A Data Analysis of FDI Inflows and Poverty Rates in Central America

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Abstract:

This paper investigates the impact of Foreign Direct Investment on poverty rates in Central America. The study incorporates a data analysis to discover whether FDI improves (lowers) poverty rates in Central American countries. this paper found that FDI Inflows did have significant and positive impacts on life expectancy and household consumption while having no impact on infant mortality rate.

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1.0 INTRODUCTION

Foreign Direct investment plays a major role in economies all around the round, it is a major component of globalization, the ability for organizations and corporations to invest in the economies of other countries. This takes the form of a company buying land and operating a farm to building factories. Often to take advantage of local talent or lower prices of production. The main question this paper seeks to answer is if foreign direct investment has a palpable impact on that country's poverty levels. This is a highly researched topic because countries may rely on foreign companies to provide work for individuals, this is due to the size of that economy it may not be able to provide employment for them. Other research speculates that the FDI might be a source of corruption, where payments are actually bribes and work conditions in some areas are very poor and the actual wage received is minimal. But many countries have legitimate concerns, history is no shortage of private companies taking advantage of countries, through corruption and dirty policies. Modern day countries have a responsibility to its citizens to ensure that foreign direct investment benefits the country as a whole. For example, China has long has stringent policies forcing companies who want to invest in China do take a minority position and give them the technology in cases.

This paper is guided by three research objectives that differ from other studies. First is that the region studied, Central America, has not been studied in this way recently. Also it is worth noting that Central America, although small relative to several South American nations and its North American counterparts, is still a destination for FDI. This Study will

examine all the Central American countries. The author assumes that the closeness of the central American countries to the US and has motivated companies to operate there. The paper on which my model is from only studies South Africa.

The reason why this study chose Central America for my study is because of a factor of reasons. Firstly, being geographically close to each other, and with the exception of Belize the main language spoken is Spanish (the official language of Belize is English), not that the author has any evidence that language plays an impact on this study but it is evidence to how similar these nations are. Also by choosing these seven countries one can see how FDI impacts these countries individually while hoping one can draw conclusions from my research that could apply to all the central American countries. (these countries are: Belize, Costa Rica, Panama, Nicaragua, Guatemala, Honduras and El Salvador). Mexico and the South American Countries are not included in this study, partly because if one were to include Mexico, which is many times larger than the seven countries combined, possesses a much larger economy, and could skew potential results. The author is also working under the theory that these countries could exhibit club convergence, which is another reason why this paper is placing the nations together instead of separately.

The rest of the paper is organized as follows: Section 2 and 3 gives a brief literature review and further information. Section 4 outlines the empirical model, data and estimation methodology are discussed. Finally, section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.

2.0 TREND

Foreign Direct Investment has been well studied. Foreign direct investment is a major part of what makes globalization work. Allowing companies from one nation to invest in the economy of other nations. Some countries are more closed off than other countries to

outside investment either through sanctions and blockades which is an extreme example. Or by that country's protectionist policies to protect local industry. This goes beyond tariffs and quotas. Overall the openness of the economy to the world is a factor.

Figure 1 shows the population figures of the central American countries as of 2015, these are rough estimates gathered from data from the UN and each country
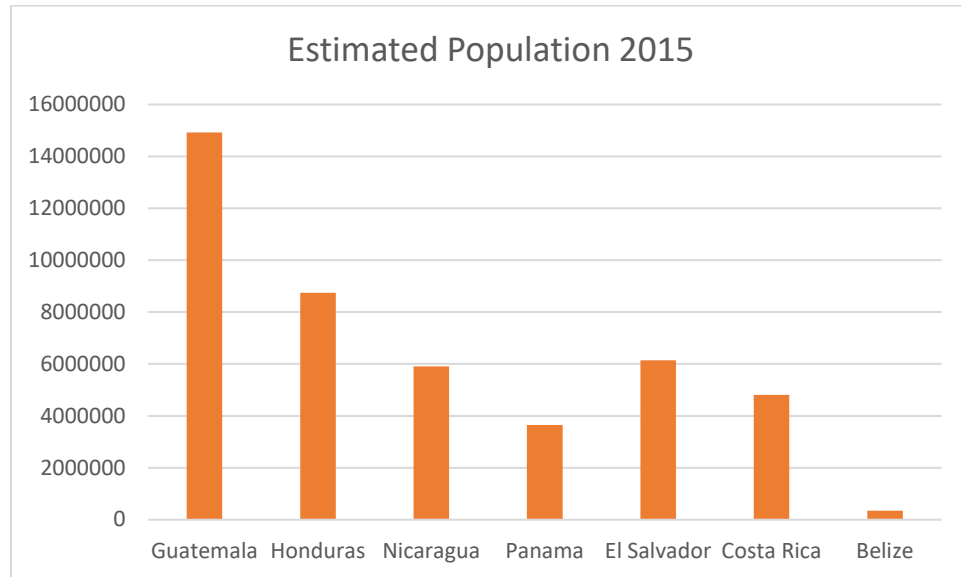
Source: World Population Review

