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# The Impact of Foreign Aid on Aggregate Welfare Measures: A Panel Data Analysis\*

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## Abstract

Does foreign aid enhance aggregate human welfare? This paper attempts to answer this question by using a panel of twenty-eight countries, covering the period from 1990 to 2014. It explores intra-country variation by splitting the sample into low-income and middle-income countries. Combined with the fixed effects estimator, these approaches sought to control for the heterogeneity of the effects of aid on welfare measures. Perhaps surprisingly, there was no evidence that foreign aid contributes to the reduction of infant mortality or increase of human development index.

**Keywords:** Foreign Aid, Aggregate Human Welfare, Low-Middle Income Countries.

**JEL Codes:** C23, F35, F63, P33

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## 1. Introduction

Foreign aid has been defined as the transfer of financial or other resources from rich to poor countries. The primary goal is to assist in recipients' needs, although, it might also serve other objectives with strategic, political and commercial means. These transfers started after the World War II with the formation of the United Nations and the independence of many former colonies. In 1948, the Marshall Plan was launched and provided approximately \$300 billion dollars (at today's exchange rate) seeking to help the reconstruction of many of the European countries affected by the war. From that period onwards, aid has attempted to provide support for the diverse development challenges experienced in modern societies (Arvin and Lew, 2015). More specifically, in the last four decades, the principal aim of aid donors has been on helping developing countries reduce their poverty levels. Despite, the remarkable progress on decreasing the number of individuals living in extreme poverty since 1990, the more recent estimations, in 2013, predicted that 10.7 percent of the globe's population still live in extreme poverty. This implies that poverty eradication continues to be one of the major concerns of the international development agenda (World Bank, 2016). In fact, two of the United Nations sustainable development goals are closely related to poverty reduction. It has been proposed the elimination that the number of individuals living in poverty and in hunger by the year of 2030. Therefore, once again reviving the importance of the role of foreign aid on assisting poor countries on their development process.

This paper seeks to study the role of foreign aid on aggregate human welfare, as measured by the infant mortality rates (IM) and human development index (HDI), using cross-country data. The originality of this research arises from the use of more recent data that permits to evaluate the impact of latest international efforts on improving aggregate welfare levels. One is therefore aware that infant mortality rates and human development index are not poverty measures, nonetheless, due to the strong evidence in the literature that these measures are correlated with poverty, this study continues to present pertinent informational value.

However, the empirical investigation of aid effectiveness has been a difficult exercise. Aid donors' purposes and mechanisms have been changing overtime. Therefore, it is crucial to account for the different channels that they can use to impact aggregate human welfare because only in very exceptional cases the effects of aid are direct, for instance, if aid donors directly fund rural labour programmes (Gomanee et al. 2003). Most commonly, aid donors chose to provide budget support to poor countries, seeking to increase public spending on social

services, in particular, those considered as pro-public, for example, healthcare, education, water and sanitation. On the balance, these expenses have shown to be positively associated with aggregate human welfare. Based on these arguments, this study has also been interested in evaluating the potential indirect effects of foreign aid on welfare levels by including public spending on health and education. In detail, it has been constructed a public health-education expenditure indicator. Thus, adopting a similar empirical approach to the most recent empirical studies in the literature such as Gomanee et al. (2003), Mosley, Hudson and Verschoor (2004), Gomanee, Girma and Morrissey (2005a) and Gomanee et al. (2005b). Though, the literature has acknowledged that this approach might be problematic, as a share of aid resources might be utilised to finance public spending, consequently, including both variables in a single regression might lead into the issue of double counting. To address this potential issue it has been constructed a generated regressor for the variable of public health-education expenditure indicator, which sought the elimination of the effects of aid on public spending.

We use data from twenty-eight countries covering the period from 1990 to 2014. Further in the analysis, it has been explored intra-country variation by separating the full sample in low-income and middle-income countries. This process permitted to assess the effects of aid within countries with similar income levels and helped also to control for the heterogeneity of the effects of aid among countries (Chaveut, 2015). Overall, our findings suggested that there is no evidence that foreign aid reduces infant mortality or increases human development index. Our paper is organized as follows: section 2 reviews the literature regarding the topics under analysis; section 3 presents the data and methodology employed in our research; section 4 discusses our results; and, lastly, section 5 summarizes our conclusions.

## **2. Literature Review**

In recent years, there has been great interest in reducing poverty levels. This interest has essentially emerged from the publication of the World Development Report in 1999, which established as one of the main development priorities the reduction of poverty levels by half by the year of 2015 (Healey and Killick, 2000). Therefore, aid donors' main objectives have been altered. Shifting from helping developing countries to increase economic growth to helping them to reduce poverty rates. Following this shift, recent empirical studies have been interested in evaluating the role of aid on poverty rather than on economic growth. However, the empirical investigation of the direct effect of aid on poverty has been, so far, a difficult

exercise as data on poverty measures overtime is scarce. Due to this lack of data, it is difficult to establish comparison among countries (Gomanee et al. 2005b). Nonetheless, some researchers attempted to investigate such relationship and several influential empirical contributions have been presented.

For instance, Collier and Dollar (2002) used a panel of more than 100 countries to investigate the effectiveness of aid on poverty reduction by estimating a poverty-efficiency allocation of aid regression. The authors have used different poverty measures such as squared poverty gap, poverty-gap and headcount. Their findings suggested that aid showed to be effective in reducing poverty, as for their sample of countries aid has taken, on a year-to-year basis, approximately 10 million people out of poverty. They have additionally predicted that this number could be doubled if recipient countries presented good policy and institutional environment. Nonetheless, many scholars due to the policy index employed have challenged the results obtained in this study.

