Good Governance and the Millennium Development Goals,

the Case of Water & Sanitation

Anna Wikman Widiyanto

Supervisor: Therese Nilsson

NEKH01, Economics: Bachelor´s Essay, 15 credits

School of Economics and Management,

Lund University

Date: 5 April 2018

ABSTRACT:

When adopting the eight Millennium Development Goals (MDGs), in 2000, the United Nations General Assembly recognised the importance of good governance in reaching them. This study examines the hypothesis that good governance has an impact on the achievement of the MDGs. It does so by conducting regression analysis on the impact of good governance on the MDG indicators for water and sanitation. The analysis uses data for 162 countries over the period from 2000 to 2015, the year when the MDGs were established to the year they were expected to be achieved. The Worldwide Governance Indicator for government effectiveness is used as a proxy for good governance. As such, the study will also be indicative of the role of good governance for achievement of the new internationally set agenda, the Sustainable Development Goals (SDGs) and SDG 6 on water and sanitation. The findings indicate that good governance is positively correlated with access to improved drinking water, but not for sanitation. Also, for the rate of progress for improving water in low and middle-income countries, measured over the MDG timeframe, no clear correlation can be viewed, either when analysing correlation with the average level of government effectiveness and with the rate of progress of improving government effectiveness.

Key words: good governance, water and sanitation, MDGs, SDGs.

Contents

1. Introduction

The Millennium Development Goals (MDGs), adopted by the United Nations General Assembly in the year 2000, consist of eight international development goals on poverty, illiteracy, basic services and more. As such, it was recognised that the achievement of the goals depended on good governance (United Nations General Assembly, 2000). This study examines the hypothesis that good governance has an impact on the achievement of the MDGs. It does so by conducting regression analysis on the impact of good governance on the MDG indicators for water and sanitation.

In 2015, the new global commitment of the Sustainable Development Goals (SDGs) was adopted, now set to being achieved in 2030. The new goals focused even further on sustainability and institutional quality, with goal 16 being solely focused on building peace and inclusive institutions (United Nations, 2016). This indicates that the discussion on the role of good governance for sustainable development will continue being important.

Theoretically, there exist solid foundations for claiming that good governance is important for the achievement of MDG 7C on water and sanitation, as capable governments are able to provide basic services to their citizens. However, empirically studies have shown mixed results, where some studies suggest that there is not enough evidence to prove a causal relationship running from good governance to the achievement of the MDGs and more specifically to the indicators for water and sanitation.

The empirical results in this study are mixed when it comes to proving a correlation between good governance and improved water and sanitation. The findings indicate that there exists a positive correlation between good governance and improved drinking water. However, the results regarding the impact of good governance on improved sanitation are inconclusive. Although some studies look at good governance and other MDGs (see for instance Kwon & Kim (2014) on goal 1 and Ortega, Sanjuán & Casquero (2017) on Goal 4), further studies are needed to understand the

impact of good governance for the achievement of the MDGs and its perceived role for the more recently adopted SDGs.

The essay is structured as follows; Chapter two reviews previous literature and looks at the theoretical logic of a causal relationship as well as develops the hypotheses. Chapter three describes the data and the method used to test the hypotheses. Chapter four presents the results, and chapter five discusses the results and present some final conclusions.

2. Theory and Previous Literature

2.1 Previous literature

Since the adoption of the MDGs, many have explored the relationship between good governance and various parts of sustainability and human development. For instance, empirical studies have explored the relationship between good governance and sustainable social development and economic development (Acemoglu, 2008; Bhattacharya et. al. 2017; Charron et. al., 2010; Kurtz & Schrank, 2007). Others have looked at good governance relationship to sustainable human development and poverty reduction (Davis, 2017: Kwon & Kim, 2014), or the relationship between good governance and sustainable management of the environment (Bernauer & Koubi, 2009; Welsch, 2004: Morse, 2006).

There has also been an interest in the relationship between good governance and the provision of basic services, such as water and sanitation. Some studies indicate that a lack of good governance will lead to under provision of these services (Bernauer & Koubi, 2009; Charron et. al., 2010). Ortega, Sanjuán & Casquero (2017) concluded that government effectiveness, together with income distribution, correlates with the ability to deliver health outcomes. Others (Morse, 2006; Kwon & Kim, 2014) remained critical towards good governance ability to impact the progress towards the MDGs, and now the SDGs, rather, suggested that more direct interventions are needed.

Empirical evidence of a correlation between good governance and the MDG 7C on water and sanitation are also mixed. Dondeynaz, Moreno and Lorente (2012) explored the key variables that influence developing countries' level of water and sanitation. While good governance indicators still had a high correlation, the study did not find it to be the most significant in explaining access to water and sanitation. Also, studies by Wolf (2007) and Ndikumana and Pickbourn (2017) showed little, or mixed, correlation between good governance and access to water and sanitation. Nevertheless, these three studies looked at Sub-Saharan countries or developing countries only and used indicators on the percentage of the population with access to these services. Progress reports show that while many countries in Sub-Saharan Africa and South East Asia have managed

to quickly progress in their water and sanitation provision, the results on percentage of the population with access is still low, specifically when it comes to sanitation (United Nations, 2015; Easterly, 2009).

In contrast, Munamati, Nhapi and Misi (2016) looks at the rate of progress in improving sanitation over the implementation period of the MDGs. Their cluster analysis shows that countries that improved their sanitation, over the period 2000 to 2015, were characterized by political stability, along with the highest income level and population densities.

Table 1 below summarises the studies reviewed on the relationship between good governance and water and sanitation.

