Infant Mortality

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	-0.006	0.035	-0.032	0.022
	(0.064)	(0.124)	(0.096)	(0.121)
$GNI_{i,s-2}$	-0.086	-0.606	-0.484	-2.057
	(0.073)	(0.651)	(0.427)	(1.631)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	-0.237	-1.835	-0.165	-0.671
	(0.195)	(1.972)	(0.134)	(0.527)
$GNI_{i,s-2}^2$			0.252	1.281
			(0.587)	(2.657)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			0.148	0.502
			(0.242)	(0.897)
Constant	4.409***	4.511***	4.331***	4.495***
	(0.188)	(0.360)	(0.293)	(0.358)
Observations	108	76	108	76
R-squared	0.99	0.96	0.97	0.96
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 17 Second Stage Results for Life Expectancy

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	0.036**	0.042	0.038	0.036*
	(0.018)	(0.026)	(0.025)	(0.021)
$GNI_{i,s-2}$	0.007	-0.075	-0.015	-0.173
	(0.018)	(0.096)	(0.113)	(0.266)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	0.027	-0.222	-0.002	-0.058
	(0.050)	(0.291)	(0.036)	(0.086)
$GNI_{i,s-2}^2$			-0.133	0.255
			(0.139)	(0.351)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			-0.051	0.086
			(0.061)	(0.113)
Constant	4.110***	4.122***	4.114***	4.106***
	(0.051)	(0.074)	(0.072)	(0.058)
Observations	108	76	108	76
R-squared	0.98	0.96	0.98	0.96
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 18 Second Stage Results for Primary Schooling

	(1) Full Sample	(2) Optimal Bandwidth	(3) Full Sample	(4) Optimal Bandwidth
$Aid_{i,s-1}$	0.037	-0.055	0.058	-0.129***
	(0.061)	(0.085)	(0.095)	(0.042)
$GNI_{i,s-2}$	0.008	-0.018	0.157	0.096
	(0.051)	(0.149)	(0.350)	(0.445)
$Aid_{i,s-1}$ x $GNI_{i,s-2}$	0.079	-0.035	0.038	0.033
	(0.152)	(0.457)	(0.108)	(0.139)
$GNI_{i,s-2}^2$			-0.274	1.498
			(0.470)	(1.088)
$Aid_{i,s-1}$ x $GNI_{i,s-2}^2$			-0.128	0.484
			(0.219)	(0.383)
Constant	0.132	-0.155	0.193	-0.376***
	(0.192)	(0.265)	(0.292)	(0.134)
Observations	104	72	104	72
R-squared	0.82	0.89	0.80	0.88
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

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