Mosley, Hudson and Verschoor (2004) have also contributed to this new body of the literature by estimating a Generalised Method of Moments (GMM) 3SLS estimator for a sample of forty-six countries, over the period of 1990-1999. This study did not focus on the direct effect of aid on poverty, as most of the early empirical studies; instead, it concentrated on the indirect mechanisms which aid might impact the poor. In order to conduct the investigation, the authors used a different approach, which consisted on the inclusion of government expenditures towards social services in their regressions. This approach is used, as the authors were interested in evaluating the role of aid on influencing public spending such that it would benefit the poor. To complement their analysis, measures of inequality and corruption were also included, as both are considered to influence poverty leverage of aid. The results showed that aid is capable of influencing public spending towards social services (e.g. health, education, agriculture research, water and sanitation) –, as a consequence, reducing poverty levels and enhancing welfare.

Even though these studies on the effectiveness of aid on poverty have provided good insights to the empirical literature and important improvements have been achieved, some limitations were underlined. For instance, the two papers mentioned above by Collier and Dollar (2002) and Mosley, Hudson and Verschoor (2004) used monetary poverty measures such as poverty-gap and headcount index. These indicators represent the percentage of people living with less than one dollar a day or perhaps the percentage of people that are allocated

below the national poverty line. According to Anand and Sen (1992) and Reggy and Pogge (2009), such monetary measures of poverty (e.g. headcount index and poverty-gap) might not effectively represent the material hardship experienced by people. Therefore, as an alternative, some authors (Bonne 1996, Mosley, Hudson and Verschoor 2004; Gomanee, Girma and Morrissey, 2005a; Gomanee et al. 2005b) suggested the use of non-monetary indicators such as aggregate welfare measures, for example, infant mortality, life expectancy and human development index. In fact, Mosley, Hudson and Verschoor (2004) – study mentioned above - has taken this argument into account and in addition to the headcount index, it alternatively included infant mortality, in the dependent variable, in their poverty equation. It is worth noting that these investigations have not claimed that welfare indicators were measures of poverty, instead, it suggests that they show to successfully represent the material hardship of being poor (Reggy and Pogge, 2009; Gomanee et al. 2003; Gomanee, Girma and Morrissey, 2005a; Gomanee et al., 2005b; Verschoor and Kalwij, 2006). In fact, some empirical studies, for example, Gomanee, Girma and Morrissey (2005a), Gomanee et al. (2005b) and Verschoor and Kalwij (2006) reported that the correlation between ‘a dollar a day’ measure and infant mortality rates is 0.78, 0.75 and 0.79, respectively, for the sample countries analysed in their studies. Therefore, this has led the authors to conclude that there is similarity in terms of informational value.

Another limitation faced by the studies of aid and monetary poverty measures is the deficiency on the availability of data, which makes the comparison between countries difficult. Consequently, another good reason highlighted by academics is that the data availability on aggregate welfare measures is substantial, which therefore facilitates cross-county comparison (Gomanee et al, 2005a, 2005b and Verschoor and Kalwij 2006).

Boone (1996) has also investigated the relationship between aid and aggregate welfare measures and perhaps was one of the earliest empirical studies looking at this relationship. Boone (1996) used life expectancy, primary schooling ratio and infant mortality as measures of aggregate human welfare, on a panel of 97 countries, covering the period from 1971 to 1990. The author based his analysis on standard neoclassical growth models, as his theoretical framework. He has simply substituted growth indicators, in the dependent variable for welfare indicators. The study focused on understanding whether governments make appropriate use of aid resources such that would benefit the poor. The results showed that aid had no effect on the selected aggregate welfare measures, concluding that poor people do not benefit from aid. Unsurprisingly, this finding has been challenged. Recent empirical investigations argued that

the regressions presented in Boone (1996) contained specification errors, as the author considered that aid has a direct impact on welfare (Gomanee, Girma and Morrissey, 2005a). Instead, it is suggested that the impact of aid on welfare is indirect, that is via public spending on social services considered pro-public (e.g. healthcare, education, water and sanitation). In other words, aid might directly influence government spending orientation towards sectors that enhance welfare, thus, indirectly affecting welfare levels (Gomanee, Girma and Morrissey 2005a).

Nonetheless, the argument that increasing public spending on pro-public social services enhances welfare has been controversial. Some authors claimed that an increase in government spending on social services such as education and health do not necessarily guarantee an increase on aggregate welfare, as the distribution of these services might be unequally shared among the population (Pritchett, 1996; Castro-Leal et al. 1999; Reinikka and Svenson, 2004). Yet, in general, it has been shown that higher government spending on social services increases the likelihood of improving poor people's welfare (Gomanee et al. 2005b). In line with this last argument, recent empirical studies (Mosley, Hudson and Verschoor, 2004; Gomanee, Girma and Morrissey, 2005a; Gomanee et al., 2005b) focused on evaluating the effectiveness of aid on aggregate welfare through public spending on social services. The results of these studies have shown to be mixed.

