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Working Paper No. 16-23

This paper can be found at the College of Business and Economics Working Paper Series homepage:

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Spatial Spillover Effects of Debt Relief from the Heavily Indebted Poor Countries (HIPC) Initiative

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December 20, 2016

Abstract

The impacts of various economic and institutional factors transcend the borders of a nation and flow over to adjacent countries. Past research has found that there are spatial spillovers in economic growth, development of institutions, governance quality and institutional quality. This paper conducts a study on the direct and indirect effects of debt relief from the Heavily Indebted Poor Country (HIPC) Initiative and the Multilateral Debt Relief Initiative (MDRI) programs. The IMF and the World Bank provide debt relief to the member countries that have passed the Decision Point of the HIPC Process. Using the Spatial Durbin Model (SDM) model, this study shows that there are negative spatial spillovers of the impacts of being a HIPC member on neighboring countries.

Keywords: foreign aid, debt relief, HIPC, spatial spillovers, SDM model, SLX model
JEL Classification: F34, F35, C31

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1. Introduction

Every year, international donors provide developing nations with billions of dollars of aid to help them improve their standard of living. According to the Development Assistance Committee (DAC), $127.3 billion of net official development aid (ODA) was disbursed in 2010. Foreign aid can be given as loans, grants, and debt relief. Unfortunately, many countries obtain such a large amount of loans that they are unable to pay them back without borrowing more. Eventually, their outstanding debt balance starts to threaten their economic stability. Krugman (1988) describes this condition as a debt overhang problem. Debt overhang is an important issue because debt-ridden countries will have trouble attracting new investment, and they have to direct scarce resources to repay their oversized debt, which can influence development. Reinhart et al. (2012) identify two channels through which public debt overhang leads to lower growth: lower private investment and a higher risk premium on government debt.

This situation is similar to a corporation taking on so much debt that it becomes impossible to service debt payments, leading to bankruptcy. To help countries in similar situations, the World Bank and the International Monetary Fund (IMF) jointly created a new program called the Heavily Indebted Poor Countries (HIPC) Initiative. The goal of this initiative is to alleviate the debt burden of heavily-indebted countries so that they can accomplish the Millennium Development Goals (MDGs). These goals cover a wide array of well-being measures, such as the eradication of extreme poverty and hunger, and the combat against HIV/AIDS and malaria.[1]

It is of great interest to policy makers to know the effects of the HIPC Initiative on the recipient countries. However, past research shows that spatial correlation should be considered when analyzing the impacts of public policy (Lacombe, 2004; Hall and Ross, 2010; Sobel et al., 2010; Leeson et al., 2012). When the spatial correlation parameters are not zero, then the standard estimation methods such as the least-squares method yield

[1]For more on the Millennium Development Goals, see Kimenyi (2007).

biased and inconsistent estimates. We test our data set and find spatial correlations across countries. We therefore use spatial econometrics to investigate the impact of the HIPC debt relief efforts.

Our paper focuses on the amount of debt relief that each country receives from the HIPC Initiative and investigates whether this amount positively, or negatively, affects the recipient country's GDP per capita, and whether the effect carries over to the surrounding neighbors of the recipient country. We employ the Spatial Durbin Model (SDM) to find the answer. The SDM regression results reveal a correlation between GDP per capita of neighboring countries. Furthermore, there are spillover effects of the HIPC membership on nearby countries. When country i is part of the HIPC Initiative, neighboring country j's GDP per capita suffers.

Using spatial analysis to investigate international spillover effects is a relatively new contribution. Murdoch and Sandler (2002) find long-run and short-run effects of civil wars on income per-capita growth in the host country and its neighbors. They find that there are spillover effects to the neighboring countries. The effects are stronger in the short-run compared to the long-run. Their policy implication is that countries neighboring civil war stricken countries also need foreign assistance. Therefore, a conflict (war) is a channel through which one country's political situation can affect its neighbors' income levels.

Institutional quality represents another channel that affects income levels across countries (North, 1990; Gwartney et al., 1999; Rodrik et al., 2004; Acemoglu and Johnson, 2005; Hall et al., 2010; Young and Sheehan, 2014). Kelejian et al. (2013) use the Spatial Autocorrelation (SAC) model to examine spatial spillovers between countries in the development of institutions. They employ a counter-factual way of looking at the direct and indirect effects of spatial spillovers. The authors conclude that in the long run, governance quality spills outside of a country's borders. A possible policy implication of their paper is to encourage and incentivize institutional development in both aid recipient and neighboring countries. In a related study, Leeson et al. (2012) find spatial spillovers of both economic and political institutions. In addition to institutions, recent research also shows that foreign direct

investment also has spillover effects. For example, Shepotylo (2012) provides evidence that there are spatial links in foreign direct investment (FDI) between a recipient country and its neighbors. The author argues that FDI models are misspecified when they omit spatial effects of FDI flows. The paper uses a Spatial AutoRegressive (SAR) model and finds a stronger evidence of spatial spillovers in disaggregate data.

Our paper contributes to the literature on international development by shedding light on the issue of whether HIPC debt relief brings benefit or harm to recipient countries and their neighbors. Our estimation strategy uses a spatial econometrics model based on a weight matrix that accounts for neighbors in term of geographical location. Our main argument for spatial modeling is that debt relief not only affects the recipient country but also its neighbors. Our results suggest that HIPC membership is negatively associated with member country's economic wellbeing as well as the economic wellbeing of its neighbors.

We proceed as follows. Section 2 introduces the debt relief initiatives by the World Bank and the IMF. Section 3 describes the data and the variables used in this study. Section 4 outlines the model selection procedures. Section 5 summarizes the regression results, and Section 6 concludes the paper.

2. Background on the HIPC Initiative and the MDRI

The Heavily Indebted Poor Countries (HIPC) Initiative is a joint effort program created by the World Bank and the International Monetary Fund (IMF) to help poor nations accomplish the Millennium Development Goals (MDGs). The HIPC Initiative was launched in 1996 and was later enhanced in 1999. The Multilateral Debt Relief Initiative (MDRI) was created in 2006 to supplement HIPC countries with more financial support. The HIPC Initiative calls for voluntary debt relief by creditors. It could serve in a creditor's interest to forgive some debt to get HIPC countries to a more sustainable debt level so that the probability of repayment might increase. Creditors can be commercial, bilateral, such as the Paris club,

and multilateral creditors, such as the World Bank.