Table 1 – Studies of the relationship between good governance and water and/or sanitation

Study	Measure of water and sanitation	Measure of good governance	Data	Results
Ndikumana and Pickbourn, 2017	Share of rural population's access (water and sanitation respectively); Ratio of urban access to rural access (water and sanitation respectively)	Government stability index (International Country Risk Guide)	Panel data: 29 Sub-Saharan Countries, 1990 - 2010	Study focus on impact of aid on access to water and sanitation and looks at the urban and rural disparities. Government stability, included as a control variable, presents mixed results on its correlation with water and with sanitation.
Munamati, Nhapi and Misi, 2016	The proportion of the 2015 population that gained access to sanitation since 2000	Political stability (World Bank)	46 Sub-Saharan countries, average over 2000 to 2015	Looks at what determinants best describe countries sanitation success. Cluster analysis showed that countries that improved their sanitation were characterized by the highest income level, population densities and political stability.
Dondeynaz, Moreno and Lorente, 2012	Access to improved water source; Access to improved Sanitation (WatSan4Dev database)	Worldwide Governance Indicators: voice and accountability, political stability and absence of violence and government effectiveness (WatSan4Dev database)	101 developing countries for 2004	Multi-variate analysis and does not focus on good governance. However, estimations show that government effectiveness is correlated mainly with GDP per capita (0.724 correlation), water supply access (0.647 correlation), basic sanitation access (0.559 correlation) and gross school enrolment (0.518 correlation).
Wolf, 2007	Access to water; Access to sanitation	Press freedom X corruption index; Control over corruption index; Control over corruption X aid for water (Ln)	Sub-Saharan countries for 2002	Focus on impact of aid on the effectiveness of the service delivery of water and sanitation. Results show it is at best limited. The effect of governance on access to water and sanitation is also limited. Press freedom has a positive coefficient, although it is only significant for access to water.

2.2. Theoretical logic of a causal relationship

This section analyses the theoretical claims, and its empirical implications, underpinning the hypothesis that good governance positively impacts the provision of improved drinking water and sanitation.

As was shown above, previous literature presents mixed results, some studies suggested that there is not enough evidence to prove a causal relationship running from good governance to the achievement of the MDGs and more specifically to the indicators for water and sanitation. One of the reasons for these mixed results is the different definitions used for good governance. Good governance is an ambiguous term, and its numerous aspects need to be considered when analysing its effects on the provision of water and sanitation.

Theories suggest that democratically elected governments have more pressure to make sure their voters have access to the basic services they need. Sen (2001) for example, in his seminal work on famines, suggests that no famine has taken place in a country with a democratically elected government, as elections provide a safeguard for governments failing to guarantee the minimum wellbeing for their citizens. Consequently, there are theoretical grounds for assuming causality running from democracy and good governance to the provision of improved drinking water and sanitation.

A quite common way of theorising good governance in empirical studies is by looking at the level of corruption (see for instance Wolf, 2007; Morse, 2006; Welsch; 2004). Corruption, it is argued, stands in the way of managing resources effectively, and might lead to the misuse of scarce resources, such as water. In addition, democratic institutions lacking in integrity weakens their credibility and accountability (United Nations, 1997).

Another aspect of good governance is government stability or political stability (Ndikumana and Pickbourn, 2017; Munamati, Nhapi and Misi, 2016). Political stability is an indicator pointing toward the risk of a government becoming destabilized or failing. In line with the argument for

corruption, without a functioning government public services will most likely not improve. Rothstein (2005) debates that civil war breaks out, to a larger extent, as a consequence of incapable governments rather than due to religious or ethnical reasons.

Another theoretical strand suggests that causality, running from good governance to improved service provision, is not because of elections, but rather the effectiveness of governments. Capable governments can be defined by their ability to provide basic services to their citizens. Charron et. al. (2010), argue that differences exists between being legitimate and democratic and a state's capacity to implement the change needed. Rothstein (2013;13) also calls for a shift away from focusing on *"how the access to power is organized"* towards *"how power is exercised"*.

Consequently, there are numerous variables available as proxies for good governance, with diverse characteristics. Some examples are, Worldwide Governance Indicators six dimensions (Kaufmann, Kraay and Mastruzzi, 2011), Age of democracy (Sjöstedt and Jagers, 2014), Index of State Weakness in the Developing World (Rice and Patrick, 2008) and Corruption Perception Index (Transparency International, 2017).

Ottervik (2013) argues that the link between the concept and the indicators chosen is not always sufficiently analysed, to make sure we are measuring what we seek to measure. The theoretical and empirical argument followed above indicates looking at good governance through the ability of the state might give a good indication of good governance relationship to progress in water and sanitation. One indicator for this is the Worldwide Governance Indicator for government effectiveness.

Of the previous literature reviewed, only Dondeynaz, Moreno and Lorente (2012) looked at the MDG indicators on water and sanitation in relation to the ability of the state, using the Worldwide Governance Indicator for government effectiveness. Notably, the study concluded that, although other indicators were deemed more significant, a positive correlation existed between government effectiveness and water supply access (0.647 correlation) as well as with basic

sanitation access (0.559 correlation). Further empirical studies are needed to investigate their claims.

Drawing on the theoretical and empirical arguments presented above, this study will explore the following hypotheses:

> ***H1****: Good governance leads to a higher proportion of the population using an improved drinking water source.*
> ***H2****: Good governance leads to a higher proportion of the population using an improved sanitation facility.*

However, only measuring the proportion of the population with access to improved drinking water and sanitation fails to account for the progress that countries make in improving their water and sanitation infrastructure. Countries preconditions before the adoption of the MDGs also plays an important role on countries achievement of the MDG 7C on water and sanitation (Munamati, Nhapi and Misi, 2016; Easterly, 2009; Arun, 2016).

Consequently, Fukida-Parr, Greenstein and Steward (2013) argue for a measurement focusing on determining the rate of progress to better be able to evaluate the achievement of the MDGs. Their alternative performance measurement of the MDGs looks at the rate of progress before and after the adoption of the MDGs. The study determines that countries on the African continent have achieved a, in comparison, high rate of progress (Fukida-Parr, Greenstein and Steward, 2013). While in UN progress reports, the same countries are usually perceived as failures in achieving the MDGs (United Nations, 2015). The model has also been applied to exploring the relationship between lack of data for the MDGs and countries rate of progress (Arun, 2016). Following the same reasoning this study will include an analysis on the rate of progress towards MDG 7C on improved water and sanitation.

Consequently, two hypotheses includes the rate of progress achieved:

H3: *Good governance has had an impact on the rate of progress towards MDG 7C on water.*

H4: *Good governance has had an impact on the rate of progress towards MDG 7C on sanitation.*

3. Data and Method

3.1 The Data measuring MDG 7C

The dependent variables used are the official indicators for MDG 7C for water and sanitation, compiled by the United Nations (see table 2). For the analysis, data is used on three different levels in each country: total (national), on urban population and on rural population, hence in total six dependent variables for the analysis.

