

Department of Economics and Finance

Chair: Econometrics II

# **Economic Rents, Institutions and Growth**

International Aid and Natural Resources: a Comparative Analysis

# SUMMARY

SUPERVISOR

Prof. Giuseppe Ragusa

CANDIDATE Mariana Lopes da Fonseca

Student Reg. No. 645351

CO-SUPERVISOR

Prof. Giovanna Vallanti

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#### 1 Introduction

Gross Domestic Product (GDP) varies widely across countries. Actually, the highest GDP per capita value achieved by a country in 2010 is more than 500 times the lowest one.<sup>1</sup> This huge gap poses serious concerns bearing in mind that GDP is often seen as the most representative measure of economic development. Particularly, GDP growth is linked to progress and prosperity, while its decline is connected to stagnation and poverty. The study of the roots of economic growth is therefore of utmost importance, and constitutes a classical area of research in economics.

As a result of years of investigation, nowadays institutions are thought to play a crucial role in determining economic growth. They are believed to influence economic outcomes through the structuring of economic incentives in the society.<sup>2</sup> Hence, several areas in economics are taking a political and institutional approach to economic growth. Among them, the natural resource curse and the aid effectiveness topics that are the focus of this study.

With regards to natural resources, their discovery and exploitation has had perverse effects on economic growth of several countries worldwide over the past decades. These effects were at first explained relying on an economic resource curse, i.e. the Dutch Disease.<sup>3</sup> More recently, albeit not rejecting the Dutch Disease hypothesis, there has been a turn to a political resource curse that is in fact supported by evidence, being the two main findings in the literature that resource rich countries on average do tend to grow slower, but this undesired effect can nevertheless be overcome in a good institutional environment.

The aid effectiveness literature, in turn, provides less homogeneous results. In fact, decades ago international aid programmes started to be carried out, without any convincing empirical or

<sup>&</sup>lt;sup>1</sup> The data on GDP per capita (expressed in current US\$) has been retrieved from the World Bank (WB). The richest country in terms of GDP per capita in 2010 is Luxembourg and the poorest Burundi.

<sup>&</sup>lt;sup>2</sup> See Acemoglu, Johnson and Robinson (2005)

<sup>&</sup>lt;sup>3</sup> The Dutch Disease is a theory that associates negative repercussions to the non-resource sector from a boom in the natural resources sector. It works as follows: a boom in the resource sector leads to the appreciation of the real exchange rate, which in turn causes a loss of competitiveness of the non-resource sector and its shrinkage. This does not simply reflect a shift of a country's comparative advantage due to the fact that the Dutch Disease relies on the assumption that the resource sector lacks the learning-by-doing mechanism existent in the manufacturing sector, resulting no positive externalities therefrom.

theoretical foundation and still nowadays, there is no compelling evidence of their growth enhancing potential or traceable benefits.

Providing either more, or rather less sharp results, the existence of a vast literature on the macroeconomic effects of both economic rents is undeniable. Furthermore, there is the emergence of literature comparing aid rents to natural resource rents. Notwithstanding the important differences between them, natural resource rents and foreign aid share in fact two crucial aspects; they are both fungible and have a windfall character, i.e. provide extra revenues to an economy. In this study it is hypothesized that whatever negative impact these extra revenues have, it is a result of the interaction between the rents and the local institutional arrangements. Specifically this analysis tries to answer two questions, in light of the evidence supporting the natural resource curse: what is the impact of aid on economic growth and whether this impact depends on the institutional environment. Multiple regression (MR), Instrumental Variable (IV) regression, and Fixed Effects (FE) regression models are the empirical methods used for this purpose.

The MR approach, relying on the Ordinary Least Squares (OLS) estimator, provided evidence of a negative impact of both windfalls on economic growth. When assessing to what extent institutional quality influences this result, the average impact of the rents remained negative, however the impact on economic growth of natural resource rents coupled with good institutions is estimated as significantly positive, despite lacking robustness. The IV regression reinforces the results obtained by the OLS estimator in the MR context. Finally using country FE most specifications show a significant positive impact of aid inflows in good institutional environments.