For instance, Gomanee, Girma and Morrissey (2005a) used quantile regressions on a sample of 38 countries in Asia, Sub-Saharan Africa, Latin America, over a time period of up to 18 years, from 1980 to 1998. The paper focused on the study of the impact of aid on aggregate welfare levels. It assumed that, perhaps, the effects of aid on welfare occur through government spending. For this reason, the authors have constructed a Pro-Public Expenditure index (PPE), which included public spending on education, health, water and sanitation. For the dependent variable, it has included two welfare measures such as infant mortality rates and human development index. Moreover, it has included initial income, aid lagged one period (to address possible endogeneity) and lastly the government spending on military expenditures, as explanatory variables. Their findings suggested that aid has a significant impact on welfare and that in fact there is evidence that these effects might occur via PPE. More specifically, the quantile regressions showed that aid increased human development and decreased infant mortality. This significant effect of aid has showed to be more accentuated in countries that lied bellow the median of the welfare distribution, stated differently, in countries that presented

lower level of human development (e.g. higher infant mortality and lower human development index).

Furthermore, some changes have been made in Gomanee et al. (2005b) yielding slightly different results. In this study the authors have used fixed effects estimator for a sample of 104 countries from Sub-Saharan Africa, Middle East and North Africa, Central and South America and transition economies, which then were grouped into middle and low income, for the period of 1980 to 2000. This regression technique allowed the authors to account for non-observable country characteristics. As in the previous study, the principal objective was to understand the effects of aid on aggregate welfare indicators, accounting for the fact that these effects might occur through public spending. Therefore, similarly to Gomanee et al. (2005a), the authors constructed the PPE index. The findings suggested that aid has significant effects on welfare. And similarly to Gomanee, Girma and Morrissey (2005a) these effects showed to be of greater magnitude in low-income countries. However, it was not found that aid impacts welfare through pro-public expenditures, contrary to the findings presented by Gomanee, Girma and Morrissey (2005a) and Mosley, Hudson and Verschoor (2004). This difference in the result might be explained by the large sample and the use of fixed effects estimator, which controlled for the countries unobservable characteristics. Thus, Gomanee et al. (2005b) argued that the significant and positive effect of aid occur either directly or through economic growth.

Although, the empirical literature of aid effectiveness has been vastly explored. There are very few studies on the effectiveness of aid on improving aggregate human welfare. As this continues to be an important topic to be researched, this study seeks to contribute to the literature by using more recent data as well as a different group of countries. The econometric approach employed is in line with more recent investigations, for example, Mosley, Hudson and Verschoor (2004) and Gomanee, Girma and Morrissey (2005a) Gomanee et al. 2005b).

### **3. Data and methodology**

#### **3.1. Data**

The data used in this empirical research are yearly, covering the period from 1990 to 2014 and are collected from the databases of the World Development Indicators (WDI) and United Nations Development Programs (UNDP) Human Development Report. Due to restrictions on the availability of data on public spending on education and health, the first two periods for



some of the countries have been completed with data used in Gomanee et al. (2005b). In more detail, the variables employed are the following: Net Official Development Assistance received as a share of gross national income (Net ODA), as a measurement of aid flows; Human Development Index (HDI); Infant Mortality rate (per 1000 live births, IM); Gross Domestic product per capita (constant 2010 US\$, GDPPC); Government Expenditure on Education as a percentage of GDP (Education), Domestic General Government Health Expenditure as a percentage of GDP (Health) and lastly Military Expenditure as a share of GDP (Military) (World Development Indicators, 2018).

Additionally, period averages were computed for: 1990/1993 (period 1); 1994/1997 (period 2); 1998/2001 (period 3); 2002/2005 (period 4); 2006/2009 (period 5) and 2010/2014 (period 6). It is used period-averages in order to smooth out short-term fluctuations and remove measurement errors due to lack of data (Bonee, 1996; Calderon and Serven, 2004).

The full sample is constituted by twenty-eight developing countries, including 22 middle-income countries as Cameroon, Peru, Cote D'Ivoire, El Salvador, Kenya, Paraguay, Mauritius, India, Tunisia, Bangladesh, South Africa, Indonesia, Swaziland, Malaysia, Senegal, Pakistan, Belize, Thailand, Brazil, Mongolia, Colombia and Bolivia, and 6 low-income countries including Benin, Gambia, Mali, Nepal, Sierra Leone and Togo. Further on in the analysis, countries have been grouped into each of the two categories according to the World Bank Classification Countries Status List. These classifications are essentially form on gross national income (GNI) per capita (World Bank, 2017). Moreover, in table 1 it is also presented the summary statistics.

**Table 1. Summary statistics (full-sample)**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>S.D.</b>	<b>Min.</b>	<b>Max.</b>
<i>Aid</i>	167	4.847	5.588	-0.127	25.946
<i>IM</i>	168	53.708	32.427	6.775	154.875
<i>HDI</i>	168	0.543	0.127	0.231	0.7798
<i>GDPpc</i>	168	2642.518	2424.961	293.677	11648.78
<i>Education</i>	143	4.141	1.459	0.975	7.145
<i>Health</i>	168	1.983	1.103	0.469	5.65
<i>Military</i>	165	1.717	0.966	0.155	7.084

Note: Data presented in period-averages.

### 3.2. The Public Health-Education Expenditure Indicator

In what respects the unweighted Public Health-Education Expenditure Indicator, the approach used to construct this indicator is similar to the methodology used in Gomanee, Girma and Morrissey (2005a) and Gomanee et al. (2005b). However, we exclude the public spending on water and sanitation, due to lack of data for the sample of countries employed in this study.