Table 2 the indicators and their sources

Indicators:	Source:
MDG Indicator 7.8 – on Water	http://mdgs.un.org/
MDG Indicator 7.9 – on Sanitation	http://mdgs.un.org/
WGI Government Effectiveness	www.govindicators.org
GNI per capita (PPP $)	http://hdr.undp.org/
ODA per capita (current US$)	http://wdi.worldbank.org/
Pop. Growth (% annual)	http://wdi.worldbank.org/

Notably, there is a difference between the definition in the target and the definitions used in the indicators (see table 3). “Sustainable access” is not measured for the MDGs due to difficulties in collecting reliable data and due to lack of a common framework of what it entails. Therefore, “improved water and sanitation” should be considered proxies for “sustainable access to safe drinking water and basic sanitation” (Millennium Development Goals Indicators, n.d.). Aguilar and Garcia de Fuente (2007) critique the indicators for water and sanitation for being too broad. For instance, they argue, improved sanitation does not consider the connection to a sewage system and might lead to contamination of groundwater and consequently the source for drinking water.

Table 3 - Millennium development goal on water and sanitation

OVERALL GOAL
7. Ensure environmental sustainability
TARGET
7C - Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.
INDICATORS
7.8: Proportion of population using an improved drinking water source (%).
7.9: Proportion of population using an improved sanitation facility (%).

However, new monitoring methodology has been developed for data collection for the new SDG indicators. New indicators for water and sanitation demands higher thresholds of quality and are defined as "safely managed drinking water services" and "safely managed sanitation services" (Leadership Council of the Sustainable Development Solutions Network, 2015). While this study has chosen to look at the progress of the implementation of the MDGs on water and sanitation, further studying good governance and water and sanitation with these new definitions are deemed valuable.

3.2 The Concept of Good Governance

Following the rationale from chapter 2, causality running from good governance to improved service provision is rather a question of the effectiveness of governments. Capable governments are more able to provide basic services, such as water and sanitation to their citizens and therefore an indicator for good governance describing the capacity of the state is arguably suitable. Consequently, Worldwide Governance Indicator for government effectiveness is the main independent variable used to proxy good governance (see table 2).

Worldwide Governance Indicators conceptualise good governance in six dimensions, or variables: voice and accountability, political stability and absence of violence, government effectiveness, and regulatory quality, rule of law and control of corruption. These aggregated indicators are based on several hundred other variables (Kaufmann, Kraay and Mastruzzi, 2011). Not without criticism on its validity and reliability (see for instance Kurz and Schrank, 2007; Langbein and Knack, 2010)

these indicators have been argued to provide a good tool to measure good governance (see for instance Kaufmann and Kraay, 2002; Kaufmann, Kraay and Mastruzzi, 2007; Charron et.al, 2010; Kwon and Kim, 2014).

In my empirical specification, government effectiveness has been lagged four years as it can be argued the effect of good governance on improving infrastructure for water and sanitation, through for instance new policies, takes time.

3.3 Control Variables

The control variables explored for this study were largely informed by previous research (Munamati, Nhapi and Misi, 2016; Dondeynaz, Moreno and Lorente, 2012). Several variables explored, such as health and education, has been taken out to avoid multi-collinearity.

The control variables used are GNI per capita (Purchasing Power Parity $), Overseas Development Assistance (ODA) received per capita (current US$) and population growth (% annual). GNI per capita is taken from Human Development Index, while ODA per capita and population growth, are both taken from World Banks World Development Indicators (see table 2). GNI per capita and ODA per capita are put in log.

GNI per capita is chosen as the economic variable for this study, which goes in line with previous similar studies reviewed (Munamati, Nhapi and Misi, 2016; Dondeynaz, Moreno and Lorente, 2012; Ndikumana and Pickbourn, 2017). When looking at large, usually publicly financed, infrastructure investments such as the one needed for the provision of improved water and sanitation, GNI per capita is a good measurement to indicate a country's economic ability to do the right investment.

In terms of ODA per capita, it is argued that improving water and sanitation is considered a priority amongst the financiers of ODA, due to the MDGs. Accordingly, the assumption is that a country receiving ODA is able to improve its water and sanitation infrastructure without good governance.

However, Dutta & Williamson (2016) conclude that the quality of institutions influences the ability of the ODA. Moreover, high ODA could be argued stands in the way of motivating improved institutional quality.

Population growth is included since it will change the percentage of the population with access to water and sanitation without changing the absolute number. Consequently, a country with a large population growth will have more difficulty achieving MDG 7C on access to water and sanitation. A negative relationship to the dependent variables are expected.

There are other variables that have not been included here, due to a lack of data and validity in their measurement. For instance, risk of droughts and various topographical differences might further complicate the provision of these services. Geography most likely influences the difficulty of building and managing water and sanitation services, but to measure it is difficult.

3.4 Method

To test the validity of the good governance hypothesis underpinning the United National General Assembly approach to the achievement of the MDGs, this study looks closer at the relationship between government effectiveness and improved drinking water source and sanitation facilities. The data used consists of a data set from 162 countries, covering the period 2000 to 2015. The reasoning is to have information over the 15 years the MDGs where implemented. Due to a lack of data, between 2000 and 2006 observations are recorded from every other year, and from 2007 to 2015 every year.

The dependent variables used on water and sanitation are data for the total population, as well as on rural and urban population separately. The analysis also accounts for group differences between low and middle-income countries and high-income countries, treating data per group separately. Arguably, these are good divisions of the data as the low and middle-income countries are considered the focus group of countries for the MDGs. The two country groups are divided following the World Banks definition of low & middle-income countries in 2000 as GNI lower than

9265 US$ per capita, and high-income countries as GNI higher than 9265 US$ per capita. In this way, the data set of 162 countries is divided between 98 low and middle-income countries and 64 high-income countries.