While Guatemala and Belize are the obvious outliers (approximetly 15 million for Guatemala and 350,000 for Belize) the other five nations all have similar populations.
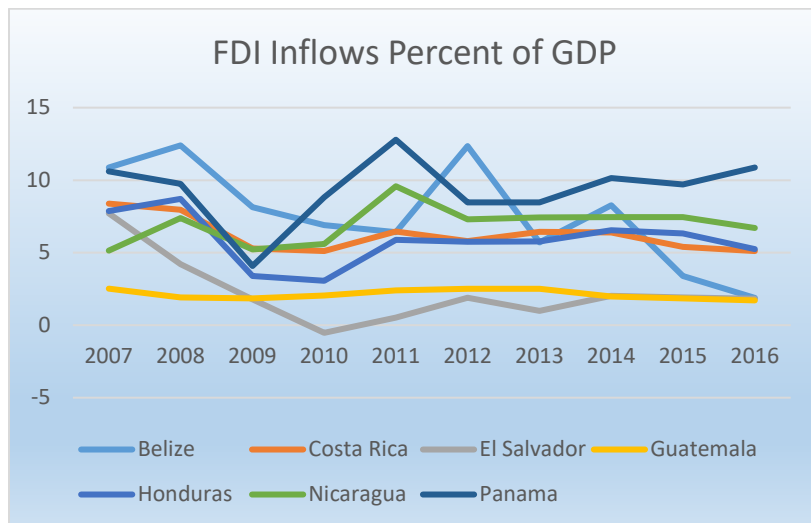
Figure 2