Moreover, it was only possible to include public spending on education and health, as availability of data was substantial. The first step, in constructing the unweighted public health-education expenditure indicator, consisted on estimating a simple regression of each welfare measure (e.g. infant mortality rates and human development) on the individual categories of public spending (e.g. healthcare and education) and initial GDP per capita ( $GDPpc_0$ ). This has helped to understand the impact of public spending on health and education on the welfare measures employed. The estimation results are presented in table 2.

Consistent with previous studies (Gomanee et al. 2003, 2005b), it is found that higher initial GDP per capita ( $GDPpc_0$ ) is associated with higher levels of welfare, irrespective of the welfare measure used. That is the higher the initial GDP per capita of a country the lower the infant mortality and the higher the human development index.

However, this study did not find evidence that public spending on social services – for example, health and education – have an impact on welfare levels. The coefficients of both variables have shown to be insignificant, irrespective of the welfare measure employed. The insignificant result of public spending on healthcare services has been also reported in Mosley, Hudson and Verschoor (2004), who continued to include the variable in the infant mortality regressions, despite the insignificant results. On the other hand, it has not been found support on the literature regarding the insignificant results in public spending on education. In fact, previous empirical investigations have reported a significant and positive impact of public spending on education on welfare measures (Mosley, Hudson and Verschoor 2004; Gomanee et al. 2005b).

One can anticipate two possible explanations for the differences in the results. First, the number of countries used in this study is relatively small in comparison to the number of countries used in earlier studies, therefore this might suggest not sufficient cross-country variation in these variables for the sample used (Gomanee et al. 2005b). Secondly, it is included countries with very distinct political and economic environment, thus, government' budget

share allocation to social services might differ considerably. Consequently, affecting the results obtained in this section.

Despite the insignificant results found for public spending on health and education, this study has included both of them in the light of strong evidence that they might be an important channel used to enhance welfare levels (Gomanee 2005a, 2005b, Mosley et al. 2004; Verschoor and Kalwij 2006). Therefore, it has been constructed an unweighted total public health-education spending indicator ( $P_{social}$ ) as follows:

$$P_{social} = P_{health} + P_{education} \quad (1)$$

where  $P_{health}$  is public spending on health care and  $P_{education}$  is public spending on education, both as a share of GDP.

This constructed indicator assumes that public spending on health and public spending on education have equal weight on welfare. This might seem to be a very strong assumption, however, this study has not been concerned in exploring the weight systems, as according to Gomanee et al. (2005b) the results of the unweighted and weighted index did not present significant differences. Therefore, in this empirical investigation is solely used the unweighted index rather than the weighted.

### **3.3. Military Expenditure and Welfare**

Moreover, this study has been interested on investigating the impact of military spending on the welfare (as this variable will be later employed in the main regressions). Thus, the simple regression conducted in the previous section has been repeated. In this case, the welfare measures have been regressed on initial GDP per capita ( $GDPpc_0$ ) and public military spending. It is important to mention that the sign of the coefficient of this measure is unclear. On the one hand, it might indicate country's instability, thus, showing a negative association with welfare measures (that is an increase in infant mortality rates and decrease in human development index). On the other hand, it might represent the country's efforts on guaranteeing security, thus, presenting a positive association with welfare measures (low infant mortality and high human development index) (Gomanee et al. 2005b). The estimation results are also shown in Table 2.

It has been found that for the infant mortality estimation an increase in public spending on military expenditure leads to an increase in infant mortality rates, as the coefficient of the

variable is shown to be statistically significant and sign positive. A 10% increase on public spending on military expenditure results in a 13.34% rise in infant mortality rates. However, for the human development index estimation, this spending has shown statistically insignificant.

**Table 2. Welfare Regressions and Public Expenses**

	(1)	(2)
	IM	HDI
<i>GDPpc<sub>0</sub></i>	-0.607 (0.044)***	0.241 (0.013)***
Public Spending on Health	0.075 (0.071)	-0.033 (0.021)
<i>R</i> <sup>2</sup>	0.6198	0.7335
N	168	168
<i>GDPpc<sub>0</sub></i>	-0.582 (0.042)***	0.213 (0.011)***
Public Spending on Education	0.064 (0.102)	-0.009 (0.027)
<i>R</i> <sup>2</sup>	0.5992	0.7471
N	143	143
<i>GDPpc<sub>0</sub></i>	-0.567 (0.035)***	0.228 (0.011)***
Public Spending on Military	0.171 (0.056)***	-0.007 (0.017)
<i>R</i> <sup>2</sup>	0.6381	0.7312
N	165	165

Notes: \*, \*\* and \*\*\* represent statistical significance at levels of 10%, 5% and 1% respectively. All variables are measured in logarithms. Dependent Variables are HDI and IM Standard error terms are presented in parenthesis.

## 3.2. Methodology

This section outlines the formal framework used to investigate the effectiveness of foreign aid on aggregate welfare measures. It has been adopted a simple specification, based on Gomanee et al. (2005b), who have also analysed this relationship for a different group of countries over the period 1980-2000. By considering the similarities of the question posited in our article and the one discussed by Gomanee et al. (2005b) study, it seemed appropriated to follow the same empirical approach.