The following equation is used to test hypotheses one and two on the relationship between good governance and countries proportion of population using an improved drinking water source and an improved sanitation facility.

$$\ln Y_{it} = \alpha + \beta_1 X_{it-1} + \beta_2 C_{it} + \varepsilon_i \qquad (1)$$

Where Y stands for the dependent variables on water and sanitation, X for the good governance indicator lagged with four years, C for the control variables and e for the error term.
i = 1, . . . n is the individual (countries) index and t = 1, . . . T is the time (year) index

The second part of the analysis test hypothesis three and four on the impact of good governance on the rate of progress towards MDG 7C on water and sanitation, and uses the following equations:

$$\ln \Delta Y_i = \alpha + \beta_1 \Delta X_i + \beta_2 \bar{C}_i + \epsilon_i \qquad (2)$$

$$\ln \Delta Y_i = \alpha + \beta_1 \bar{X}_i + \beta_2 \bar{C}_i + \epsilon_i \qquad (3)$$

Where $\Delta Y_i = Y_{i_{2015}} - Y_{i_{2000}}$ for the dependent variables on water and sanitation, $\Delta X_i = X_{i_{2015}} - X_{i_{2000}}$ for the independent variable government effectiveness (formula 2) and $\overline{X_i} = \frac{S}{N}$ depicts the averages of government effectiveness (formula 3) and $\overline{C_i} = \frac{S}{N}$ depicts the average of control variables, as S is the sum of the observations for country i, and N is the number of observation for country i.
i = 1, . . . n is the individual (countries) index

Ordinary least square (OLS)/pooled analysis is used to test the hypotheses[1], including the variable on good governance and, then, adding the remaining control variables to the model. The pooled model is used, rather than fixed effect, as both the dependent variables and the main independent variable move slowly over time. However, to test the robustness of the baseline estimations a sensitivity test with fixed effects is conducted. In addition, the other five dimensions of Worldwide Governance Indicators where estimated. Although the difference in results was not as large as might have been anticipated, government effectiveness showed to have the strongest correlation to water and sanitation, underpinning the theoretical reasoning from chapter 2.

[1] Data analysis was performed in R version 3.4.2.

4. Results and Analysis

4.1 Descriptive Statistics

Table 4 represents the descriptive statistics of the selected indicators. Table 5 describes the correlation coefficient between the independent variable, government effectiveness, and the control variables; (ln) GNI per capita, (ln) ODA per capita, and population growth. Government effectiveness and (ln) GNI per capita has the highest correlation coefficient of 0,761, while the others show less correlation.

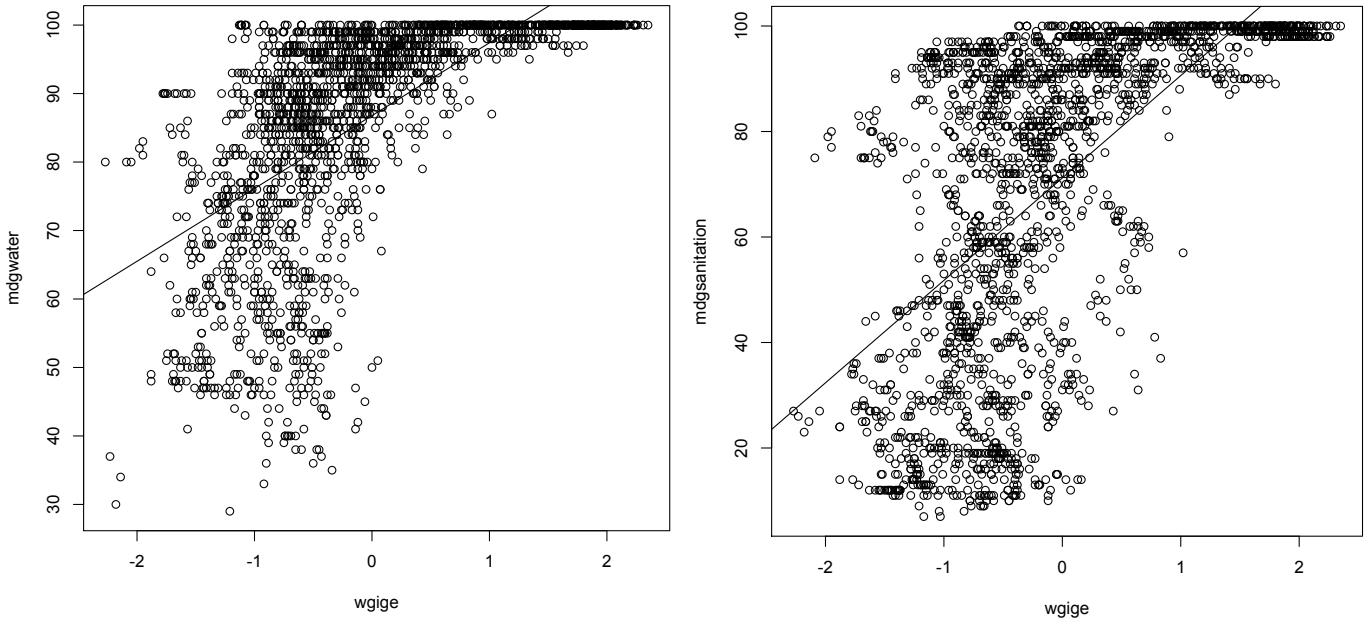
Table 4 Descriptive statistics of the indicators

	Mean	Std dev.	Median	Min	Max
(ln) Water $_{it}$	4.434218	0.2219973	4.532599	3.367296	4.60517
(ln) Water urban it	4.537815	0.1037805	4.574711	3.806662	4.60517
(ln) Water rural it	4.339917	0.3143763	4.454347	2.944439	4.60517
(ln) Sanitation $_{it}$	4.095976	0.6375891	4.406719	1.94591	4.60517
(ln) Sanitation urban it	4.265251	0.4402063	4.465908	2.772589	4.60517
(ln) Sanitation rural it	3.893095	0.8738666	4.304065	1.098612	4.60517
Gov. effectiveness $_{it-1}$	-0.0597151	0.9551406	-0.255	-2.27	2.35
(ln) GNI per capita $_{it}$	8.970384	1.224184	9.069179	5.955837	11.77464
(ln) ODA per capita $_{it}$	4.939813	0.4031634	4.804021	4.49981	6.796824
Pop. Growth $_{it}$	1.537923	1.519616	1.395395	-3.107229	16.33164

Table 5 Matrix of correlation coefficient between the indicators

	Gov. Effectiveness $_{it-1}$	GNI per capita $_{it}$	ODA per capita $_{it}$	Pop. Growth $_{it}$
Gov. Effectiveness $_{it-1}$	1	-	-	-
GNI per capita $_{it}$	0.7609963	1	-	-
ODA per capita $_{it}$	-0.3792119	-0.4339364	1	-
Pop. Growth $_{it}$	-0.3180903	-0.2696542	0.1298966	1

Figure 1 Plotted relationship between government effectiveness and water (left) and sanitation (right).