Figure 3

Percent of population with Internet

Figure 4
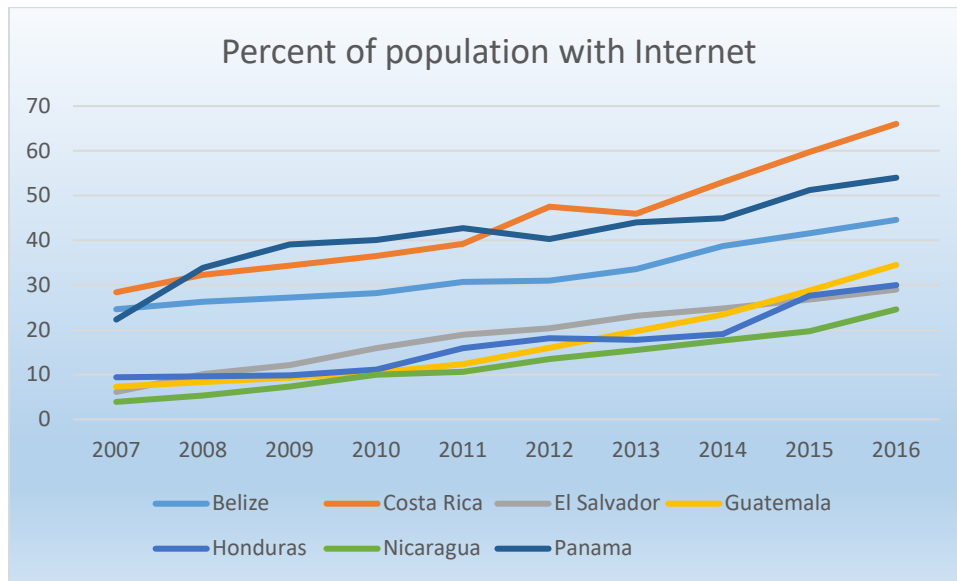
Infant Mortality Rate
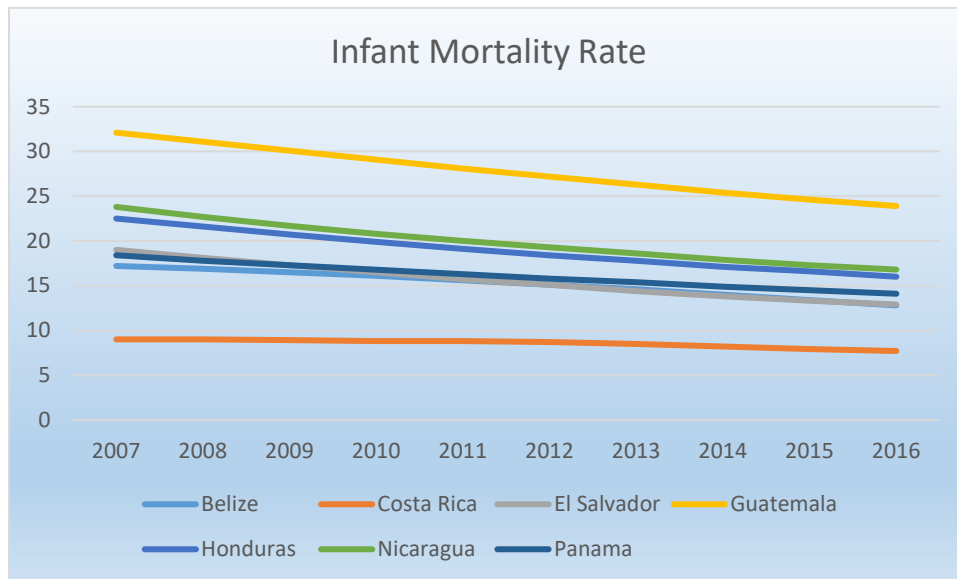
This chart shows the infant mortality rate which is eplained in the later section decribing the variables.

3.0 LITERATURE REVIEW

Foreign direct investment occurs when a company creates or purchases a business in a foreign country, at least ten percent must be owned for the figure to be included in the paper. The primary incentive for doing this is to take advantage of either a part of a production process for example a rubber plantation in Liberia has been joined by a new

tire factory. Another reason why is to take advantage of lower costs in foreign countries, even lower regulation both environmental and workplace. A majority of studies on this subject, linking FDI to poverty reduction, have found that FDI has a positive impact on poverty reduction, these studies use GDP or the Human Development Index as a proxy for poverty. Many studies face the same issue of how to properly define poverty.

There is a rich theoretical literature on the argument that FDI reduces poverty, not that FDI is the solution to poverty. Some focus on the indirect impact of FDI on poverty, through the economic growth channel (Hsiao and Hsiao, 2006). Studies have been done around the world in different time periods, and they differ in their findings. Jalilian and Weiss (2012), found positive impacts in ASEAN countries. conversely three studies on Pakistan are split empirically on the impact of FDI on poverty, two studies concluded that the impact is positive (Zaman et al. 2012; Shamim et al., 2014) while another found that there was a negative relationship (Ali and Nishat 2010). The broadness of these results may lead us to conclude that there are country or region specific variables that impact how FDI is used that would impact the poverty level.

Magombeyi and Odhiambo (2017) found in their study an inconclusive relationship between FDI and Poverty reduction both in the short term and the long term, for household consumption expenditure. But their other variables for openness, education both yielded negative results in the long run. Overall they found a short run worsening in poverty but a long run benefit. Overall their results were inconclusive on the impact of FDI and poverty.

This table, provided by Magombeyi and Odhiambo (2017) show studies and the results either positive, negative or insignificant, this table can be found in Appendix C.