#### 2 Empirical Model

This empirical study attempts to answer two main questions: (1) To what extent is aid comparable to natural resources in terms of its impact on GDP growth?, and more importantly (2) Is the impact of aid on growth conditional on the local institutional arrangements? In other words it is hypothesized

whether aid hinders growth and if this result applies to countries with sound institutions. In order to test this aid-institutions-growth relationship, different procedures are implemented in estimating departures from the following general equation:

$$g_{it} = y_{it}\beta_y + a_{it}\beta_a + nr_{it}\beta_{nr} + iq_{it}\beta_{iq} + a_{it}iq_{it}\beta_1 + nr_{it}iq_{it}\beta_2 + X_{it}\beta_X + \varepsilon_{it}^g$$
(1)

where *i* indexes countries, *t* indexes time,  $g_{it}$  is the annual percentage growth of GDP per capita,  $y_{it}$  is the logarithm of initial GDP per capita,  $a_{it}$  is the percentage of aid receipts to GDP,  $nr_{it}$  is the percentage of natural resource rents to GDP,  $iq_{it}$  is a measure of institutional quality, and  $\varepsilon_{it}^{g}$  is the error term. Both  $a_{it}iq_{it}$  and  $nr_{it}iq_{it}$  are interaction terms, the first between aid receipts and institutional quality and the later between natural resource rents and institutional quality. Finally,  $X_{it}$  is a vector of other exogenous variables that might affect growth, i.e. control variables; it consists of a measure of the level of investment to control for capital formation, a measure of openness of the economy, which is believed to have a positive impact on growth, and an ethnic tensions index as suggested by Easterly and Levine (1997).<sup>4</sup>

While the logarithm of initial GDP per capita is included in order to capture convergence effects, the variables measuring natural resource rents and aid receipts as fractions of GDP are included to assess the impact of both on growth. Furthermore, institutional quality being one of the most important variables in this work is included not only to control for the institutional environment, which might affect growth, but also in the interaction terms allowing to infer upon the predicted conditionality.

Variants of this equation have been estimated previously in the literature, specifically in Burnside and Dollar (2004), where the authors complement their earlier study by reviewing the interaction term used, to incorporate a institutional quality index. Its differentiating feature concerns the link made with the natural resource curse literature, through the inclusion of the terms  $nr_{it}$  and  $nr_{it}iq_{it}$ . MR, FE and IV procedures are used to estimate equation (1). The first relies on the OLS estimator,

<sup>&</sup>lt;sup>4</sup> The variables included in X<sub>it</sub> are found in Sachs and Warner (1995), Burnside and Dollar (2000) or Mehlum Moene and Torvik (2006).

which is used as a general technique for estimating linear regression models, however since the introduction in Boone (1996) of the use of instrumental variables, due to concerns about the possible endogeneity of aid inflows, IV regressions have become a standard procedure. This move towards IV regression, which relies on the Two Stage Least Squares (2SLS) estimator, created the need to estimate a new equation relating aid to variables known as instruments and the exogenous variables included in the equation of interest. The following equation is therefore regressed as a 1<sup>st</sup> stage in the referred procedure:

$$a_{it} = Z_i \gamma_z + y_{it} \gamma_y + n r_{it} \gamma_{nr} + i q_{it} \gamma_{iq} + X_{it} \gamma_X + \varepsilon_{it}^a$$
(2)

where  $Z_i$  is a vector of instrumental variables. The two instruments used in this study are the logarithm of population and the colonial links between donor and recipient countries. While the first was already used as an instrument in Boone (1996), the choice of the second was motivated by the literature concerning the allocation of aid that reports evidence of a trend of aid rents flowing from former colonizers to former colonies (Alesina and Dollar 2000, Dudley and Montmarquette 1976).