4.2 Good governance and access to water and sanitation

Table 6 presents the OLS/pooled estimation results for the relationship between the good governance indicator and the indicators for improved drinking water source and sanitation facilities. The relationship is also plotted in figure 1 above. The estimations suggest that good governance associates with improved drinking water source, with significance at the 0.1 percent level in all six, simple and multiple, regressions. However, we cannot assume the existence of a causal relationship. In contrast, the estimates regarding the correlation between good governance and improved sanitation facilities are mixed. The three simple regressions that only include the variable on good governance (column 1, 3 and 5), show a positive correlation with a significance at 0.1 percent level. However, the results for all countries (column 2) and for low and middle-income countries (column 4) are not robust to the inclusion of control variables and the estimates for good governance shows a negative relationship with a significance of at least 5 percent level.

Table 6 presents the OLS/pooled estimation results dividing the dependent variables between rural and urban populations use of improved drinking water source and sanitation facilities. The results seem to show the same positive relationship, with statistical significance at a 0.1 percent level reached in all estimates on improved drinking water source but conflictual results on improved sanitation facilities once control variables are added. What is more interesting is the slightly stronger estimates of a positive relationship between good governance and the access to improved drinking water for rural population than for the urban population. For instance, multiple regressions of improved drinking water access in low and middle-income countries, depicts rural population (slope: 0.130) having a stronger relationship than urban population (slope: 0.052).

Overall the control variables show the expected relation to the dependent variables, with GNI per capita being positively related, ODA per capita being positively correlated for low and middle-income countries, and population growth being negatively correlated.

Table 6 Baseline model - OLS/pooled estimations with panel data

WATER	All Countries		Low & Middle Income Countries		High Income Countries	
Gov. effectiveness $_{t-1}$	0.136330 (33.22)***	0.021440 (4.067)***	0.21341 19.43)***	0.066077 (6.125)***	0.058044 (18.84)***	0.056193 (12.718)***
(ln) GNI per capita $_{t}$	-	0.118263 (27.699)***	-	0.112126 (14.428)***	-	-0.010234 (-1.263)
(ln) ODA per capita $_{t}$	-	0.031970 (9.008)***	-	0.027168 (5.318)***	-	-0.007561 (-1.944) .
Pop. Growth $_{t}$	-	-0.037434 (-16.917)***	-	-0.059006 (-12.551)***	-	-0.004738 (-2.465)*
Adjusted R^2	0.3437	0.567	0.2283	0.5091	0.2988	0.313
Observations	2106 (n = 162, T = 13)		1274 (n = 98, T = 13)		832 (n = 64, T = 13)	

SANITATION	All Countries		Low & Middle Income Countries		High Income Countries	
Gov. effectiveness $_{t-1}$	0.36517 (29.98)***	-0.106666 (-8.284)***	0.51588 (15.64)***	-0.06649 (-2.421)*	0.081546 (17.59)***	0.037445 (5.910)***
(ln) GNI per capita $_{t}$	-	0.480955 (46.121)***	-	0.50700 (25.631)***	-	0.105818 (9.109)***
(ln) ODA per capita $_{t}$	-	0.081312 (9.380)***	-	0.06460 (4.968)***	-	-0.006174 (-1.107)
Pop. Growth $_{t}$	-	-0.102915 (-19.042)***	-	-0.14915 (-12.463)***	-	-0.011471 (-4.162)***
Adjusted R^2	0.2989	0.6869	0.1607	0.6164	0.2707	0.3514
Observations	2106 (n = 162, T = 13)		1274 (n = 98, T = 13)		832 (n = 64, T = 13)	

Absolute value of t statistic in parentheses: significant at: '.' < 10%, '*' < 5%, '**' < 1%, '***' < 0,1%.

Table 7 Baseline model - OLS/pooled regressions, divided between urban and rural population.

	Water Urban		Water Rural		Sanitation Urban		Sanitation Rural	
ALL COUNTRIES								
Gov. effectiveness $_{t-1}$	0.053327 (25.84)***	0.022414 (7.268)***	0.203052 (35.95)***	0.069644 (9.192)***	0.245506 (28.87)***	-0.058934 (-6.120)***	0.49793 (29.76)***	-0.102900 (-5.301)***
Adjusted R^2	0.2405	0.322	0.3803	0.554	0.2834	0.6325	0.2959	0.6212
Observations	2106 (n = 162, T = 13)							
LOW & MIDDLE INCOME COUNTRES								
Gov. effectiveness $_{t-1}$	0.082435 (14.57)***	0.052047 (8.024)***	0.30852 (20.38)***	0.129961 (8.430)***	0.36923 (15.98)***	-0.014773 (-0.721)	0.67538 (14.77)***	-0.03478 (-0.824)
Adjusted R^2	0.1423	0.2573	0.2456	0.4843	0.1665	0.5678	0.1456	0.5202
Observations	1274 (n = 98, T = 13)							
HIGH INCOME COUNTRIES								
Gov. effectiveness $_{t-1}$	0.029256 (16.69)***	0.030782 (12.350)***	0.117589 (23.76)***	0.096774 (13.647)***	0.062800 (14.73)***	0.021937 (3.756)***	0.136612 (19.64)***	0.072603 (7.793)***
Adjusted R^2	0.2503	0.2784	0.4042	0.4174	0.2064	0.2906	0.3165	0.4161
Observations	832 (n = 64, T = 13)							

Absolute value of t statistic in parentheses: significant at: '.' < 10%, '*' < 5%, '**' < 1%, '***' < 0,1%.

The analyses in gray: Control variables included but not shown.