4.0 DATA AND EMPIRICAL METHODOLOGY

4.1 Data

The study uses data collected from 2007 to 2016. Data were obtained from the World Development Indicators database who in turn collect data from the International Monetary Fund, World Bank, World Health Organization and others. Several data points within certain sets were estimated, for example the data for the year 2016 was a three-year average

of the previous three years (2015, 2014, 2013) if there was a sample missing from a year that was not at the end (e.g. 2013) this problem was solved by calculating the average of the year before and the year after to fill in that sample. Most of the data was missing from estimates of the primary school enrolment and internet coverage.

4.2 Empirical Model

Following Magombeyi and Odhiambo (2017), this study has incorperated their model for studying poverty rates in South Africa and applied it to this study with one change, instead of having telecommunications as a variable, replaced it with internet access. This was due to a lack of data for Central American countries.

These models are written as follows:

(1) **Life Expectancy = $\beta + \beta_1$*FDI + β_2Primary_School + β_3Openness + β_4CPI + β_5Internet + ε**

(2) **IMR = $\beta + \beta_1$*FDI + β_2Primary_School + β_3Openness + β_4CPI + β_5Internet + ε**

(3) **Household consumption = $\beta + \beta_1$FDI + β_2Primary_School + β_3Openness + β_4CPI + β_5Internet+ ε**

ε Is the error term β is the constant.

Magombeyi and Odhiambo (2017) used these three measures to study poverty so this study will run a regression on each of these.

Dependent variables:

Infant mortality rate (IMR) is measured as the number of infant deaths per 1,000 live births before the age of one. This statistic relies on strong record keeping. This is a measure of poverty, areas which are impoverished will have lower quality healthcare and medical care, increasing the risk of death and disease. For comparison to the Central American countries average mortality rate is 17.5 the average of the US has an infant

mortality rate of 5.9 (CDC) and the EU has an infant mortality rate of 4 (Index Mundi). An important distinction is that was unable the data did not provide separate urban vs rural infant mortality rates for these countries; this statement is true for all the variables this would be important to distinguish between.

Life Expectancy: Life expectancy is a measure of how long a person is expected to life when they are born in that year. This is not an average life expectancy, and many factors can influence on a macro level the life expectancy of a particular country, civil war, presence of major disease, famine, or even providing clean water for everyone, reducing pollution, improving medical care.

Household consumption is how much (2010 US dollars) an average household spends in a given year; this is not to be confused with their income. Income shows how much they earn in a given year; this shows how much they spend. These purchases are for everything from food and water to consumer items, electricity, and other needs.

Independent variables: in addition to our three measures of poverty, we have several independent variables. In following Magombeyi & Odhiambo (2017) this study has taken into consideration the openness which is defined as the percent of GDP for that year of the imports and exports combined, using percent instead of actual dollar amounts because each is being compared to their own economy also fear the data would become less reliable if done this way. The downside of using openness could be the data quality, imports and exports are the value of the products, not what they actually sold for.

The second variable is FDI, the main focus of this research. Measured as well as a percent of GDP in that year. Defined by the world development indicators as "net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock)

in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP." As quoted above this does go down if a company disinvests (pulls its funding, shuts down or sells back to a company local to that country) these is only one negative number for FDI inflows in this sample. This number does not change if one foreign company sells its investment to another foreign company, even if it was less than what was paid for it initially. As shown by the 10% ownership minimum FDI only has significant investments, with implied partial control over the operations of the firm/industry.

CPI is also an independent variable, short for consumer price index, all values are set where $100=2010, (US Dollars) this also means that for 2010 all seven countries have the same CPI. The price of the "basket of goods" is used in part as a measure of inflation. Notably CPI is a measure of inflation, critics of CPI call the method outdated since the basket of goods needs to be modernized to better measure inflation.

Primary school enrolment is a measure of the percentage of the qualified population that attends primary school, it is well known that an individual with a higher education can open doors not available to those with lower educations as well as earn more income. While this does not show how strong or week the education system is, which would be extremely difficult, even in countries such as the United States, the quality of public education varies tremendously by town, state and region. Also we are considering this variable at a macro level. Future studies could consider variables such as high school (or equivalent) graduation rate, percent with a bachelor's degree, and other education variables.