### 3.2.1. Simple Model

The simple specification used permitted the evaluation of the potential direct effects of foreign aid flows on welfare, as well as, the effects that might result from public spending on

social services. Moreover, fixed effect estimator<sup>§</sup> has been used, as it is important to account for countries unobservable characteristics that might affect the variations of welfare levels thus allowing for arbitrary correlation between the dependent and explanatory variables (Gomanee et al. 2005b; Wooldridge, 2013). This can therefore be presented as follows:

$$W_{it} = \delta_0 + \delta_1 Y_{it} + \delta_2 P_{Social_{it}} + \delta_3 Aid_{it} + \varepsilon_{it}, \quad (2)$$

where,  $i$  and  $t$  denote, respectively, our countries' sample and the time period. Also in this equation,  $W$  represents the welfare measures used, more specifically, infant mortality (IM) and human development index (HDI),  $Y$  represents a measure of income,  $P_{Social}$  represents a measure of pro-public spending,  $Aid$  represents a measure of foreign aid flows and  $(\varepsilon_{it})$  presents an error term. It is worth noting that the coefficient of major interest is  $\delta_3$ , which captures the effects of aid on welfare. In addition, income ( $Y$ ) is used as a control variable, as it has been considered crucial on enhancing welfare levels (Dollar and Kraay, 2002; Gomanee, 2005b). As previously argued the effects of aid on welfare might occur indirectly through public spending on specific social services, as aid donors might provide budget support seeking to increase the government budget share on these expenses, thus  $P_{Social}$  has been also included in the estimation (Gomanee et al. 2003; Gomanee et al. 2005b). Additionally, it is worth noting that the coefficient of  $P_{Social}$  might also be examined as policy measure.

### 3.2.2. Construction of Generated Regressor

Further in the analysis, Gomanee et al. (2005b) have suggested that public spending on social services as a share of GDP could be written as a function of aid and income as follows:

$$P_{Social_{it}} = \alpha_0 + \alpha_1 Y_{it} + \alpha_2 Aid_{it} + u_{it} \quad (3)$$

Having derived equation (3), it was possible to identify that such approach could be problematic. As a considerable proportion of aid flows might directly fund public spending on social services, thus, including both measures in a single regression estimation, as previously suggested in equation (2), would lead to double counting. Consequently, spurious results would be obtained. In order to overcome this issue, Gomanee et al. (2005b) have suggested the

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<sup>§</sup> It has been performed the Hausman test for all regressions and for seven out of nine regressions fixed effects (FE) is the favoured, whereas for the remaining two random effect has showed to be more efficient. For consistency, it is only reported the results for FE, as it also allows to control for unobservable country characteristics. Moreover, and for reasons of parsimony, we do not detail the Hausman test results in the article, being available upon request.

construction of a regressor ( $\widetilde{P}_{Social}$ ) that would substitute the computed public health-education expenditure indicator ( $P_{Social}$ ). Thus, this study has also adopted an identical approach. The principal objective of this procedure is to eliminate public social spending directly financed by aid, thus removing double counting issue detected in equation (2). In this regard, the first step sought to test the hypothesis that a share of foreign aid is used to directly finance public spending towards social services. This process consisted essentially on estimating equation (3).

However, before equation (3) has been estimated, one should note that caution recommends the use of aid lagged one period rather than current aid, as this would help to avoid potential endogeneity problems due to the fact that a share of aid resources might be used to directly fund spending on social services. Thus equation (3) has been re-written as follows:

$$P_{Social_{it}} = \alpha_0 + \alpha_1 Y_{it} + \alpha_2 A_{t-1} + u_{it} \quad (4)$$

The results of the estimations of equation (4) for the full and sub samples are presented in Table 3. It is worth mentioning that equation (4) has also included GDP per capita ( $Y$ ) in order to test whether countries with higher income levels allocate a larger share of their GDP to public spending on social services, more specifically, in healthcare and education. Moreover, an error term has been also added ( $u_{it}$ ).

**Table 3.  $P_{Social}$  Index Regressions**

	Full Sample	Low-Income	Middle-Income
$Aid_{t-1}$	-0.0074 (0.082)	0.016 (0.306)	-0.121 (0.072)
GDP $pc$	0.656 (0.233)***	2.221 (0.909)**	0.408 (0.204)*
$N$	136	30	106
$R^2$	0.1965	0.0553	0.0886

Notes: \*, \*\* and \*\*\* represent statistical significance at levels of 10%, 5% and 1% respectively. All variables are measured in logarithms. Dependent variable is public health-education expenditure indicator.

The findings have suggested that GDP per capita is a significant determinant of public spending on health and education indicator ( $P_{Social}$ ), irrespective of the sample used (e.g. full sample, middle and low income). Nevertheless, foreign aid has shown to be insignificant for all the samples, suggesting that aid is not an important determinant of public health-education expenditure indicator ( $P_{Social}$ ). Stated differently, these findings demonstrated that the potential effects that aid might have on welfare levels do not occur through  $P_{Social}$ . Strictly speaking, the construction of the generated regressor is unwarranted as the results of the

estimation of equation (4) for the aid coefficient showed to be insignificant. However, caution recommends proceeding with the use of the generated regressor, as some aid might continue to finance public spending on healthcare and education ( $P_{Social}$ ). Hence, the variable  $\widetilde{P_{Social}}$  is generated from saving the residuals from the regression of ( $P_{Social}$ ) on aid one period lagged. It is worth mentioning that such procedure only affects the coefficient of aid, while the others remain unchanged.