To test the robustness of the results and to take unobserved heterogeneity into account, fixed effect estimations was performed. The Hausman test shows that a fixed effect model is a better choice than a random effect model. As presented in column 1 and 2 of Table 8 the baseline model is robust to the inclusion of time fixed effects. But the results are sensitive to the inclusion of country fixed effects. As seen in column 4 and 6 the estimate turns negative and then insignificant when running country effect and country-time fixed models.

Table 8 Sensitivity analysis – fixed effect estimations

WATER – ALL COUNTRIES

	One-way (time) effect Within Model		One-way (country) effect Within Model		Two-way effect Within Model	
Gov. effectiveness $_{t-1}$	0.1365634 (33.625)***	0.0233928 (4.4204)***	-0.0010418 (-0.1708)	-0.0152139 (-3.0331)**	0.0041503 (0.4097)	-0.0065817 (-1.3520)
(ln) GNI per capita $_t$	-	0.1151590 (26.491) ***	-	0.1700903 (29.181) ***	-	0.1025979 (13.331)***
(ln) ODA per capita $_t$	-	0.0299652 (8.3355)***	-	0.0144210 (6.2612)***	-	0.0101073 (4.4560)***
Pop. Growth $_t$	-	-0.0373205 (-16.866)***	-	-0.0032720 (-2.2378)*	-	-0.0018131 (-1.2856)
Adjusted R^2	0.34681	0.56058	-0.08336	0.27565	-0.089725	0.0094807
Observations	2106 (n = 162, T = 13)					

Absolute value of t statistic in parentheses: significant at: '.' < 10%, '*' < 5%, '**' < 1%, '***' < 0,1%,

4.3 Good Governance Impact on the rate of progress towards Goal 7C

This section presents the results when testing hypothesis three and four, whether good governance has had an impact on the rate of progress towards MDG 7C on halving, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. Table 9 below examines the relationship between the change over time in the dependent variables as well as in the change over time in the independent variable. The estimates show no relationship with a significance of at least 10 percent. Suggestively, some positive change in water and sanitation can be viewed over the implementation of the MDGs, while government effectiveness changes slower over time. Subsequently, there is no clear indication of whether change in government effectiveness improves water and sanitation.

To further explore the relationship over time, the indicator for government effectiveness is set as an average over the time period, while the dependent variables still depict the rate of progress. The estimates are shown in table 10. Once again, the results are similar with only improved drinking water showing a positive relationship at a 10 percent level, when control variables are added. As some studies already eluded to, the results of this study might be an indication of good governance not being correlated with MDG 7C on water and sanitation. However, further analyses of the relationship between good governance and its effect on reaching universal access to safely managed water and sanitation is needed, as good governance and water and sanitation continue to be a focus for the SDGs.

Table 9 OLS Regressions change in dependent and independent variables over time.

	LOW AND MIDDLE INCOME COUNTRIES			
	WATER		SANITATION	
Δ Gov. effectiveness $_{t-1}$	0.003598	-0.002233	-0.06450	-0.04406
	(0.063)	(-0.039)	(-0.919)	(-0.619)
(ln) GNI per capita	-	-0.085790	-	0.06078
		(-2.183)*		(1.230)
(ln) ODA per capita	-	-0.032636	-	-0.02471
		(-1.676) .		(-1.009)
Pop. Growth	-	0.001557	-	0.06118
		(0.054)		(1.681) .
Adjusted R^2	-0.01038	0.04803	-0.001614	0.00795
Observations	1274 (n = 98, T = 13))			

Absolute value of t statistic in parentheses: significant at: '.' < 10%, '*' < 5%, '**' < 1%, '***' < 0,1%.

Table 10 OLS Regressions change in dependent variables over time.

	LOW AND MIDDLE INCOME COUNTRIES			
	WATER		SANITATION	
Gov. effectiveness $_{t-1}$	-0.01393	0.114268	0.03788	0.01951
	(-0.267)	(1.769) .	(0.589)	(0.236)
(ln) GNI per capita	-	-0.131844	-	0.05709
		(-2.844) **		(0.962)
(ln) ODA per capita	-	-0.034268	-	-0.02464
		(-1.788) .		(-1.004)
Pop. Growth	-	-0.002308	-	0.06460
		(-0.082)		(1.796) .
Adjusted R^2	-0.009669	0.079	-0.006776	0.004453
Observations	1274 (n = 98, T = 13)			

Absolute value of t statistic in parentheses: significant at: '.' < 10%, '*' < 5%, '**' < 1%, '***' < 0,1%.

5 Discussion

The study's results indicate that good governance is positively correlated with access to improved drinking water, with statistical significance at a 0.1 percent level. However, for the rate of progress for improving water in low and middle income countries, measured over the MDG timeframe, no clear correlation can be viewed, either when analysing correlation with the average level of government effectiveness and with the rate of progress of improving government effectiveness.

Splitting the sample, the empirical analysis also points towards a positive correlation between level of government effectiveness and level of improved drinking water source for the urban population (R2: 0.257) and rural population (R2: 0.4843). Although, the risk of reversed causality seems highly unlikely (i.e. access to drinking water leads to a higher level of good governance) there could be a risk of other variables generating a spurious relationship between the indicator for good governance and improved drinking water sources, for instance topographical once. Arguably, both government effectiveness and improved water and sanitation highly correlates with GNI per capita.

Moving from water to sanitation, the study's results show no clear relationship between the level of government effectiveness and the level of improved sanitation facilities. The estimates for low and middle-income countries show a negative correlation, significant at a 10 percent level, when including control variables. However, the estimates for high-income countries are positive with a significance at 0.1 percent level. How can this difference between high-income countries and countries classified as low and middle-income be explained?

One aspect that has, only been analysed by looking at rate of progress is the issue of countries various preconditions. Water and sanitation infrastructure can be considered quite static. It can improve, but the risk of it deteriorating over a shorter time period is not common (not taking into consideration disasters and conflicts). However, while government effectiveness has been found to move quite slowly (see for instance Kaufmann, Kraay and Mastruzzi, 2011), there is a possibility

of fluctuation, both negatively and positively that is arguably bigger than it is for infrastructural installation.

Conceivably, in an event of change in government to a more autocratic government, the pre-existent infrastructure of water and sanitation will not deteriorate completely within a short time frame. In this study the good governance indicator was lagged four years, with the logic of policy change takes time. However, it can be argued that this lag should be even longer.