The last independent variable is Internet, defined as the percentage of the population who have used the internet in a given year. The study replicated, Magombeyi & Odhiambo (2017), had telecommunications as a variable. Described as the portion of the country with access to phone lines. This data is not available for these countries for this time period. After doing research coming to the conclusion that internet access would be a substitute for the purpose of this study. Also none of the Central American countries have any harsh policies regarding internet access, including undue restriction or universal monitoring. This study hypothesizes that internet access might be used more by those not in poverty and they may be the last reached. Although hypothetically internet access does not automatically lead to success or higher income.

A chart of all these variables and their sources are given in appendix A.

5.0 EMPIRICAL RESULTS

Table 1: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
IMR	70	17.45	5.757	7.7	32.1
LE	70	73.77	3.05	69.44	79.61
HC	70	3234.39	1545.82	1273.3	6650.795
FDI	70	5.77	3.18	-0.5283	12.787
Openness	70	96.22	29.63	46.82	157.07
CPI	70	106.166	12.88	77.37	132.82
Internet	70	26.22	14.61	3.9	66.02
PSE	70	96.56	2.58	88.04	99.56

Here we see that they all have 70 observations, a small number of the data points were estimated with the methods described above.
The negative minimum FDI shown above is the only negative number in the dataset, it refers to El Salvador in the year 2010. If one were to look at FDI levels per country over this time period, Panama has the highest average and El Salvador has the lowest. Hypothesize Panama has the highest (relative to GDP) due to its location and the Panama Canal. The negative number means that more investments were taken out of the economy

than entered in during that year. Also for all the countries Primary School enrolment is mostly in the 90s the low variation of these data points may contribute to it being insignificant in the regression analysis.

Table 2: Correlation Matrix

Correlation Matrix	IMR	LE	HC	FDI	Openness	CPI	Internet	PSE
IMR	1							
LE	-0.5603	1						
HC	-0.6613	0.6934	1					
FDI	-0.2839	0.2888	0.1976	1				
Openness	-0.1116	-0.0533	-0.1159	0.6846	1			
CPI	-0.1791	0.2403	0.0322	-0.0431	-0.1433	1		
Internet	-0.7093	0.6133	0.8242	0.2727	0.0934	0.402	1	
PSE	-0.3172	0.1788	0.1278	0.3437	0.3203	-0.3269	0.0471	1

The highest correlation seen here is that between household consumption and internet at .82. It is also worth noting that all the variables are negatively correlated with the Infant Mortality Rate. FDI and openness are also correlated at .68, this is to be expected even though they measure two different things, they are still related to the GDP of that country, also having no other way to measure openness aside from the measure provided. Since none of my variables are too related or have suspiciously high correlations all of these will be using all of them in my regressions.

All the following regressions are done using Stata 15 software.

Table 3: Summary Regression

Summary

Summary	Model 1	Model 2	Model 3
FDI	-.0923 (.2115)	.3456*** (.1247)	85.9012*** (31.71)
CPI	.0072 (.0425)	.0102 (.025)	-48.3361*** (6.36)
Openness	.0163 (.0218)	-.0410*** (.0128)	-20.3589*** (3.2679)
Internet	-.2743*** (.03677)	.1099*** (.0216)	103.0007*** (5.5)

Primary School Enrolement	-.6418*** (.2038)	.2026* (.1201)	8.6568 (30.537)
Constant	84.83*** (21.175)	52.18*** (12.48)	6292.692*(3172.87)
R-Squared	.5875	.4895	.8715
Adjusted R-Squared	.5553	.4496	.8615
Obervations	70	70	70

Note: ***, **, and * denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses

Model 1 shows the impact of the variables on infant mortality rate, model 2 shows the impact on life expectancy and model 3 shows the impact it has on household expenditure.