Regarding the FE regression model, while time fixed effects are widely used in the aid literature, and are employed in this study in every specification for robustness, country fixed effects are seldom used to assess the impact of aid inflows on GDP growth.<sup>5</sup> Nevertheless, this study implements this procedure given its unique feature of controlling for unobserved variables that are intrinsic to the countries and do not vary over time, hence minimizing omitted variable bias.

Furthermore, it is a common practice to divide the time frame into sub-periods.<sup>6</sup> This is done for mainly three reasons: it increases the size of the sample; it is useful to explore the time dimension in the data; and it eliminates business cycle factors and measurement error. In this study the 22-years time frame is divided into four sub-periods, of 5 years each with the exception of the last period

<sup>&</sup>lt;sup>5</sup> Time fixed effects were used in Boone (1996), Burnside and Dollar (2000, 2004), Collier and Dehn (2001), Easterly Levine and Roodman (2004) among others. Country fixed effects were used in Hansen and Tarp (2001) and Rajan and Subramanian (2008).

<sup>&</sup>lt;sup>6</sup> While Burnside and Dollar (2000) use 4-year periods, Boone (1996) uses both 5-year and decade averaged data and Easterly (2003) uses 8, 12 and 24 year periods.

which averages the last 7 years under analysis, from 2000 to 2006.<sup>7</sup>

### 3 Data: Main Variables Description and Sources<sup>8</sup>

The dependent variable in equation (1) is the WB series entitled GDP per capita growth (annual %) and defined as the annual percentage growth rate of GDP per capita.

Aid is measured as the net disbursements of Official Development Assistance (ODA) available from the Development Assistance Committee (DAC-OECD).<sup>9</sup> It is expressed in current US\$ and defined as flows that are concessional in character and convey a grant element of at least 25%. For the purpose of this work it is divided by the WB series GDP (current US\$).

Following Sachs and Warner (1995), the WB series total resource rents to GDP, defined as the sum of oil, natural gas, coal, mineral, and forest rents, is used as the measure of natural resources.

Regarding institutional quality, two different measures are used to capture this variable throughout the empirical analysis, based on data from the International Country Risk Guide (ICRG-PRS), the most widely used source of information on institutions in the literature.<sup>10</sup> The first, used as the prime measure of institutional quality in this study, consists of an unweighted average of four indices: Law and Order, Investment Profile, Bureaucratic Quality and Corruption.<sup>11</sup> The resulting index is believed to capture the essence of the degree of property rights protection and rule of law prevalence. The second measure is used in order to test for robustness and consists solely of the Law and Order index.<sup>12</sup> The institutional quality variable, which is not provided for several developing countries, is the major source of constraint in terms of data availability.

#### 4 Empirical Results

The evidence presented in this section results from the estimation of the equations described above

<sup>&</sup>lt;sup>7</sup> Initial GDP per capita is not averaged, but measured at the beginning of the period.

<sup>&</sup>lt;sup>8</sup> Descriptions and sources of all variables are available in the Appendix Table A.1.

<sup>&</sup>lt;sup>9</sup> Measure used in Boone (1996), Easterly (2003), Burnside and Dollar (2004).

<sup>&</sup>lt;sup>10</sup>ICRG-PRS constitutes the source of information regarding institutional quality in Sachs and Warner (1995),Burnside and Dollar (2000, 2004), Easterly Ross and Levine (2004), Tavares (2003), Mehlum, Moene and Torvik (2006), among others.

<sup>&</sup>lt;sup>11</sup> The index is based on the analysis of Knack and Keefer (1995).

<sup>&</sup>lt;sup>12</sup> Approach followed in Mehlum, Moene and Torvik (2006).

Table 1 - Descriptive Statistics						
	Average	Std. Dev.	Min	Max		
GDP per capita growth (% annual)	1,42	1,92	-4,28	8,79		
GDP per capita (current US\$)	3318,09	5462,37	169,47	30627,82		
Natural Resource Rents (%GDP)	0,12	0,15	0,00	0,68		
Foreign Aid (%GDP)	0,06	0,08	0,00	0,42		
Institutional Quality Index	3,49	0,78	1,37	5,63		
Investments (%GDP)	0,21	0,06	0,09	0,39		
Openness (%GDP)	0,73	0,44	0,20	3,50		
Ethnic Tensions Index	0,61	0,22	0,09	1,00		

using a panel of 88 countries with data across four five-years periods from 1985 to 2006.