To further explore a causal relationship between good governance and drinking water (and possibly also sanitation) qualitative research using progress tracing might be a useful method (see for instance Vanhala, 2017). Utilising this way of studying casual mechanisms, one could explore two countries from this study's sample as similar as possible, except for the level of good governance to probe causal mechanisms running from good governance to improved drinking water and sanitation.

This study has examined some aspects of the relationship between good governance and the MDGs. It has done so by looking at parts of the MDG on water and sanitation and countries' level of government effectiveness. Theoretically there exist solid foundations for claiming that good governance is important for the achievement of MDG 7C on water and sanitation as capable governments are able to provide basic services to their citizens. However, the empirical results investigating the theoretical claims are mixed when it comes to proving a correlation between good governance and improved water and sanitation. In addition, the study showed little proof that good governance correlates with the rate of progress of improving water and sanitation over the MDGs implementation period. Arguably, there is a need to look more concretely at good governance when aiming, by 2030, to achieve the highly ambitious SDGs.

REFERENCES

Acemoglu, Daron (2008) Oligarchic versus democratic Societies, *Journal of the European Economic Association*, 6(1): 1-44.

Aguilar, Mauricio Domingues & Garcia de Fuentes, Ana (2007) Barriers to achieving the water and sanitation-related Millennium Development Goals in Cancún, Mexico at the beginning of the twenty-first century, *Environment and Urbanization*, Vol 19 243-260.

Arun, Jacob (2016) Mind the Gap: Analyzing the Impact of Data Gap in Millennium Development Goals' (MDGs) Indicators on the Progress toward MDGs. *World Development*, Vol. 93, 260–278.

Bernauer, Thomas & Koubi, Vally (2009) Effects of political institutions on air quality, *Ecological Economics*, 68, 1355-1365

Bhattacharya, Mita, Churchill, Sefa Awaworyi and Paramati, Sudharshan Reddy (2017) The dynamic impact of renewable energy and institutions on economic output and CO2 emissions across regions, *Renewable Energy*, 111 157-167"

Charron, Nicholas et. al. (2010) "Measuring the Quality of Government and Subnational Variations", Report for the European Commission Directorate-General Regional Policy Directorate Policy Development, the Quality of Government Institute, University of Gothenburg

Davis, Theodore J. (2017) Good governance as a foundation for sustainable human development in sub-Saharan Africa, *Third World Quarterly*, 36:3, 636-654.

Dondeynaz, C.; Moreno, C. Carmona; Lorente, J. J. Céspedes (2012) Analysing inter-relationships among water, governance, human development variables in developing countries, *Hydrology and Earth System Sciences*, Vol 16, Issue 10, 3791-3816

Dutta, Nabamita & Williamson, Claudia R. (2016) Aiding economic freedom: Exploring the role of political institutions, *European Journal of Political Economy*, 45 24-38.

Easterly, William (2009) How the Millennium Development Goals are Unfair to Africa, *World Development*, Vol. 37, No. 1, 26–35.

Fukuda-Parr, Sakiko, Greenstein, Joshua and Stewart, David (2013) How should MDG success and failure be judged: Faster progress or achieving the targets? *World Development*, 41, 19–30.

Kaufmann, Daniel and Kraay, Aart (2002) Growth withough governance, *Economía*, Vol 3, No 1, 169-229.

Kaufmann, Daniel, Kraay, Aart and Mastruzzi, Massimo (2007) Growth and Governance: A Reply, *The Journal of Politics*, Vol. 69, No. 2, 555–562.

Kaufmann, Daniel, Kraay, Aart and Mastruzzi, Massimo (2011) The Worldwide Governance Indicators: Methodology and Analytical Issues, *Hague Journal on the Rule of Law*, 3 : 220–246.

Kurtz, Marcus J. and Schrank, Andrew (2007) Growth and Governance: Models, Measures, and Mechanisms, *The Journal of Politics*, Vol. 69, No. 2, 538–554.

Kwon, Huck-ju & Kim, Eunju (2014) Poverty Reduction and Good Governance: Examining the Rationale of the Millennium Development Goals, *Development and Change*, 45(2) 353-375.

Langbein, Laura and Kanck, Stephen (2010) The Worldwide Governance Indicators: Six, One, or None? *Journal of Development Studies*, Vol. 46, No. 2, 350–370."

Leadership Council of the Sustainable Development Solutions Network (2015) Indicators and a monitoring framework for the sustainable development goals, launching a data revolution for the SDGs. Revised working draft (version 7), March 20, 2015

Millennium Development Goals Indicators, n.d. The updated handbook on Indicators for Monitoring the Millennium Development Goals (accessed on 5 april 2018) https://unstats.un.org/unsd/mdg/Host.aspx?Content=Indicators/Handbook.htm

Munamati, Muchaneta, Nhapi, Innocent and Misi, Shepherd (2016) Exploring the determinants of sanitation success in Sub-Saharan Africa, *Water Research*, 103, 435-443

Ndikumana, Léonce and Pickbourn, Lynda (2017) The Impact of Foreign Aid Allocation on Access to Social Services in sub-Saharan Africa: The Case of Water and Sanitation, *World Development*, Vol. 90, 104–114.

Ortega, Bienvenido, Sanjuán, Jesús & Casquero, Antonio (2017) Determinants of efficiency in reducing child mortality in developing countries, The role of inequality and government effectiveness, *Health Care Management Science,* 20(4)

Ottervik (2013) Conceptualizing and measuring state capacity, Working Paper Series 2013:20, the Quality of Government Institute, University of Gothenburg

Rice, Susan E. and Patrick, Stewart (2008) "Index of State Weakness in the developing world", The Brookings Institution, https://www.brookings.edu/wp-content/uploads/2016/06/02_weak_states_index.pdf (accessed on 21 March 2018)

Rothstein, Bo (2013) The Three Worlds of Governance: Arguments for a Parsimonious Theory of Quality of Government, The quality of government institute (presented at the Annual Meeting of the American Political Science Association, Chicago Aug. 29 - Sep 1 2013 in Panel 11:52)

Rothstein, Bo and Toerell, Jan (2005) What is Quality of Government, A theory of Impartial Political Institutions (paper to be presented to the conference Quality of Government - What it is, How to get it, Why it matters, Göteborg, Nov 17-19, 2005)

Sen, Amartya (2001) *Development and freedom*, New York: Oxford University Press.