I was surprised at the results, for infant mortality rate, most of the variables were statistically insignificant. What was discovered was surprising, that internet access and primary school enrolment both had negative effects on infant mortality rate. (In this context IMR negative is good which means the IMR is decreasing in that country). According to my results, when internet access increases by 1% the infant mortality rate decreases by .27, which means approximately 4% increase in internet access would correspond to a decrease of 1 in the IMR. (IMR is measured by number of deaths per 1000 live births before age one). Also primary school enrolment also had a negative result which was surprising. There is no immediate connection to how IMR for that year is connected to the primary school enrolment of the same year. Foreign Direct Investment was insignificant in this example.

For life expectancy at birth this study found many significant results of the independent variables. The only variable that was insignificant was CPI. FDI, Openness, internet access, were all significant at the 1% level. Primary School enrolment was only significant at the 10% level. Here this study found that an increase in the FDI correlated with an increase of .34 years (four months) while increase of 1% internet access corresponded with an increase of .1 years (five weeks) across this study. Openness however had a negative impact on life expectancy. Openness is measured by adding the

value of imports and exports as a percent of GDP. A 1% increase in openness corresponds to a decrease of .04 years (14.6 days). This is barely negative. Primary school enrolment is also positive, an increase of 1% in the primary school enrolment corresponds to a .2 increase in life expectancy. Also it is worth noting that many of the values for primary school enrolment were estimated using averages of the years around it, also this variable was barely significant at the 10% level because of the flaws in data this study is not fully confident that this result is significant. The adjusted R-squared is .449

Household consumption, the final measure of poverty derived from Magombeyi & Odhiambo (2017), is measured slightly differently. This is the average household consumption of each nation in the given year. A 1% increase in FDI (in relation to that country's GDP) correlated with an increase of approximately 85 dollars, which is significant at the 1% level is not a reason for the policy makers of these countries to be jumping with joy but expecting that they would be happy that the FDI is not linked to negative income. Not surprisingly CPI is significantly negative, CPI being a crude measure for inflation, and as their currency becomes worth less the expenditures should go down as either they cannot afford the highly priced products or for other reasons. Openness is also surprisingly negative although there is no reason this study can think of as to why. Money spent is money spent, they do not track if this money is staying in the country or being spent on imported products. Internet is the big star here, Internet had a greater impact on Household Consumption than FDI. A 1% increase of internet is correlated with an increase of over 100 dollars of household consumption. Given the laws of expected returns, the impact will shrink the closer internet coverage increases to 100. The adjusted R-squared value of this regression was the highest at .865, while it is very high, it is not suspiciously high.

Overall on whether FDI decreases poverty based on the three measures that this study derived from Magombeyi & Odhiambo (2017) this study found that it was insignificant for Infant mortality rate, and increased the life expectancy and increased household consumption in Central America. Given that impacts two thirds of the poverty variables positively this study can conclude that FDI inflows do in some way lessen poverty in these countries.

6.0 CONCLUSION

FDI had no effect on infant mortality, confirming the null hypothesis. However, it did have a positive impact on both life expectancy and household consumption significant at the 1% level. Which would conclude that while not all variables were influenced by FDI two of them were. This study concludes say with confidence that life expectancy and household consumption are correlated with FDI, but given these measures of poverty this study cannot speak to the overall conditions have improved.

The author is happily surprised that internet access proved to be a very significant variable in all three regressions in fighting poverty measures, at a 1% level internet access and usage had a negative correlation with infant mortality rate and a positive correlation with household consumption and life expectancy at birth. The author cannot think of a direct connection as to why this would be so strongly positive. It may be highly correlated with another variable not present in this research, or providing alternative incomes online through connections and small enterprise. There is no immediate connection of how internet decreases the infant mortality rate though. One would think the IMR is more impacted by number of hospitals, or doctors. Or the overall health of a nation and its ability to fight disease. But the results advise these countries to expand internet availability and access within their countries. Also the author encourage these leaders to not in any way unduly restrict FDI inflows into their countries. my literature review has shown that in different regions of the world FDI's impact is not the same. This research only speaks to the seven nations in this study and should not be used as justification for the other 190 countries.