### 3.2.3. Baseline Model

Thereafter, the construction of the generated regressor, equation (2) has been rewritten as follows:

$$W_{it} = \delta_0 + \delta_1 Y_{it} + \delta_2 \widetilde{P_{Social}_{it}} + \delta_3 A_{it} + \varepsilon_{it}, \quad (5)$$

As it can be observed the only difference between equations (2) and (5) is the substitution of  $P_{Social}$  by  $\widetilde{P_{Social}}$ . As previously mentioned,  $\widetilde{P_{Social}}$  represents the public spending on healthcare and education, which are not directly funded by a proportion of aid received, thus, avoiding the issue of double counting that could have led to spurious results.

The final equations have then been derived from a variant of equation (5) and are presented as follows:

$$IM_{it} = \beta_0 + \beta_1 GDPpc_0 + \beta_2 \widetilde{P_{Social}_{it}} + \beta_3 P_{military_{it}} + \beta_4 Aid_{t-1} + \varepsilon_{it} \quad (6)$$

$$HDI_{it} = \beta_0 + \beta_1 GDPpc_0 + \beta_2 \widetilde{P_{Social}_{it}} + \beta_3 P_{military_{it}} + \beta_4 Aid_{t-1} + \varepsilon_{it} \quad (7)$$

Where,  $IM_{it}$  is infant mortality rates and  $HDI_{it}$  is human development index.  $GDPpc_0$  is initial GDP per capita, which has been considered an important mechanism to enhance welfare (e.g. in this case the measures of infant mortality rates and human development index);  $\widetilde{P_{Social}}$  represents government expenditure on health and education that are not directly funded by aid,  $P_{military}$  is the public spending on military expenditure, which accounts for either the deviation from public spending on sectors with high productivity that could have benefited the poor or the government effort to guarantee the security of the country;  $Aid_{t-1}$  is one period lagged aid, which have been employed for two principal reasons. First of all, it helps to account for endogeneity issues that might arise and secondly for the fact that the effects of aid might have delayed results. Finally, it is included an error term,  $\varepsilon_{it}$ , which is assumed to be

independent from the explanatory variables. It is also worth noting that all the variables employed in this equation are presented in logarithm form.

#### **3.2.4. Empirical Approach: Potential Issues**

The empirical approach in our article is not without challenges. For instance, the lack of theoretical guidance makes the empirical investigation of aid effectiveness on welfare problematic, as it is difficult to identify the possible factors affecting the cross-country variation of the dependent variable (Gomanee et al. 2003).

Furthermore, another difficulty is raised regarding the variable used as a measurement of aid because it does not permit to identify whether the aid donor's target is directed to poverty/welfare (Gomanee et al. 2003, Chauvet, 2015). Aid might be donated for multiple purposes, as discussed in section 2, and it might be provided in many different forms, for example, technical assistance, private sector aid, emergency relief (Mosley and Eeckhout, 2000). Therefore, this could result into misleading conclusions, as the amount of aid flows towards the enhancement of welfare levels could be overestimated. In order to overcome this issue, this study has added public spending on health and education on the regressions because it considers that aid donors might use these expenses as a channel to impact human welfare.

Moreover, previous empirical studies (e.g. Hansen and Tarp, 2000a, 2001; Collier and Dollar, 2001, 2002) have also reported that the relationship between aid and growth or poverty is non-linear. This suggests that the effects of aid are heterogeneous across countries (Chaveut, 2015). This might be problematic if the country that received the highest amount of aid flows is also the country that is most in need (e.g. higher infant mortality rates, lower human development index), as the correlation between both variables might only reflect the country's characteristics and not necessarily the effects of aid on these measures (Chaveut, 2015). Seeking to solve this issue, it has been used fixed effects estimator, as suggested by many of the empirical investigations from the 1990s (ibid). This method accounts for time-invariant characteristics, which might be detrimental in ensuring the effectiveness of aid (Wooldridge, 2013). To complement this approach, it has been also explored intra-country variation to assess the effects of aid within countries with similar income levels, thus attempting to reduce the level of heterogeneity (Chaveut, 2015). Lastly, it has been used aid lagged one period, accounting for endogeneity and for the fact that the impact of aid might have delayed results.



Although, this study has consistently attempted to overcome the potential challenges presented in the empirical evaluation of aid effectiveness, one is aware that the econometric results obtained should be interpreted with carefulness.

## **4. Results**

This section will present and discuss the empirical results obtained by the estimation of equations (6) and (7), of the twenty-eight developing countries used in this study. It begins by discussing the results for the full sample and following on from there, the sub-samples results will be presented, Tables 4-5, respectively.

### **4.1. Full Sample**

By observing the table 4, where in column 1 it is reported the results of the estimation of infant mortality, while in column 2 the results of the estimations of human development index (HDI), it can be noted that the set of variables used in these two estimations are able to explain approximately 61% and 75% of the variation in infant mortality rates and human development index, respectively. Moreover, it has also been found that initial GDP per capita is statistically significant at 1% and with the expected sign, regardless the welfare measure used (e.g. infant mortality rates and human development index). In more detail, a 10% increase of the initial GDP per capita is associated with a 13.21% decrease of infant mortality rates and a 3.98% increase of human development index. These results are consistent with those reported in previous empirical studies, which have suggested that initial income is an important mechanism to improve welfare levels (Gomanee et al. 2003, 2005b; Dollar and Kraay, 2002). Moreover, it suggests that countries that present the highest initial GDP per capita do also have the highest welfare levels.