The HIPC Initiative process mainly involves two stages: the Decision Point and the Completion Point with the time between these two points referred as the *interim period*. The HIPC Initiative and MDRI provide aid and debt relief to countries that are struggling to service their debt. However, to qualify for aid provided by the HIPC Initiative and MDRI (hereafter both referred as HIPC), candidate countries must satisfy certain criteria. We provide the list of countries that have qualified or potentially eligible for HIPC aid as of December 2011 in Tables 1 and 2. Once candidate countries meet the required conditions, they receive irrevocable aid that arrives in a lump sum payment. The size of the debt relief package ranges from hundreds of millions to several billions of dollars.

3. Data

We use two cross-sectional data sets. The first data set has 63 countries (set A), 36 of which are HIPCs, and 27 of which are the neighbors of HIPCs. The second data set includes 56 countries (set B), which contains all countries in the 63-countries except for the seven island countries. Island countries do not have contiguous neighbors. However, a rational for including the seven island countries is technology. Since island countries have bridges, ferries, cargo ships, and planes that enable them to perform business transactions with foreign countries, they may have spatial relationships with other countries. The regressions performed on set A should be viewed as a robustness check. The estimates of spatial parameters are statistically significant in all models, which helps confirm the robustness of the results.

3.1 Dependent Variable

Both data set, A and B, cover the 1999-2010 time frame. The year 1999 is when the HIPC Initiative was enhanced and when countries started their reform packages to enter the decision point (and thus started receiving interim aid). The dependent variable in our study

is the growth rate of real GDP per capita from 1999 to 2010 (*Growth*). We calculate this variable as the change in the log of the real GDP per capita [log(Ending GDP) - log(Initial GDP)] where *Ending GDP* is the real GDP per capita in 2010, and *Initial GDP* is the real GDP per capita in 1999. The real values use the base year of 2005. Across the countries in our sample, the average initial real GDP per capita is $2,812.42 while the average ending real GDP per capita is $4,211.71. We obtain the necessary data to construct the dependent variable from the World Bank's World Development Indicator database. We provide the variable definitions and the data sources for the all variables used in this study in Table 3.

3.2 Main Explanatory Variables

Our main explanatory variables are the average HIPC debt relief per capita (*HIPCrelief*) over the 1999-2010 period, the dummy variable indicating whether a country belongs to the HIPC Initiative (*Member*), and the duration that a HIPC Initiative member has stayed in the interim period by the end of 2010 (*Months*). For a given country, we calculate the annual HIPC debt relief per capita by dividing the total debt relief in a given year (in millions of US dollars) by the population (in millions) in that year. Since 27 countries in the data set do not receive HIPC debt relief, *HIPCrelief* equals zero for these countries, which rules out the use of logarithmic transformation for this variable. Our anticipation is that *HIPCrelief* will not only impact the recipient country's real GDP per capita but it will also impact the surrounding neighbors' real GDP per capita. Therefore, we include these 27 neighboring countries in our analysis even though they are not recipients of the HIPC debt relief.

Months variable also allows us to measure the effect of being a HIPC member, regardless of the debt relief amount. This variable measures the time, in months, that country i spends in the interim period. We also use *Member* variable to measure the impact of being a member of the HIPC Initiative. This variable takes a '1' if a country is a HIPC member, and a '0' otherwise. We aim to find the impact of being a HIPC member, regardless of the debt relief amount. These two explanatory variables give us the non-monetary component of the

membership to the HIPC Initiative.

3.3 Additional Control Variables

The additional control variables are the rule of law index (*Rule of Law*), the polity score (*Polity*), the conflict indicator (*Conflict*), the inflation rate (*Inflation*), the net official development aid, ODA, per capita amount (*ODA*), the debt burden (*Debt Service*), net inflows of foreign direct investment (*FDI*), the public health expenditure ratio (*Health*), the absolute latitude (*Latitude*), and a dummy variable indicating whether a country is landlocked (*Landlocked*). In our econometric analysis, we use the average values for the time-varying covariates over our sample period (1999-2010).[2]

Rule of Law ranges from -2.5 to 2.5, with 2.5 being the relatively better rule (Kaufmann et al., 2011). This variable serves as a control for government quality. As mentioned in Burnside and Dollar (2000), aid can be ineffective unless the recipient country has well established institutions. *Polity* is the combined polity score from the Polity IV that grades political regimes (Marshall et al., 2016). The combine polity score ranges from -10 to +10, strongly autocratic to strongly democratic, respectively. *Conflict* helps us quantify the presence of wars in a country. If country i has battle related deaths in a year, the dummy variable takes '1', and '0' otherwise. Since we estimate cross sectional regressions, we average this dummy across time for country i. Many poor nations face dictator regimes or genocide or civil war that stripped them the ability to progress. Therefore, it is important to control for the effects of such important events in our regressions.

Inflation is the average annual rate of inflation, calculated from the GDP Deflator, for a given country over the 1999-2010 period. The HIPC Initiative requires that recipient countries improve their macroeconomic stability, and inflation serves as a proxy for macroeconomic stability. A country with unstable inflation rate would harm its citizens by bringing uncertainty into their day to day business transactions, which, ultimately will decrease their

[2]All macroeconomic variables come from the World Bank.

income. We also control for *ODA*, because HIPC debt relief is not the only help that a poor country can receive. Many countries receive net official development aid as well. We further control for the size of the national debt by *Debt Service*, which captures the percentage of total debt service as a percent of GNI.

FDI variable helps us capture inflows of funds and capital from other countries. Often, foreign direct investment is touted as a vehicle to promote productivity and economic growth. *Health* is the ratio of public health expenditures to GDP. Higher health expenditures should improve the life expectancy, indirectly contributing to the GDP per capita. To account for geographic characteristics, we use *Latitude* and *Land Locked*. *Latitude* is the absolute latitude of a country and it takes a value between 0 and 1, with 1 being further away from the equator (La Porta et al., 1999). *Land Locked* controls for access to a port that facilitates trade, taking the value of 1 for landlocked countries and 0 otherwise. Table 4 to Table 7 present the descriptive statistics of all of the variables.