The author recognizes that this study may suffer from missing variable bias. This study used less objective measures of poverty in this study, as well as not including variables more indicative of educational success nor did this study do a proper panel data analysis of this. The author feel that this is only rudimentary research on this ever intriguing topic of the relationship between FDI inflows and Poverty reduction.

6.1 Final Remarks and Future research

There may be other ways to define poverty then what this study used which may be more accurate to actual poverty conditions in Central America, in addition using country specific poverty levels or possibly looking into a happiness index as well as looking at

specific types of FDI (e.g. agricultural FDI versus manufacturing FDI versus financial FDI) and their impact on poverty.

Using economic analysis to discover how to best promote policies and actions by governments to reduce poverty and improve the overall welfare of a nation is very important. More important is to find the policies which are increasing poverty rates, and decreasing welfare and alter them or get rid of them. This study has shown that FDI inflows do have a partial positive impact on poverty rates.

Appendix A: Variable Description and Data Source

Acronym	Description	Data source
FDI	Foreign Direct Investment in percentage of GDP	World Development Indicators
IMR	Infant Mortality Rate: deaths per 1000 live births before age 1	World Development Indicators/ UNICEF
CPI	Consumer Price Index (2010=100 USD)	World Development Indicators
LE	Life Expectancy	World Development Indicators/ UN/WHO
HC	Household consumption	IMF
PSE	Primary School enrolment: in percent of school age population	World Development Indicators
Internet	Percent of population with access to internet and used it in certain year	IMF/ International Telecommunications Organization

Appendix B- Variables and Expected Signs

Acronym	Description	Expected Sign
FDI	Foreign Direct Investment in percentage of GDP	Negative
IMR	Infant Mortality Rate: deaths per 1000 live births before age 1	Dependent variable
CPI	Consumer Price Index (2010=100 USD)	Positive
LE	Life Expectancy	Dependent Variable
HC	Household consumption	Dependent Variable
PSE	Primary School enrolment: in percent of school age population	Negative
Internet	Percent of population with access to internet and used it in certain year	No impact
Openness	Adding imports to exports as a percentage of GDP in that year	Negative

Appendix C

Author (s)	Title	Region/Country	Impact
Jalilian and Weiss, 2002	Foreign direct investment and poverty in the ASEAN region	ASEAN	– Positive association between FDI and poverty reduction
Zaman *et al.,* 2012	The relationship between foreign direct investment and pro-poor growth policies in Pakistan	Pakistan	– Positive association between FDI and poverty reduction
Gohou and Soumare, 2012	Does foreign direct investment reduce poverty in Africa and are there any regional differences?	Africa	– Positive association between FDI and poverty reduction in Central and East Africa
Shamim *et al*, 2014	Impact of foreign direct investment on poverty reduction in Pakistan	Pakistan	– Positive association between FDI and poverty reduction
Fowowe and Shuaibu, 2014	Is foreign direct investment good for the poor? New evidence from African countries	Africa	– Positive association between FDI and poverty reduction

Israel, 2014	Impact of foreign direct investment on poverty reduction in Nigeria 1980-2009	Nigeria	– Positive association between FDI and poverty reduction
Soumare, 2015	Does foreign direct investment improve welfare in North Africa countries?	Northern Africa	– Positive association between FDI and poverty reduction
Huang *et al.,* 2010	Inward and outward foreign direct investment and poverty: East Asia and Latin America	East Asia and Latin America	– Negative association between FDI and poverty reduction
Ali and Nishat, 2010	Do foreign inflows benefit Pakistan poor?	Pakistan	– Negative association between FDI and poverty reduction
Tsai and Huang, 2007	Openness, growth and poverty: The case of Taiwan	Taiwan	– Insignificant impact
Gohou and Soumare, 2012	Does foreign direct investment reduce poverty in Africa and are there any regional differences?	Africa	– Insignificant impact in Southern and Northern Africa
Akinmulegun, 2012	The impact of foreign direct investment on poverty reduction in Nigeria	Nigeria	– Insignificant impact

Source: Magombeyi & Odhiambo (2017)

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