Note: The Institutional Quality Index varies from 0 to 6. The Ethnic Tensions Index varies from 0 to 1.

Descriptive statistics of the main variables across the 22-year timeframe are reported in Table 1. Concerning the economic rents, the average percentage of natural resource rents to GDP is two times the average percentage of foreign aid rents to GDP. Moreover, dependence on natural resource rents appears greater than dependence on foreign aid rents as suggested by the maximum value of the two.

#### 4.1 Multiple Regression Model

To start with, equation (1) is regressed excluding the interaction terms. The results are presented in Appendix Table A.2 and provide evidence of a significant negative impact of natural resources and foreign aid on GDP per capita growth, robust to the inclusion of controls and to some extent to the use of the second measure of institutional quality.

Table 1 presents the results of the OLS estimation of equation (1) including the interaction terms. Albeit the lack of robustness to a different measure of institutional quality in column (5), and the statistical insignificance of the interaction term involving aid receipts, results are in line with the hypothesis previously described; both economic rents present negative coefficients while both interaction terms present positives ones.

Even though it is useful to start with an OLS regression in order to understand the patterns in the data, no major conclusions should be taken from this first method. The consistency of its results depends on key assumptions that do not hold in case of endogeneity or omitted variables, two real

threats in this study. In fact, performing an Omitted Variable Test, results in the rejection, at a 1% significance level, of the hypothesis that there exists no omitted variable.

		- Multiple Ke	gression wou		
Estimation Method			OLS		
	(1)	(2)	(3)	(4)	(5)
Initial GDP pc	-0.547	-0.425*	-0.377*	-0.400*	-0.204
	(0.368)	(0.218)	(0.227)	(0.242)	(0.222)
Natural Resources	-0.633	10.47***	-9.923**	-9.749**	-8.767**
	(8.587)	(3.893)	(3.919)	(3.926)	(4.371)
Aid	-6.766	-5.317**	-5.219**	-5.128**	-3.608
	(12.49)	(2.073)	(2.090)	(2.110)	(2.505)
NR* IQ	0.0150	0.138**	0.132**	0.130**	0.103
	(0.120)	(0.0588)	(0.0595)	(0.0596)	(0.0713)
Aid*IQ	6.117	2.910	3.996	3.499	1.545
	(17.37)	(6.804)	(7.019)	(7.259)	(8.230)
IQ	2.778**	1.274**	1.309**	1.307**	2.233
	(1.178)	(0.595)	(0.604)	(0.606)	(1.441)
Investments		18.13***	18.72***	18.63***	19.09***
		(2.725)	(2.848)	(2.866)	(3.079)
Openness			-0.343	-0.328	-0.306
			(0.428)	(0.427)	(0.406)
Ethnic Tensions				0.0408	-0.00381
				(0.131)	(0.133)
R-squared	0.114	0.311	0.313	0.313	0.300
Observations	326	313	313	313	313

Table 1 Multiple Pegression Model

Note: The dependent variable is GDP per capita growth. IQ stands for Institutional Quality. Variables are described in more detail in the text. In regressions (1), (2), (3) and (4), the IQ variable is the contructed IQ Index. In regression (5) the IQ variable corresponds to a Law and Order Index. All regressions include time dummies and a constant, which coefficients are not reported. Robust standard errors in parentheses. Full sample. \*significant at 10%, \*\*significant at 5%, \*\*\*significant at 1%.