4. Econometric Models

Our goal is to estimate the direct and indirect effects of HIPC membership on real GDP per capita. According to Elhorst (2010), if the OLS model is rejected in favor of Spatial AutoRegressive (SAR) or Spatial Error Model (SEM), then the Spatial Durbin Model (SDM) should be estimated, which takes the following form:

$$\begin{aligned} y_i &= \alpha i_N + \rho \Sigma W_{ij} y_j + X_i \beta + \Sigma W_{ij} X_{ij} \theta + \varepsilon_i \\ \varepsilon_i &\sim MVN(0, \sigma^2 I_n) \end{aligned} \tag{1}$$

If the theta (θ) parameter fails the hypothesis test of θ=0, then SAR should be used. On the other hand, if $\theta + \rho\beta$ =0 then the SEM should be used. We run the Spatial Durbin regression and find that the thetas, (θ), and the rhos, (ρ), are not zero; therefore, we will

use the SDM model. Nevertheless, we also estimate the SLX model as a robustness check:

$$\begin{aligned} y_i &= \alpha i_N + X_i\beta + \Sigma W_{ij}X_{ij}\theta + \varepsilon_i \\ \varepsilon_i &\sim MVN(0, \sigma^2 I_n) \end{aligned} \tag{2}$$

Here n is the number of observations, in this case, it is the number of countries. Y is an n x 1 vector of observations which contains the dependent variable, real GDP per capita. X is an n x k matrix of independent variables. ε is an n x 1 vector of independently and identically distributed disturbance, and β is a k x 1 vector of regression parameters. The W is an n x n, row normalized, four-nearest-neighbors spatial weight matrix. The spatial weight matrix, W, is of geographic location which is exogenous to real GDP per capita. Using a nearest-neighbor spatial weight matrix instead of a contiguity spatial weight matrix helps us deal with island countries. Some countries do not have any connected neighbor. (θ) is a k x 1 vector of response parameter to the interaction effects of WX.

In terms of interpretations, the SLX model's β's represent the direct effect of X while θ's correspond to the indirect (or spillover) effects. Unlike the SLX, the SDM model is a little more complicated because of the ρ term. The ρ is the spatial dependence parameter, and it informs us the feedback effects. Equation 3 expresses the SDM model in reduced form.

$$y_i = (I - \rho W)^{-1}\alpha i_N + (I - \rho W)^{-1}(X\beta + WX\theta) + (I - \rho W)^{-1}\varepsilon_i \tag{3}$$

When we compute $\partial y/\partial X_r$ we get $(I_n - \rho W)^{-1}(\beta_{X_i} + W\theta_{X_i})$. Therefore, β is no longer sufficient to measure the impact of the X variable. To properly interpret the impact of each explanatory variable, we need to look at each variable's direct and indirect effects.

5. Regression Results

The spatial autocorrelation parameters, ρ's are statistically significant in all model variations. The ρ's range from 0.5 to 0.75. This translates to similar GDP per capita from country i and its surrounding neighbors. Even when island countries are included, there are significant spillovers effects of the HIPC member variable. Direct effects measure how a change in the explanatory variable in location i can affect the dependent variable at location i, plus the feedback effects. Indirect effects (θ's) are cumulated over all neighbors of location i to other locations.

For the SDM model, we cannot simply look at the β's and θ's because of feedback effects from the ρ's. Table 12 and Table 13 list the direct, indirect, and total effects for the SDM models for the 64 countries data set and the 57 countries data set, respectively. Direct effects are statistically significant for HIPC debt relief, and the months. Indirect effects are statistically significant for the HIPC *Member* variable. For the SLX model, direct effects are the β's and indirect effects are the θ's.

Out of the three HIPC variables, two of them, *HIPCrelief* and the HIPC program duration, *Months*, have statistically significant direct, and total effects. *HIPCrelief* direct effect is -0.00013, indirect effect is 4e-06, and the total effect is -0.00012. The OLS coefficient for this model specification is -0.00014. Using HIPC debt relief, OLS and SDM results are similar.

When we use the dummy *Member* variable, results are different. Without the spatial model, we will only see that *Member* has no statistical significance from OLS. However, with the Spatial Durbin Model, the indirect effect is statistically significant at -0.15324. This represents the spatial spillover effects of being a HIPC member on neighboring countries. The impact is negative. Hence, having a neighbor that is a HIPC country adversely affects one's GDP.

There are several requirements for HIPC countries to complete before they finish the program. Besides maintaining macroeconomic stability, they also need to increase public

health expenditures, build more schools, and decrease poverty. These attempts should help increase real GDP per capita. Economic reasons behind the negative effects of HIPC variables could be due to the fact that we use averaged data from 1999 to 2010 for all counties. This includes countries that completed the program long before 2010. Therefore, while some countries experienced an increase in real GDP per capita, others may have regressed after they exited the program.

Another surprising result is the statistical insignificance of the variable *Conflict*. According to Murdoch and Sandler (2002), when there is civil war in one country, its neighbors are affected too. Our results for *Conflict* has no spillover effects. We suspect this difference in outcome could be due to our difference in time frames and in econometrics approaches. Their study spans from 1961 to 1990, while our study is from 1999 to 2010. We have no overlap. Also, they test their spillover effects using neighbors that are contiguous, while we use a nearest-neighbor spatial weight matrix.

Overall, there is consistency in the SLX and the SDM models with regards to impacts of belonging to the HIPC Initiative. *HIPCrelief*, the relief per capita amount, has a negative effect on the recipient country, with no spillover. Being a HIPC member does not have a statistically significant direct effect on the member country, but it has a negative spillover effect onto surrounding countries. And, the length of time that a country stays in the HIPC program negatively affects its real GDP per capita. However, *Months* variable has no spillover effects.