Additionally, the coefficients on aid are statistically insignificant, irrespective of the welfare measure used. This suggests that there is no evidence that aid is associated with neither higher levels of human development index nor lower levels of infant mortality (for the full sample). It has been also found insignificant results for the coefficients of the generated regressor of public health-education expenditure and public spending on military for both infant mortality and human development index estimations.

**Table 4. Fixed Effects Estimations (Full Sample)**

	(1) IM	(2) HDI
$GDPpc_0$	-1.321 (0.102)***	0.398 (0.042)***
$\widetilde{P}_{Social}$	-0.836 (0.368)	0.420 (0.151)
$Aid_{t-1}$	-0.006 (0.041)	0.019 (0.017)
$P_{military}$	0.003 (0.059)	-0.001 (0.024)
$N$	133	133
$R^2$	0.619	0.756
F-statistics	43.48	18.39

Notes: \*, \*\* and \*\*\* represent statistical significance at levels of 10%, 5% and 1% respectively. Dependent variables are HDI and IM. All variables are measured in logs. Standard errors are presented in parenthesis.

## 4.2. Sub-Samples

This empirical investigation has also been interested in exploiting intra-country variation of aid effectiveness on welfare measures. Therefore, the full sample has been separated into two sub-samples – e.g. middle and low-income. The principal goal is to evaluate how aid influences aggregate welfare measures according to countries' income levels. The results are presented in Table 5.

**Table 5. Fixed Effects Estimations (sub-samples)**

	Middle-Income		Low-Income	
	(1) IM	(2) HDI	(3) IM	(4) HDI
$GDPpc_0$	-1.211 (0.121)***	0.315 (0.032)***	-1.738 (0.209)***	1.095 (0.166)***
$\widetilde{P}_{Social}$	-0.809 (0.332)***	0.180 (0.088)**	1.584 (2.298)	0.220 (1.830)
$Aid_{t-1}$	-0.014 (0.045)	-0.0004 (0.012)	0.159 (0.166)	0.027 (0.132)
$P_{military}$	0.125 (0.097)	-0.008 (0.026)	-0.070 (0.052)	-0.035 (0.042)
$N$	105	105	28	28
$R^2$	0.560	0.675	0.164	0.137
F-statistics	45.07	36.99	35.97	15.39

Notes: \*, \*\* and \*\*\* represent statistical significance at levels of 10%, 5% and 1% respectively. Dependent variables are HDI and IM. All variables are measured in logs. Standard errors are presented in parenthesis.

#### 4.2.1. Middle-Income Countries

The results for middle-income countries are shown in column 1 and 2 of Table 5. Consistent with the results found in the full sample regressions, the coefficient of major interest, lagged aid ( $Aid_{t-1}$ ) has showed to be statistically insignificant for both welfare measures. Moreover, it has been found that initial GDP per capita is statistically significant and have the expected sign, irrespective of the welfare measure used. A 10% increase in the initial GDP per capita is associated with a decrease of nearly 12.11% in infant mortality rates and an increase of 3.1% in human development index. Therefore, one can conclude that aggregate welfare is higher in middle-income countries that present the highest initial GDP per capita (Gomanee et al., 2005b).

However, noticeable differences have also been reported. For instance, the coefficient of the generated regressor of public health-education expenditure indicator ( $\widehat{P_{Social}}$ ) has shown to be statistically significant and with expected sign for both welfare measures. This significant result has suggested that for middle-income countries a 10 % increase in public spending on health and education is associated with a reduction of roughly 8% in infant mortality rates and an increase of 1.8% in human development index. Lastly, the coefficient of public spending on military expenditure has shown to be insignificant, for both welfare measures.

#### 4.2.2. Low-Income Countries

Observing the results obtained for low-income countries, we can conclude that the initial GDP per capita have shown to be statistically significant for both welfare measures. However, for low-income countries, the effects of this measure have shown to be of greater magnitude. For instance, a 10% increase showed to be associated with a decline in infant mortality rates of approximately 17.38% and an increase of 10.95% in human development index. Furthermore, the coefficient of major interest, lagged aid ( $Aid_{t-1}$ ) has also shown to be statistically insignificant for both welfare measures. And again, public spending on military expenditure has shown insignificant, irrespective of the welfare measure.

However, few differences have also been noted in comparison to middle-income. The coefficients for the generated public spending on health and education have shown to be statistically insignificant, irrespective of the welfare measure used. The insignificant results on these coefficients do not necessarily show that there is no impact of these variable on both infant mortality and human development index, instead, this might simply represent that there

is no sufficient cross-country variation in both variables for this sample (Gomanee et al. 2005b).

To conclude, this empirical investigation has not found evidence that foreign aid is associated with infant mortality reduction nor human development index increase. The coefficients of aid have shown to be consistently insignificant, irrespective of the welfare measure used (in all samples). Moreover, it has been found that military spending has no effect on human welfare for the sample of countries used in this study. These insignificant results might show that the negative effects of this expense might be outweighed by the possible benefit of increasing military spending towards the maintenance of the country's security and therefore welfare improvement. On the other hand, the coefficients of initial GDP per capita has shown to be consistently significant in all specifications and samples. It implies therefore that aggregate human welfare is shown to be higher in countries with a higher initial GDP per capita. Finally, the results on the public spending on education and health are not very conclusive. After, removing Burundi from the sample, the coefficients have shown to be statistically significant and had the expected sign for the full and middle-income countries samples, when using fixed effects estimator. However, for low-income countries the coefficients have shown to be insignificant.