#### 4.2 Instrumental Variable Regression Model

The use of IV regression is the most standard approach in the aid literature to overcome the problems of endogeneity and omitted variable bias not addressed by OLS. It involves the use of instruments, which ideally capture the movements in the aid variable that are uncorrelated to the error term in equation (1), allowing for a consistent estimation of its coefficients. A 2SLS estimation strategy fitting equations (1) and (2) is used for this purpose.

Table 2 presents the IV regression results. Before proceeding to the analysis of the relationship of interest present in the  $2^{nd}$  stage regression results, there is the need to confirm the validity of the instruments, given that unless the two conditions for a valid instrument are fulfilled the resulting estimates are meaningless.

Estimation Method						
Estimation Method	(10)	(11)	(12)	(13)		
Initial GDP nc	-0 750***	-0 748**	-0.808**	-0 542*		
initial GDT pe	(0.266)	(0.298)	(0.333)	(0.307)		
Natural Resources	-10 53***	-10 52***	-10 23***	-10 18**		
Natural Resources	(3.937)	(3.942)	(3.935)	(1 399)		
Aid	-11 46***	-11 46***	-11 <b>2</b> 1***	( <del>1</del> .399)		
Alu	(3.726)	(3.806)	(3.750)	(4.721)		
NP *IO	(3.720)	(3.800) 0 142**	(J.739) 0 130**	(4.721)		
NK IQ	(0.0500)	(0.0605)	(0.0604)	(0.0725)		
1:4*10	(0.0399)	(0.0003)	(0.0004)	(0.0723) <b>5 862</b>		
Alu IQ	(0.506)	(0.052)	(10.52)	(12.26)		
ю	(9.300)	(9.933)	(10.55)	(13.20)		
IQ	(0.610)	(0.622)	(0.627)	(1.590)		
<b>T</b> , ,	(0.019)	(0.023)	(0.027)	(1.369)		
Investments	18.18***	18.19***	17.98***	18.83***		
0	(2.781)	(3.002)	(3.043)	(3.333)		
Openness		-0.00342	0.0386	0.0551		
F4 : T :		(0.451)	(0.456)	(0.446)		
Ethnic Tensions			0.0835	0.0450		
			(0.138)	(0.137)		
R-squared	0.292	0.292	0.292	0.279		
Observations	313	313	313	313		
		1st	Stage			
	(14)	(15)	(16)	(17)		
Initial GDP pc	-0.294***	-0.294***	-0.295***	-0.301***		
	(0.0477)	(0.0478)	(0.0475)	(0.0482)		
Initial GDP pc ^2	0.0162***	0.0162***	0.0162***	0.0168***		
	(0.00313)	(0.00314)	(0.00312)	(0.00318)		
Population	-0.0264***	-0.0263***	-0.0262***	-0.0257***		
	(0.00284)	(0.00347)	(0.00356)	(0.00343)		
Colonies	-0.0340***	-0.0341***	-0.0336***	-0.0314***		
	(0.00861)	(0.00812)	(0.00871)	(0.00820)		
Natural Resources	-0.0496***	-0.0498***	-0.0487***	-0.0516***		
	(0.0187)	(0.0181)	(0.0187)	(0.0181)		
IQ	0.00645	0.00640	0.00599	-0.0158		
	(0.00833)	(0.00833)	(0.00807)	(0.0215)		
Investmets	0.136**	0.135*	0.134	0.143*		
	(0.0665)	(0.0803)	(0.0811)	(0.0830)		
Openness		0.000654	0.000791	0.00236		
		(0.0103)	(0.0104)	(0.0102)		
Ethnic Tensions			0.000767	0.00195		
			(0.00234)	(0.00228)		
R-squared	0.679	0.679	0.679	0.679		
Observations	317	317	317	317		
	Relevance of	the instruments te	st			
F(2)	43 78	28.95	27.01	28 30		
· (~,·)	Overida	ntification test	27.01	20.30		
$v^{2}(1)$	2 51800	2 72585	2 01601	2 22716		
χ (1)	2.31009	2.12303	2.01001	2.33/40		
	(p = 0.1125)	(p – 0.0987)	(p – 0.1556)	(p – 0.1203)		