6. Conclusion

This paper uses the Spatial Durbin Model to investigate spatial correlations in countries' GDP per capita growth and spillover effects of explanatory variables. We document two key results from the effect of HIPC Initiative debt relief. First, the dependent variable, change in real GDP per capita, is spatially correlated, with ρ values ranging from 0.46 to 0.75. Second,

there are negative spatial spillovers effect of HIPC's membership from country i, onto its neighbor, country j, based on the indirect effect of the explanatory variable, *Member*. While our empirical approach can identify that these spillovers exist, we cannot say for sure if they are the result of the HIPC program or the debt conditions that cause a country to join the HIPC initiative.

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Table 1: Country List 1

	Name	Months	HIPC dummy	HIPC aid (millions)
1	Afghanistan	31	1	$ 1,319
2	Algeria	0	0	$ -
3	Andorra	0	0	$ -
4	Argentina	0	0	$ -
5	Benin	32	1	$ 1,596
6	Bolivia	16	1	$ 4,876
7	Brazil	0	0	$ -
8	Burkina Faso	21	1	$ 2,147
9	Burundi	41	1	$ 1,468
10	Cameroon	66	1	$ 6,202
11	Cape Verde	0	0	$ -
12	Central African Republic	21	1	$ 1,105
13	Chad	117	1	$ 260
14	Chile	0	0	$ -
15	Comoros	7	1	$ 136
16	Congo, Dem Rep	84	1	$ 16,273
17	Congo, Republic of	46	1	$ 1,942
18	Costa Rica	0	0	$ -
19	Cote d'Ivoire	40	1	$ 3,415
20	Dominican Republic	0	0	$ -
21	Egypt	0	0	$ -
22	El Salvador	0	0	$ -
23	Eritrea	0	0	$ -
24	Ethiopia	29	1	$ 6,555
25	Gabon	0	0	$ -
26	Gambia	84	1	$ 495
27	Ghana	29	1	$ 7,368
28	Guatemala	0	0	$ -
29	Guinea	143	1	$ 800
30	Guinea-Bissau	122	1	$ 790
31	Guyana	37	1	$ 2,061
32	Haiti	31	1	$ 1,172
33	Honduras	58	1	$ 3,714
34	Kenya	0	0	$ -
35	Liberia	27	1	$ 4,866

Table 2: Country List 2

	Name	Months	HIPC dummy	HIPC aid (millions)
36	Libya	0	0	$ -
37	Madagascar	47	1	$ 4,293
38	Malawi	69	1	$ 3,205
39	Mali	30	1	$ 2,887
40	Mauritania	28	1	$ 1,983
41	Mauritius	0	0	$ -
42	Mozambique	17	1	$ 6,332
43	Namibia	0	0	$ -
44	Nicaragua	38	1	$ 6,404
45	Niger	41	1	$ 2,252
46	Nigeria	0	0	$ -
47	Pakistan	0	0	$ -
48	Paraguay	0	0	$ -
49	Peru	0	0	$ -
50	Rwanda	53	1	$ 1,827
51	Sao Tome and Principe	76	1	$ 333
52	Senegal	47	1	$ 3,320
53	Sierra Leone	58	1	$ 1,659
54	South Africa	0	0	$ -
55	Sudan	0	0	$ -
56	Suriname	0	0	$ -
57	Tajikistan	0	0	$ -
58	Tanzania	19	1	$ 6,810
59	Togo	25	1	$ 360
60	Turkmanistan	0	0	$ -
61	Uganda	3	1	$ 5,443
62	Venezuela	0	0	$ -
63	Zambia	53	1	$ 6,647
64	Zimbabwe	0	0	$ -

Table 3: Variable Descriptions and Sources

Variable	Description	Source
Dependent Variable		
Growth	log(end real GDP per capita) minus log(initial real GDP per capita)	Authors' calculations from World Bank Group (2012)
Explanatory Variables		
HIPCRelief	Average HIPC interim aid per capita over 1999-2010	Authors' calculations from World Bank (World Bank Group, 2012)) and IMF annual reports (International Development Association and International Monetary Fund, 2011)
Member	Dummy variable: 1 if a country belongs to the HIPC Initiative; 0 otherwise.	Authors' calculations from World Bank and IMF annual reports
Months	Total number of a month that a HIPC Initiative member stayed in the interim period by the end of 2010.	Authors' calculations from IMF annual reports
Rule of Law	"The confidence that agents have confidence in and abide by the rules of society". Averaged over 1999-2010.	Kaufmann et al. (2011)
Polity	Polity IV Score with +10 being more democratic and -10 being autocratic. Averaged over 1999-2010.	Marshall et al. (2016)
Inflation	Growth rate of GDP deflator. Averaged over 1999-2010.	World Bank Group (2012)
Debt Service	Total debt service as a percentage of GNI. Averaged over 1999-2010.	World Bank Group (2012)
Initial GDP	Initial value of real GDP per capita of a country at the beginning of the sample period (i.e., 1999)	World Bank Group (2012)
Ending GDP	Final value of real GDP per capita of a country at the end of the sample period (i.e., 2010)	World Bank Group (2012)
FDI	Net foreign direct investment. Averaged over 1999-2010.	World Bank Group (2012)
Health	Ratio to health expenditures to the gross domestic product. Averaged over 1999-2010.	World Bank Group (2012)
Conflict	Value of 1 if country is in an armed conflict, 0 otherwise. Averaged over 1999-2010.	Pettersson and Wallensteen (2015)
ODA	Official development aid per capita. Averaged over 1999-2010.	World Bank Group (2012)
Latitude	Absolute latitude of a country	La Porta et al. (1999)
Land Locked	Value of 1 if a country is landlocked; 0 otherwise	Authors' calculations