#### **4.3. Effects of Aid on Welfare**

As highlighted in the previous section, this study has not found any evidence that foreign aid reduces infant mortality or increases human development index, as the coefficients of aid have consistently shown to be insignificant. These results however differ from those found in early studies in the literature. For instance, the study that is most closely related to the approach adopted in this research, Gomanee et al. 2005b, have found a positive and significant effect of aid on welfare levels. The authors have discussed that aid is an important channel on helping developing countries reducing infant mortality and increasing human development index.

The differences in the results found in this paper and previous empirical investigations could have stemmed from several reasons. First of all, the number of countries included in the sample of this research is relatively small in comparison to other empirical researches, for example Gomanee et al. 2003; Mosley, Hudson and Verschoor, 2004; Gomanee, Girma and Morrissey, 2005a; Gomanee et al., 2005b. Secondly, this study has used more recent data,

which has covered the period between 1990 and 2014. The purpose of using more recent data was essentially to evaluate the effects of foreign aid on human welfare for the last couple of years. In fact, data shows that there was a remarkable reduction in the overall volume of foreign aid received for the countries used in this empirical investigation. This reduction has been more notorious from 1990 to 2005, and perhaps this might have also contributed for the insignificant results obtained for the coefficients of aid.

Additionally, the literature has pointed out that country' policies and institutions play a crucial role in determining the effectiveness of aid (Collier and Dollar 2001, 2002). According to Burnside and Dollar (2000) and Collier and Dollar (2001, 2002), aid is only effective in countries that have 'good' policy and institutions environment. As discussed in the literature review this finding has reasonable economic intuition that is countries that present little policy distortion are more likely to better allocate the funds. Although, it is beyond the scope of this study to specifically control for each country's policies and institutions, this argument might provide important insights regarding the insignificant results obtained. For instance, measures of public spending on social services have been included, which were considered by previous studies as pro-public (e.g. healthcare and education). These measures were included not only to account for the different channels that aid donors might use to improve welfare but also as policy indicators. Even though, for some regressions the coefficient for the public health and education indicator has shown to be statistically significant (for the full and middle income countries with the exclusion of Burundi under fixed effects estimator), thus suggesting that these expenses are important to improve welfare levels however this results should be interpreted with caution. For instance, when testing the effects of each category on the welfare measures (in section 4.1), the coefficients of these public spending has shown to be statistically insignificant. This result might be an indication that there is in fact some policy distortions for the countries used in this investigation. Moreover, aid has shown to not be a crucial determinant of public spending on health and education, suggesting that aid donors do not influence these expenses. These findings suggest that perhaps institutions and policies are an important factor to ensure the appropriate use of the donated funds, therefore aid donors should be cautious when increasing the amount of aid as the designed outcome might be dependent on subsequent allocation by recipient countries allocate it (Kenny, 2006).

Also in line with this argument, Isopi (2015) has discussed that corruption is a prevalent phenomenon in developing countries, in particular in low-income. This has been a serious issue

because it impedes aid to be allocated effectively. The author has claimed that corruption restrain the aid donor's goals in alleviating underdevelopment and poverty as the poor either do not benefit or only partially benefit from the resources (e.g. loans, grants) provided. Therefore, curbing the effects of aid on growth and welfare levels. Thus, this could be also an explanation for the insignificant results on aid coefficients for the sample of countries used in this analysis.

## **5. Conclusions**

This paper has investigated the relationship between foreign aid and aggregate human welfare. It has used data for twenty-eight developing countries over the period 1990-2014 in an attempt to provide important insights regarding the role of foreign aid on welfare, for more recent years.

In doing so it has adopted a cross-country aid effectiveness model and used fixed effect estimator to control for unobservable country characteristics. Further, it has separated the full sample into low and middle-income countries seeking to capture the effects of aid on welfare, according to country's income level. Both approaches have permitted to control for heterogeneity, which could have caused some endogeneity issues.

Overall, the results of this empirical investigation has not find any evidence that foreign aid has an effect on reducing poverty levels nor increase human development index. These results have shown to be different from the findings of the previous empirical studies such as Mosley et al. (2004), Gomanee et al. (2005a, 2005b) who have found a positive and significant association between the two. Moreover, there was no evidence that aid is a determinant of public spending on health and education for the sample of countries used in this study, which leads to conclude that the effects of aid on welfare do not occur via public spending on social services.

Nonetheless, the study has found significant effects regarding public spending on health and education for the full and middle-income countries when using fixed effects estimator. These findings suggest that there is some evidence that public spending on health and education are an important channel to enhance welfare levels.

One is aware that the results obtained in this study should be interpreted with carefulness, but it seems plausible to suggest that the principal priority of aid donors should be in increasing

the quality of assistance provided to poor countries rather than increasing the quantity of the funds. Additionally, aid agents should be concerned in understanding the potential mechanisms that they might use to ensure the efficiency of the resources provided, thus, reaching the desirable effects. In fact, this has been also suggested by Gomanee et al. (2005b) who has argued that more attention should be devoted on the allocation and effectiveness of government spending.

Looking forward, further investigation should focus on country specific characteristics and improved aid measurements that identify the intended targets of donors.

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