Table 2 – Instrumental Variables Regression

 $(p = 0.1123) \quad (p = 0.0987) \quad (p = 0.1556) \quad (p = 0.1263)$ Notes: The dependent variable is GDP per capita growth in columns (10), (11), (12), (13), and Aid in columns (14), (15), (16) and (17). IQ stands for Institutional Quality. Variables are described in more detail in the text. The variables Colonies and Population are used as instruments for 2SLS. In columns (13) and (17) the measure of IQ is the Law and Order index. All regressions include time dummies and a constant, which coefficients are not reported. Robust standard errors in parentheses. Full sample. \*significant at 10%, \*\*significant at 5%, \*\*\*significant at 1%.

The relevance of the instrumental variables is confirmed through the performance of a F-statistic testing the hypothesis that the coefficients of the instruments in the 1<sup>st</sup> stage regression are zero,

which provides a result well above 10, the standard rule of thumb approach. Furthermore, given that this study relies on two instruments and there is only one endogenous regressor, it is possible to perform an overidentification test and assess whether the instruments are exogenous. In fact there is a non-rejection of the null hypothesis that the instruments are exogenous at 5% significance level, which fulfils the remaining condition confirming the validity of the instruments.

Focusing on the results from the 2<sup>nd</sup> stage regression, there is evidence of a natural resource curse as documented in Mehlum, Moene and Torvik (2006), robust to the inclusion of all controls and the use of the second measure of institutional quality. Furthermore, the interaction term involving aid has a positive coefficient as in Burnside and Dollar (2004) but it is not significant as in Rajan and Subramanian (2008). The unconditional impact of aid rents is negative, significant and robust. The growth deterrent character of aid rents has been documented previously though as non-robust (Brumm 2003, Easterly 2003, Easterly, Levine and Roodman 2004, Rajan and Subramanian 2008). Contrary to what is documented in Collier (2006) this study is not able to robustly qualify aid rents as superior to natural resource rents, nor to provide compelling evidence of a growth enhancing potential of aid, conditional on institutional quality as suggested in Burnside and Dollar (2004).

#### 4.3 Fixed Effects Regression Model

A way of controlling for omitted variables is the use of FE regression, the main tool of regression analysis of panel data. As described data have been divided into sub-periods resulting in four observations per country, however to maximize the advantages of this method the whole panel data including every year from 1985 to 2006 is also used in estimating equation (1).

The FE regression estimates in Table 3 show interesting results in what concerns the impact of aid rents on GDP growth. Both the averaged data (AVD) and the full panel data (PD) provide evidence of a positive impact of aid rents on growth when coupled with good institutions, at 1% level of significance and robust across all specifications. Moreover, while the AVD does not show a direct

significant impact of aid on GDP growth, this impact is negative with a 5% significance level in the PD. The use of the second measure of IQ across all specifications does not significantly alter the results.

Table 5 – Fixed Effects Regression								
	(6) (7)		(7)	(8)		(9)		
	AVD	PD	AVD	PD	AVD	PD	AVD	PD
Initial GDP pc	-0.570		0.965		0.960		0.960	
	(1.978)		(0.704)		(0.714)		(0.716)	
NR	-28.22	-9.202	2.187	0.970	2.500	0.791	2.647	0.484
	(22.53)	(6.278)	(7.506)	(5.164)	(7.664)	(5.356)	(8.150)	(5.492)
Aid	-2.002	-14.99***	-6.833	-9.223**	-6.828	-9.156**	-6.761	-9.393**
	(17.89)	(5.524)	(5.450)	(4.599)	(5.447)	(4.636)	(5.548)	(4.668)
NR*IQ	0.416*	2.281	0.143	1.488	0.141	1.562	0.139	1.656
	(0.250)	(1.562)	(0.129)	(1.463)	(0.129)	(1.468)	(0.136)	(1.504)
Aid*IQ	36.88	6.969***	37.95***	5.477***	38.45***	5.437***	38.37***	5.495***
	(22.63)	(1.840)	(12.40)	(1.650)	(12.68)	(1.651)	(12.72)	(1.664)
IQ	1.985**	2.291	1.109*	0.288	1.100*	0.298	1.089*	0.568
	(0.928)	(2.183)	(0.624)	(1.726)	(0.620)	(1.724)	(0.614)	(1.620)
Investments			16.30***	17.55***	16.64***	17.61***	16.64***	17.57***
			(3.807)	(2.641)	(3.921)	(2.837)	(3.928)	(2.853)
Openness					-0.383	0.0865	-0.387	0.0929
					(1.457)	(1.013)	(1.482)	(1.014)
Ethnic Tensions							0.0255	-0.108
_							(0.259)	(0.198)
R-squared	0.150	0.091	0.308	0.130	0.308	0.131	0.308	0.131
N countries	87	88	84	85	84	85	84	85
								X 0 1 0