Table 4: Descriptive Statistics - 63 countries

Statistic	N	Mean	St. Dev.	Min	Median	Max
HIPCrelief	63	257.551	488.434	0.000	86.894	2,672.256
Member	63	0.556	0.501	0	1	1
Months	63	26.857	33.475	0	19	143
FDI	63	4.014	4.119	−5.739	2.845	22.140
Inflation	63	10.932	12.657	1.426	8.481	98.294
ODA	63	608.341	660.418	22.967	379.579	3,096.562
Rule of Law	63	−0.730	0.615	−1.828	−0.738	1.269
Polity	63	−1.693	14.685	−65.273	1.000	10.000
Conflict	63	0.413	0.496	0	0	1
Health	63	2.553	1.131	0.004	2.435	5.869
Debt Service	63	3.785	3.391	0.090	3.062	23.175
Land Locked	63	0.286	0.455	0	0	1
Initial GDP	63	2,812.417	3,079.963	211.944	1,311.017	11,747.240
Ending GDP	63	4,211.711	4,404.282	342.704	1,951.369	16,632.850
Latitude	63	0.161	0.107	0.000	0.150	0.444

Table 5: Descriptive Statistics - 56 countries

Statistic	N	Mean	St. Dev.	Min	Median	Max
HIPCrelief	56	242.003	449.765	0.000	74.755	2,672.256
Member	56	0.554	0.502	0	1	1
Months	56	27.339	34.129	0	20	143
FDI	56	3.874	4.024	−5.739	2.790	22.140
Inflation	56	11.210	13.306	2.100	8.351	98.294
ODA	56	652.912	680.928	22.967	382.643	3,096.562
Rule of Law	56	−0.770	0.577	−1.828	−0.765	1.269
Polity	56	−2.216	15.057	−65.273	0.409	10.000
Conflict	56	0.446	0.502	0	0	1
Health	56	2.563	1.164	0.004	2.436	5.869
Debt Service	56	3.935	3.554	0.090	3.131	23.175
Land Locked	56	0.321	0.471	0	0	1
Initial GDP	56	2,805.027	3,109.481	211.944	1,316.978	11,747.240
Ending GDP	56	4,194.789	4,413.557	342.704	1,972.438	16,632.850
Latitude	56	0.161	0.110	0.000	0.148	0.444

Table 6: Correlation Matrix of Main Variables - 63 countries

	HIPCrelief	Months	FDI	Inflation	ODA	Rule of Law	Polity	Health	Debt Service	Real GDP	Nominal GDP	Latitude
HIPCrelief	1	0.340	0.552	0.018	-0.104	-0.059	0.001	0.291	0.274	-0.235	-0.256	-0.309
Months	0.340	1	0.245	0.194	0.014	-0.270	-0.198	-0.113	-0.151	-0.465	-0.485	-0.315
FDI	0.552	0.245	1	0.047	-0.048	-0.039	-0.076	0.078	0.359	-0.164	-0.136	-0.067
Inflation	0.018	0.194	0.047	1	0.246	-0.226	-0.305	-0.034	0.121	-0.052	-0.042	-0.117
ODA	-0.104	0.014	-0.048	0.246	1	-0.219	-0.367	-0.176	-0.292	-0.395	-0.384	-0.008
Rule of Law	-0.059	-0.270	-0.039	-0.226	-0.219	1	0.533	0.548	0.023	0.435	0.447	0.096
Polity	0.001	-0.198	-0.076	-0.305	-0.367	0.533	1	0.384	-0.055	0.265	0.274	0.044
Health	0.291	-0.113	0.078	-0.034	-0.176	0.548	0.384	1	0.111	0.259	0.277	-0.037
Debt Service	0.274	-0.151	0.359	0.121	-0.292	0.023	-0.055	0.111	1	0.366	0.369	0.005
Real GDP	-0.235	-0.465	-0.164	-0.052	-0.395	0.435	0.265	0.259	0.366	1	0.990	0.260
Nominal GDP	-0.256	-0.485	-0.136	-0.042	-0.384	0.447	0.274	0.277	0.369	0.990	1	0.309
Latitude	-0.309	-0.315	-0.067	-0.117	-0.008	0.096	0.044	-0.037	0.005	0.260	0.309	1

Table 7: Correlation Matrix of Main Variables - 56 countries

	HIPCrelief	Months	FDI	Inflation	ODA	Rule of Law	Polity	Health	Debt Service	Real GDP	Nominal GDP	Latitude
HIPCrelief	1	0.276	0.486	-0.013	-0.083	-0.063	0.009	0.260	0.304	-0.225	-0.249	-0.253
Months	0.276	1	0.203	0.175	-0.006	-0.265	-0.181	-0.152	-0.167	-0.458	-0.478	-0.306
FDI	0.486	0.203	1	0.041	-0.016	-0.113	-0.114	-0.004	0.383	-0.156	-0.131	-0.018
Inflation	-0.013	0.175	0.041	1	0.237	-0.213	-0.294	-0.035	0.114	-0.046	-0.035	-0.119
ODA	-0.083	-0.006	-0.016	0.237	1	-0.183	-0.347	-0.178	-0.319	-0.406	-0.393	-0.031
Rule of Law	-0.063	-0.265	-0.113	-0.213	-0.183	1	0.517	0.593	0.027	0.413	0.421	0.080
Polity	0.009	-0.181	-0.114	-0.294	-0.347	0.517	1	0.385	-0.053	0.254	0.259	0.050
Health	0.260	-0.152	-0.004	-0.035	-0.178	0.593	0.385	1	0.099	0.300	0.318	-0.008
Debt Service	0.304	-0.167	0.383	0.114	-0.319	0.027	-0.053	0.099	1	0.373	0.377	0.012
Real GDP	-0.225	-0.458	-0.156	-0.046	-0.406	0.413	0.254	0.300	0.373	1	0.990	0.243
Nominal GDP	-0.249	-0.478	-0.131	-0.035	-0.393	0.421	0.259	0.318	0.377	0.990	1	0.297
Latitude	-0.253	-0.306	-0.018	-0.119	-0.031	0.080	0.050	-0.008	0.012	0.243	0.297	1