Sjöstedt, Marin & Jagers, Sverker C. (2014) Democracy and the environment revisited: The case of African fisheries, *Marine Policy*, 43 143-148.

Morse, Stephen (2006) "Is Corruption Bad for Environmental Sustainability? A Cross-National Analysis" *Ecology and Society*, Vol 11, Issue 1

The Millennium Development Goals Report 2015 (accessed on 28 March 2018) http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf

Transparency International (2017) Corruption Perception Index 2017: technical methodology note

UNICEF (2013) Progress on Sanitation and Drinking-Water (accessed on 28 March 2018) http://apps.who.int/iris/bitstream/handle/10665/81245/9789241505390_eng.pdf;jsessionid=AA36801B12A475A09A6B0A9DD7BF889D?sequence=1

United Nations (2016) The Sustainable Development Goals Report, (accessed on 5 April 2018) http://www.un.org.lb/Library/Assets/The-Sustainable-Development-Goals-Report-2016-Global.pdf

United Nations (2015) The Millennium Development Goals Report, (access on 5 April 2018) http://www.undp.org/content/dam/undp/library/MDG/english/UNDP_MDG_Report_2015.pdf

United Nations General Assembly (2000) United Nations Millennium Declaration, Resolution, 55/2 (accessed on 1 April, 2018) http://www.un.org/millennium/declaration/ares552e.htm

Vanhala, Lisa (2017) Process Tracing in the Study of Environmental Politics, *Global Environmental Politics*, Vol 17, No 4, 88-105.

Welsch, Heinz (2004) Corruption, growth, and the environment: a cross-country analysis, *Environment and Development Economics*, 9, 663-693

Wolf, Susanna (2007) Does Aid Improve Public Service Delivery? *Review of World Economics*, 143(4)

ANNEX I

All 162 Countries divided between low & middle income and high income countries.

THE 64 HIGH INCOME-COUNTRIES

AND	Andorra	GBR	United Kingdom	NLD	Netherlands
ARG	Argentina	GNQ	Equatorial Guinea	NOR	Norway
AUS	Australia	GRC	Greece	OMN	Oman
AUT	Austria	HUN	Hungary	PAN	Panama
BEL	Belgium	IRL	Ireland	POL	Poland
BHR	Bahrain	IRN	Iran (Islamic Republic of)	PRT	Portugal
BHS	Bahamas	IRQ	Iraq	QAT	Qatar
BRA	Brazil	ISL	Iceland	ROM	Romania
BRB	Barbados	ISR	Israel	RUS	Russian Federation
CAN	Canada	ITA	Italy	SAU	Saudi Arabia
CHE	Switzerland	JPN	Japan	SUR	Suriname
CHL	Chile	KAZ	Kazakhstan	SVK	Slovakia
CYP	Cyprus	KWT	Kuwait	SVN	Slovenia
CZE	Czech Republic	LBN	Lebanon	SWE	Sweden
DEU	Germany	LCA	Saint Lucia	SYC	Seychelles
DNK	Denmark	LTU	Lithuania	TTO	Trinidad and Tobago
DZA	Algeria	LUX	Luxembourg	TUR	Turkey
ESP	Spain	LVA	Latvia	URY	Uruguay
EST	Estonia	MEX	Mexico	VEN	Venezuela
FIN	Finland	MLT	Malta	ZAF	South Africa
FRA	France	MUS	Mauritius		
GAB	Gabon	MYS	Malaysia		

THE 98 LOW & MIDDLE-INCOME COUNTRIES

AFG	Afghanistan	GHA	Ghana	NGA	Nigeria
AGO	Angola	GIN	Guinea	NIC	Nicaragua
ALB	Albania	GMB	Gambia	NPL	Nepal
ARM	Armenia	GNB	Guinea-Bissau	PAK	Pakistan
AZE	Azerbaijan	GRD	Grenada	PER	Peru
BDI	Burundi	GTM	Guatemala	PHL	Philippines
BEN	Benin	GUY	Guyana	PNG	Papua New Guinea
BFA	Burkina Faso	HND	Honduras	PRY	Paraguay
BGD	Bangladesh	HTI	Haiti	RWA	Rwanda
BGR	Bulgaria	IDN	Indonesia	SEN	Senegal
BIH	Bosnia and Herzegovina	IND	India	SLB	Solomon Islands
BLR	Belarus	JAM	Jamaica	SLE	Sierra Leone
BLZ	Belize	JOR	Jordan	SLV	El Salvador
BOL	Bolivia	KEN	Kenya	SRB	Serbia
BTN	Bhutan	KGZ	Kyrgyzstan	STP	Sao Tome and Principe
BWA	Botswana	KHM	Cambodia	SWZ	Swaziland
CAF	Central African Republic	LAO	Lao People's Democratic Republic	SYR	Syrian Arab Republic
CHN	China	LBN	Lebanon	TCD	Chad
CIV	Cote d'Ivoire	LKA	Sri Lanka	TGO	Togo
CMR	Cameroon	LSO	Lesotho	THA	Thailand
COG	Congo	MAR	Morocco	TJK	Tajikistan
COL	Colombia	MDA	Republic of Moldova	TUN	Tunisia
COM	Comoros	MDG	Madagascar	TZA	United Republic of Tanzania
CPV	Cape Verde	MDV	Maldives	UGA	Uganda
CRI	Costa Rica	MKD	Macedonia (former Yugoslav Republic)	UKR	Ukraine
CUB	Cuba	MLI	Mali	VNM	Viet Nam
DJI	Djibouti	MMR	Myanmar	VUT	Vanuatu

DOM	Dominican Republic	MNG	Mongolia	WBG	State of Palestine
ECU	Ecuador	MOZ	Mozambique	WSM	Samoa
EGY	Egypt	MRT	Mauritania	ZAR	Democratic Republic of the Congo
ETH	Ethiopia	MWI	Malawi	ZMB	Zambia
FJI	Fiji	NAM	Namibia	ZWE	Zimbabwe
GEO	Georgia	NER	Niger		