Table 3 – Fixed Effects Regression

Note: AVD stands for Averaged Data. PD Stands for Full Panel Data. The dependent variable is GDP per capita growth. IQ stands for Institutional Quality. Variables are described in more detail in the text. All regressions include time dummies and a constant, which coefficients are not reported. Robust standard errors in parentheses. Full sample. \*significant at 10%, \*\*significant at 5%, \*\*\*significant at 1%.

In comparison with other studies that have also employed country fixed effect, the results hereby presented, unlike the ones exposed in Hansen and Tarp (2001) where aid rents are reported to increase the GDP growth rate in any event, i.e. given good or bad institutions, are less encouraging with respect to aid effectiveness given the underlying conditionality.

Nevertheless, in Rajan and Subramanian (Rajan and Subramanian 2008), the robustness of the unconditional growth enhancing impact of aid rents had been already tested and rejected in a panel context. The results in the referred study are reported as lacking robustness concerning both the impact of aid rents on GDP growth, as well as this impact conditional on policy.

#### 5 Discussion

Given the challenges intrinsic to working with observational data, different regression models were

addressed to tackle the threats to the validity of the results provided by simple MR using the OLS estimator. Both, the IV regression model and the FE regression model, were used, approaches that find their motivation in the vast literature on aid effectiveness.

While the IV regression model was used in order to overcome the endogeneity problem that is thought to exist regarding the variable measuring aid rents, the FE regression model was employed in order to minimize the omitted variable bias through controlling for variable that are constant over time but change across countries, as well as variables that are constant across countries but vary over time.

Throughout the empirical research all specifications use the full sample, given that excluding outliers does not significantly change the results, and robust standard errors (clustered standard errors in case of the FE regression model).

Nevertheless, results regarding the aid-institutions-growth relation remain unclear. Even though the OLS and 2SLS results similar results, providing evidence of an adverse effect of aid rents on GDP growth and no significance of the interaction term between aid and institutions, the results of the FE regression model are in some aspects not in line with the ones just described.

Using averaged data as well as the full panel data results in compelling evidence of the beneficial effect of aid rents on GDP growth in a high institutional quality context. However, only the employment of the full panel data provides evidence of a deterrent character of foreign aid on GDP growth given poor local institutional arrangements.

It is not the first study encountering evidence of a negative impact of aid rents on economic growth; nonetheless this result has always been reported as a non-robust finding.

Far from trying to prove that aid is ineffective, this study, like many others, attempts to understand the dynamics that lie behind the relation between aid and growth, in this case through an institutional channel. Further empirical as well as theoretical insights are needed if cross-country studies are to be employed for policy purposes.

#### 6 Conclusion

In this study aid effectiveness was analysed in light of the documented results on the impact of natural resource rents on GDP growth. The aim was to assess to what extent both revenues are comparable. To this end two questions were addressed, namely what is the impact of aid on GDP growth and if this impact is linked with the local institutional environment.