Table 8: OLS Regression Results: 63 Countries Data Set

	Dependent variable:		
	log(Ending GDP) - log(Initial GDP)		
	(1)	(2)	(3)
HIPCrelief	−0.0001**		
	(0.0001)		
Member		−0.105	
		(0.065)	
Months			−0.001
			(0.001)
Rule of Law	0.038	0.058	0.063
	(0.050)	(0.050)	(0.051)
Polity	0.002	0.001	0.002
	(0.002)	(0.002)	(0.002)
log(Initial GDP)	−0.016	−0.030	−0.008
	(0.032)	(0.038)	(0.035)
Inflation	0.001	0.001	0.002
	(0.002)	(0.002)	(0.002)
log(ODA)	0.044**	0.047**	0.044*
	(0.022)	(0.022)	(0.023)
FDI	0.025***	0.019***	0.019***
	(0.007)	(0.006)	(0.006)
Debt Service	0.005	0.001	0.002
	(0.008)	(0.008)	(0.008)
Health	0.030	0.018	0.007
	(0.026)	(0.026)	(0.025)
Conflict	0.054	0.057	0.071
	(0.054)	(0.056)	(0.056)
Latitude	0.009	0.040	0.082
	(0.229)	(0.235)	(0.237)
Land Locked	0.122**	0.136**	0.143**
	(0.057)	(0.058)	(0.059)
Constant	0.102	0.280	0.105
	(0.315)	(0.365)	(0.350)
Observations	63	63	63
R^2	0.465	0.437	0.416
Adjusted R^2	0.336	0.301	0.276
Residual Std. Error	0.166	0.170	0.173

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors in parentheses.
Dependent variable: Change in log(real GDP pc)

Table 9: OLS Regression Results: 56 Countries Data Set

	Dependent variable:		
	log(Ending GDP) - log(Initial GDP)		
	(1)	(2)	(3)
HIPCrelief	-0.0002^{**}		
	(0.0001)		
Member		-0.073	
		(0.071)	
Months			-0.001
			(0.001)
Rule of Law	0.011	0.046	0.046
	(0.058)	(0.058)	(0.059)
Polity	0.002	0.001	0.001
	(0.002)	(0.002)	(0.002)
log(Initial GDP)	-0.027	-0.028	-0.015
	(0.035)	(0.041)	(0.038)
Inflation	0.001	0.001	0.002
	(0.002)	(0.002)	(0.002)
log(ODA)	0.055^{**}	0.053^{**}	0.050^{*}
	(0.024)	(0.025)	(0.027)
FDI	0.022^{***}	0.018^{**}	0.016^{**}
	(0.007)	(0.007)	(0.007)
Debt Service	0.007	0.002	0.002
	(0.008)	(0.009)	(0.009)
Health	0.038	0.020	0.012
	(0.028)	(0.028)	(0.027)
Conflict	0.062	0.069	0.079
	(0.056)	(0.059)	(0.058)
Latitude	0.126	0.147	0.181
	(0.233)	(0.248)	(0.247)
Land Locked	0.088	0.114^{*}	0.115^{*}
	(0.060)	(0.062)	(0.063)
Constant	0.084	0.198	0.094
	(0.351)	(0.417)	(0.408)
Observations	56	56	56
R^2	0.481	0.429	0.420
Adjusted R^2	0.337	0.270	0.258
Residual Std. Error	0.165	0.173	0.174

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors in parentheses.
Dependent variable: Change in log(real GDP pc)

Table 10: SLX Regression Results: 63 Countries Data Set

	Dependent variable:		
	log(Ending GDP)-log(Initial GDP)		
	(1)	(2)	(3)
HIPCrelief	−0.0002**		
	(0.0001)		
Member		−0.104	
		(0.069)	
Months			−0.002**
			(0.001)
Rule of Law	−0.002	0.014	0.003
	(0.052)	(0.051)	(0.049)
Polity	0.001	−0.001	0.001
	(0.002)	(0.002)	(0.002)
log(Initial GDP)	−0.004	−0.017	−0.036
	(0.037)	(0.040)	(0.038)
Inflation	−0.0002	−0.0005	0.001
	(0.002)	(0.002)	(0.002)
log(ODA)	0.002	−0.018	−0.027
	(0.028)	(0.028)	(0.026)
FDI	0.015**	0.013*	0.014**
	(0.007)	(0.006)	(0.006)
Debt Service	0.0004	−0.004	−0.006
	(0.008)	(0.008)	(0.008)
Health	0.063**	0.042	0.051*
	(0.029)	(0.028)	(0.026)
Conflict	0.036	0.051	0.049
	(0.055)	(0.055)	(0.052)
Latitude	−0.600	−0.198	−0.167
	(0.485)	(0.465)	(0.448)
Land Locked	0.172***	0.197***	0.195***
	(0.062)	(0.059)	(0.059)
WX.HIPCrelief	−0.0001		
	(0.0002)		
WX.Member		−0.259*	
		(0.140)	
WX.Months			−0.003*
			(0.002)
WX.Rule of Law	−0.188	−0.102	−0.244*
	(0.139)	(0.138)	(0.128)
WX.Polity	−0.003	−0.006	−0.002
	(0.006)	(0.005)	(0.005)
WX.log(Initial GDP)	−0.083	−0.195**	−0.213***
	(0.065)	(0.076)	(0.074)
WX.Inflation	−0.010*	−0.014***	−0.016***
	(0.005)	(0.005)	(0.005)
WX.log(ODA)	−0.165**	−0.233***	−0.245***
	(0.073)	(0.071)	(0.069)
WX.FDI	−0.013	−0.005	−0.002
	(0.016)	(0.016)	(0.016)
WX.Debt Service	−0.005	−0.009	0.011
	(0.022)	(0.020)	(0.021)
WX.Health	−0.005	−0.012	0.017
	(0.052)	(0.051)	(0.047)
WX.Conflict	−0.019	−0.182	0.017
	(0.143)	(0.144)	(0.134)
WX.Latitude	0.517	−0.380	−0.218
	(0.701)	(0.735)	(0.670)
WX.Land Locked	0.171	0.161	0.082
	(0.146)	(0.140)	(0.148)
Constant	1.816**	3.721***	3.700***
	(0.834)	(1.098)	(1.007)
Observations	63	63	63
R^2	0.648	0.660	0.686
Adjusted R^2	0.425	0.445	0.487
Residual Std. Error	0.154	0.152	0.146

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors in parentheses.
Dependent variable: Change in log(real GDP pc)

Table 11: SLX Regression Results: 56 Countries Data Set

	Dependent variable:		
	log(Ending GDP)-log(Initial GDP)		
	(1)	(2)	(3)
HIPCrelief	−0.0002*		
	(0.0001)		
Member		−0.062	
		(0.095)	
Months			−0.002*
			(0.001)
Rule of Law	−0.048	−0.003	−0.016
	(0.066)	(0.068)	(0.067)
Polity	0.002	−0.0001	0.001
	(0.002)	(0.003)	(0.002)
log(Initial GDP)	−0.014	0.001	−0.030
	(0.046)	(0.051)	(0.049)
Inflation	0.0004	0.0003	0.001
	(0.002)	(0.002)	(0.002)
log(ODA)	0.028	−0.010	−0.026
	(0.036)	(0.037)	(0.037)
FDI	0.012	0.008	0.011
	(0.009)	(0.008)	(0.008)
Debt Service	0.006	0.002	−0.002
	(0.010)	(0.009)	(0.009)
Health	0.063*	0.030	0.044
	(0.035)	(0.038)	(0.032)
Conflict	0.040	0.043	0.027
	(0.062)	(0.066)	(0.060)
Latitude	−0.331	−0.180	−0.319
	(0.654)	(0.669)	(0.642)
Land Locked	0.116	0.166**	0.152**
	(0.071)	(0.068)	(0.069)
WX.HIPCrelief	−0.0001		
	(0.0003)		
WX.Member		−0.224	
		(0.173)	
WX.Months			−0.003
			(0.002)
WX.Rule of Law	−0.240	−0.179	−0.289
	(0.186)	(0.194)	(0.176)
WX.Polity	0.003	−0.002	0.002
	(0.006)	(0.006)	(0.006)
WX.log(Initial GDP)	−0.097	−0.194*	−0.233**
	(0.101)	(0.101)	(0.110)
WX.Inflation	−0.004	−0.009	−0.010*
	(0.006)	(0.005)	(0.005)
WX.log(ODA)	−0.099	−0.197*	−0.230**
	(0.100)	(0.100)	(0.106)
WX.FDI	−0.034	−0.013	−0.006
	(0.022)	(0.025)	(0.026)
WX.Debt Service	0.018	−0.008	0.007
	(0.026)	(0.026)	(0.025)
WX.Health	−0.015	−0.044	−0.025
	(0.061)	(0.064)	(0.055)
WX.Conflict	−0.023	−0.290	−0.124
	(0.207)	(0.207)	(0.165)
WX.Latitude	0.440	−0.320	0.007
	(0.937)	(0.992)	(0.901)
WX.Land Locked	0.119	0.206	0.120
	(0.163)	(0.158)	(0.164)
Constant	1.325	3.319*	3.799**
	(1.365)	(1.672)	(1.774)
Observations	56	56	56
R^2	0.635	0.617	0.648
Adjusted R^2	0.352	0.320	0.376
Residual Std. Error	0.163	0.167	0.160

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors in parentheses.
Dependent variable: Change in log(real GDP pc)

Table 12: SDM Impacts - 63 countries

	y = change in log(real GDP pc)								
	direct			indirect			total		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
HIPCrelief	−0.0001**			0.000004			−0.0001*		
	(0.0001)			(0.0001)			(0.0001)		
Member		−0.0670			−0.1533**			−0.2203***	
		(0.0652)			(0.0652)			(0.0652)	
Months			−0.0020**			−0.0013			−0.0033***
			(0.0008)			(0.0008)			(0.0008)
Rule of Law	0.0298	0.0509	0.0417	−0.1394***	−0.0675	−0.1718***	−0.1096**	−0.0166	−0.1301**
	(0.0501)	(0.0500)	(0.0508)	(0.0501)	(0.0500)	(0.0508)	(0.0501)	(0.0500)	(0.0508)
Polity	0.0005	−0.0004	0.0006	−0.0022	−0.0037*	−0.0013	−0.0017	−0.0041**	−0.0008
	(0.0019)	(0.0020)	(0.0020)	(0.0019)	(0.0020)	(0.0020)	(0.0019)	(0.0020)	(0.0020)
log(Initial GDP)	−0.0091	−0.0172	−0.0341	−0.0582*	−0.1213***	−0.1317***	−0.0673**	−0.1385***	−0.1657***
	(0.0325)	(0.0379)	(0.0349)	(0.0325)	(0.0379)	(0.0349)	(0.0325)	(0.0379)	(0.0349)
Inflation	0.0003	0.0006	0.0016	−0.0070***	−0.0081***	−0.0107***	−0.0066***	−0.0075***	−0.0092***
	(0.0018)	(0.0019)	(0.0019)	(0.0018)	(0.0019)	(0.0019)	(0.0018)	(0.0019)	(0.0019)
log(ODA)	0.0083	−0.0046	−0.0116	−0.1027***	−0.1192***	−0.1418***	−0.0944***	−0.1237***	−0.1534***
	(0.0216)	(0.0220)	(0.0228)	(0.0216)	(0.0220)	(0.0228)	(0.0216)	(0.0220)	(0.0228)
FDI	0.0116*	0.0074	0.0095	−0.0100	−0.0021	−0.0017	0.0016	0.0053	0.0077
	(0.0067)	(0.0062)	(0.0063)	(0.0067)	(0.0062)	(0.0063)	(0.0067)	(0.0062)	(0.0063)
Debt Service	0.0026	0.0001	−0.0044	−0.0054	−0.0070	0.0075	−0.0028	−0.0069	0.0031
	(0.0076)	(0.0078)	(0.0081)	(0.0076)	(0.0078)	(0.0081)	(0.0076)	(0.0078)	(0.0081)
Health	0.0605**	0.0414	0.0497*	−0.0156	−0.0171	0.0005	0.0449*	0.0243	0.0502*
	(0.0262)	(0.0258)	(0.0252)	(0.0262)	(0.0258)	(0.0252)	(0.0262)	(0.0258)	(0.0252)
Conflict	0.0373	0.0672	0.0447	0.0233	−0.0759	0.0535	0.0606	−0.0088	0.0982*
	(0.0543)	(0.0559)	(0.0561)	(0.0543)	(0.0559)	(0.0561)	(0.0543)	(0.0559)	(0.0561)
Latitude	0.0092	0.0395	0.0815	0.0092	0.0395	0.0815	0.0092	0.0395	0.0815
	(0.2291)	(0.2349)	(0.2375)	(0.2291)	(0.2349)	(0.2375)	(0.2291)	(0.2349)	(0.2375)
Land Locked	0.1216**	0.1365**	0.1425**	0.1216**	0.1365**	0.1425**	0.1216**	0.1365**	0.1425**
	(0.0573)	(0.0581)	(0.0591)	(0.0573)	(0.0581)	(0.0591)	(0.0573)	(0.0581)	(0.0591)
Constant	0.1024	0.2796	0.1046	0.1024	0.2796	0.1046	0.1024	0.2796	0.1046
	(0.3149)	(0.3652)	(0.3500)	(0.3149)	(0.3652)	(0.3500)	(0.3149)	(0.3652)	(0.3500)
Rho	0.5 **	0.75 ***	0.54 **	0.5 **	0.75 ***	0.54 **	0.5 **	0.75 ***	0.54 **
Observations	63	63	63	63	63	63	63	63	63
R^2	0.4648	0.4367	0.4159	0.4648	0.4367	0.4159	0.4648	0.4367	0.4159
Adjusted R^2	0.3363	0.3015	0.2757	0.3363	0.3015	0.2757	0.3363	0.3015	0.2757