Using the standard measures of aid, natural resources, institutional quality and growth, and relying on controls previously used in the literature, the results were not encouraging with respect to foreign aid inflows. While the results regarding the impact of natural resource rents were consistent with previous literature, reinforcing the acknowledged conditionality on institutions, aid inflows' positive impact on growth in a good institutional environment was left to prove given the lack of robustness of the results.

Once again the aid-growth relationship has been revisited, both in cross-country and panel contexts, without providing any conclusive results. Further research should aim at going beyond cross-country analysis, and uncover what lies behind the impact of aid on economic growth. Analysing through what channels aid may be either promoting or hindering growth and understanding the different successful or rather unsuccessful experiences is imperative in order to promote aid effectiveness. Also, to bear in mind that every case is unique is very important in a developing world that comprises a vast and dissimilar amount of countries.

Aid by itself appears to lack the capability of financing growth; therefore the lasting focus on the magnitude of the transfers should not distract aid agencies from their primary objective of reaching the most in need and provide means for the improvement of life standards. Careful evaluation of on-going and complete projects, as well as population involvement can only benefit both sides of the donor-recipient relationship and should consist of a standard procedure.

## Appendices

Variable	Description	Source
GDP per capita growth	Annual growth rate of GDP per capita	WB
Initial GDP per capita	Logarithm of GDP per capita (current US\$) measured at the beggining of each period	WB
Natural Resource Rents	Total natural resource rents as % GDP	WB
Foreign Aid	Net disenbursements of ODA (current US\$) as % GDP	DAC-OECD; WB
Intitutional Quality Index	Unweighted average of the indices: Law and Order, Corruption, Investment Profile and Bureaucratic Quality	ICRG-PRS
Investments	Gross capital formation as % GDP	WB
Openness	Sum of exports and imports of goods and services as % GDP	WB
Ethnic Tensions	Ethnic Tensions Index	ICRG-PRS
Colonies	Dummy variable equal to one if the country is a former colony of France, UK or Belgium	CIA
Population	Logarithm of total population	WB

Table A.1 – Data Description and Sources

Note: WB refers to the World Bank Data Catalog. DAC-OECD, in turn, refers to the Development Assistance Committee of the Organization for the Economic Co-operation and Development. The ICRG-PRS is the International Country Risk Guide from the Political Risk Services Group. Finally the CIA is the Central Intelligence Agency World Fact Book.

Estimation Method	OLS					
	(1)	(2)	(3)	(4)	(5)	
Initial GDP per capita	-0.369*	-0.206	-0.323	-0.372*	-0.153	
	(0.204)	(0.166)	(0.209)	(0.214)	(0.191)	
Natural Resources	-3.280**	-3.568**	-3.024*	-2.873*	-3.336**	
	(1.613)	(1.526)	(1.602)	(1.592)	(1.504)	
Aid	-4.217**	-3.272*	-3.664*	-3.841*	-2.683	
	(1.976)	(1.966)	(2.084)	(2.076)	(2.096)	
Institutional Quality	1.595***	3.217***	1.643***	1.609***	3.340***	
	(0.542)	(0.934)	(0.554)	(0.557)	(0.972)	
Investments	17.60***	17.99***	18.31***	18.15***	18.72***	
	(2.724)	(2.774)	(2.870)	(2.869)	(2.919)	
Openness			-0.415	-0.386	-0.410	
			(0.416)	(0.412)	(0.388)	
Ethnic Tensions				0.0963	-0.00782	
				(0.126)	(0.131)	
R-squared	0.292	0.297	0.299	0.300	0.294	
Observations	313	313	313	313	313	

Table A.2 – Multiple Regression Model

Note: The dependent variable is GDP per capita growth. IQ stands for Institutional Quality. Variables are described in more detail in the text. In regressions (2) and (5) the IQ variable corresponds to the Law and Order Index from Political Risk Services. Further details on the IQ variables are presented in the text. All regressions include time dummies and a constant, which coefficients are not reported. Robust standard erros in parentheses. Full sample. \*significant at 10%, \*\*significant at 5%, \*\*\*significant at 1%.

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