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors in parentheses.

Table 13: SDM Impacts - 56 countries

	y = change in log(real GDP pc)								
	direct			indirect			total		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
HIPCrelief	−0.0002**			−0.00003			−0.0002**		
	(0.0001)			(0.0001)			(0.0001)		
member		−0.0320			−0.1707**			−0.2027***	
		(0.0705)			(0.0705)			(0.0705)	
Months			−0.0020**			−0.0012			−0.0032***
			(0.0009)			(0.0009)			(0.0009)
Rule of Law	−0.0188	0.0391	0.0246	−0.1775***	−0.0985*	−0.1903***	−0.1962***	−0.0594	−0.1658***
	(0.0579)	(0.0584)	(0.0591)	(0.0579)	(0.0584)	(0.0591)	(0.0579)	(0.0584)	(0.0591)
Polity	0.0017	−0.0001	0.0009	0.0016	−0.0015	0.0012	0.0033*	−0.0015	0.0021
	(0.0019)	(0.0021)	(0.0020)	(0.0019)	(0.0021)	(0.0020)	(0.0019)	(0.0021)	(0.0020)
log(Initial GDP)	−0.0136	0.0016	−0.0280	−0.0867**	−0.1504***	−0.1556***	−0.1003***	−0.1488***	−0.1835***
	(0.0346)	(0.0410)	(0.0380)	(0.0346)	(0.0410)	(0.0380)	(0.0346)	(0.0410)	(0.0380)
Inflation	0.0006	0.0009	0.0018	−0.0025	−0.0046**	−0.0060***	−0.0019	−0.0037*	−0.0042**
	(0.0019)	(0.0020)	(0.0019)	(0.0019)	(0.0020)	(0.0019)	(0.0019)	(0.0020)	(0.0019)
log(ODA)	0.0284	0.0020	−0.0084	−0.0763***	−0.1150***	−0.1325***	−0.0479*	−0.1130***	−0.1409***
	(0.0242)	(0.0254)	(0.0266)	(0.0242)	(0.0254)	(0.0266)	(0.0242)	(0.0254)	(0.0266)
FDI	0.0098	0.0052	0.0084	−0.0280***	−0.0087	−0.0073	−0.0183**	−0.0035	0.0011
	(0.0071)	(0.0072)	(0.0071)	(0.0071)	(0.0072)	(0.0071)	(0.0071)	(0.0072)	(0.0071)
Debt Service	0.0061	0.0048	−0.0025	0.0136*	−0.0061	0.0088	0.0197**	−0.0013	0.0063
	(0.0081)	(0.0085)	(0.0087)	(0.0081)	(0.0085)	(0.0087)	(0.0081)	(0.0085)	(0.0087)
Health	0.0613**	0.0335	0.0494*	−0.0120	−0.0279	−0.0197	0.0493*	0.0056	0.0297
	(0.0280)	(0.0280)	(0.0270)	(0.0280)	(0.0280)	(0.0270)	(0.0280)	(0.0280)	(0.0270)
Conflict	0.0473	0.0691	0.0289	0.0092	−0.1429**	−0.0075	0.0565	−0.0738	0.0213
	(0.0557)	(0.0591)	(0.0583)	(0.0557)	(0.0591)	(0.0583)	(0.0557)	(0.0591)	(0.0583)
Latitude	0.1256	0.1472	0.1806	0.1256	0.1472	0.1806	0.1256	0.1472	0.1806
	(0.2329)	(0.2479)	(0.2469)	(0.2329)	(0.2479)	(0.2469)	(0.2329)	(0.2479)	(0.2469)
Land Locked	0.0880	0.1139*	0.1146*	0.0880	0.1139*	0.1146*	0.0880	0.1139*	0.1146*
	(0.0602)	(0.0618)	(0.0628)	(0.0602)	(0.0618)	(0.0628)	(0.0602)	(0.0618)	(0.0628)
Constant	0.0843	0.1980	0.0942	0.0843	0.1980	0.0942	0.0843	0.1980	0.0942
	(0.3507)	(0.4170)	(0.4084)	(0.3507)	(0.4170)	(0.4084)	(0.3507)	(0.4170)	(0.4084)
Rho	0.46 *	0.73 ***	0.6 **	0.46 *	0.73 ***	0.6 **	0.46 *	0.73 ***	0.6 **
Observations	56	56	56	56	56	56	56	56	56
R^2	0.4815	0.4294	0.4198	0.4815	0.4294	0.4198	0.4815	0.4294	0.4198
Adjusted R^2	0.3368	0.2701	0.2579	0.3368	0.2701	0.2579	0.3368	0.2701	0.2579

Note: *p<0.1; **p<0.05; ***p<0.01
Standard errors in parentheses.