Women for Water

The Influence of Women's Political Representation on Access to Clean Water and Sanitation in Developing Countries

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Abstract

When women's political representation first appeared on the academic agenda, scholars focused primarily on the factors facilitating the enlargement of women's share of seats in the national legislature. Only after numerous factors had been identified, scholars broadened their scope and shifted their focus towards the influence of more women in parliament. Instead of looking at what gets women into parliaments, they started to look at what happens when more women hold seats in parliaments. Overall, scholars found that a higher share of women in parliament leads to a stronger focus on women's issues and increased spending on social policies. However, these findings are based on research conducted in developed countries. It is therefore difficult to generalize these findings to developing countries.

Recent years, more papers on the influence of women's political representation in developing countries have appeared. Most papers are case studies, while the cross-national studies predominantly focus on the influence of women's political representation on child and women's health. Women's political representation in developing countries has not yet been linked to other sustainable development goals on a large, multi-country scale. If women's political representation is found to be positively linked to other sustainable development goals, future development strategies could be adapted accordingly. This paper deemed it therefore important to assess the influence of women's political representation on another sustainable development goal besides health. Access to clean water and sanitation has been chosen as dependent variable of this research because of its importance for people's health and development.

To control for the relationship between women's political representation and access to clean water and sanitation, a time-series cross-sectional research design has been employed with data covering a total of 112 countries and 15 years. Results of the panel regression analysis show that women's political representation positively influences access to clean water and sanitation in developing countries. Furthermore, the findings corroborate the 'Critical Mass' theory. According to this theory, the share of parliamentary seats held by women must pass a certain threshold for women to enact change. Both results are in line with the hypotheses. Besides these findings, the analysis also points out the importance of economic development and women's social standing on access to clean water and sanitation, and the importance of foreign aid on access to clean water. Democracy, on the other hand, has not been found to significantly interact with the relationship between women's political representation and access to clean water and sanitation.

Acknowledgement

As a little girl, my mother took me with her to the polling station. She explained to me that she always voted for a female candidate because she believed women should stand together. My mother strongly believed in gender-equality and hoped for an equal division of parliamentary seats among men and women. When I was allowed to vote for the first time, my mother had unfortunately passed away, but her thoughts on women standing together had never left my mind. Like my mother, I voted for a female candidate and I have continued to do so. Although voting for a female candidate is merely a symbolic action, it piqued my interest into the field of women's political representation. I believe that it is important to know the positive effects of a higher political representation of women in order to increase women's share in national legislatures as such information functions as a perfect foundation for sound arguments in favor of increasing women's political representation. However, this does not explain why I chose to focus on developing instead of developed countries.

While growing up, I have had the privilege of travelling beyond Europe and the Western society. Although some countries were wealthier than others, each experience stood in stark contrast to the life I was used to in the Netherlands. One moment in particular has always stayed with me. I was sitting in an air-conditioned taxi with my camera in the one hand, and my iPod and mobile phone in the other. The taxi took my family and me to a suburb of one of the bigger cities of Tanzania. Although one could not speak of a slum, the streets were unpaved, the houses did not even resemble Dutch houses a tiny bit, people sat in front of their houses waiting for the day to pass, children walked up and down the streets in old, dirty, and worn out clothes, and the schools we visited were so primitive, they did not even look like schools to me. That day, I saw how lucky I am to have been born and raised in the Netherlands. I realized how unfair the world is and how much inequality remains to be tackled. Furthermore, I realized I did not want to close my eyes for these inequalities. I did not want to go home to the Netherlands and go on with my life and forget the things I had seen in Tanzania. I realized that, whatever I ended up doing in the future, I wanted it to be related to fighting inequalities and achieving a better world for everyone. This desire to fight inequalities and to enhance sustainable development, combined with my interest in women's political representation, led to the topic of my thesis.

Even though writing this thesis has been daunting and stressful at times, I look back at the past months with a sense of contentment. It took me longer than expected to write the thesis, but in the end, I managed to finish it and I am proud of the result. Certain people helped me a great deal during the thesis-writing process. I am extremely grateful for their help and would therefore like to thank them. First, I would like to thank my dad for providing me with the

needed support to live and study in Rotterdam and to make the most of my time as a student. I would also like to thank my brother for pushing me to dream bigger and for believing in me. Additionally, I would like to thank my mother. Although she is not with us anymore, she remains my biggest source of inspiration and motivation to keep going. She was the best role model a daughter could wish for. Moreover, I would like to thank my supervisor, professor Dijkstra. She has provided me time and again with helpful and constructive feedback that truly helped to improve my thesis. Furthermore, her flexibility has given me the chance to write this thesis on my own pace, which was extremely valuable to me. I would also like to thank my second reader, professor Haverland for helping me improve my critical mass analysis. Lastly, I would like to thank my friends for putting up with my thesis stress and my busy schedule, and for cheering me up and motivating me to continue. Without these people, I could never have written this thesis.

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1. Introduction

In 1995, many countries signed the Beijing Declaration and Platform for Action during the fourth World Conference on Women. The Beijing Platform for Action contained 12 critical areas of concern related to the empowerment of women, such as education, health, and decision-making. One specific target concerning women's ability to participate in power structures and decision-making was to increase women's share in national parliaments to a minimum of 30% (UN Women, 2017). At the time of signing, the worldwide average of women in a national legislature was a mere 11.3% (UN Women, 2016). Although the threshold of 30% remains yet to be achieved, the world average of women in the single or lower house of a national legislature has risen to 23.4% (IPU, 2017). This means that the share of female Members of Parliament (MPs) has more than doubled since 1995. Even though there is still room for improvement, it is safe to say that women have successfully increased their political representation. In two states women even managed to increase their share to over 50%, turning male MPs into a minority (UN Women, 2016). Given the fact that women are slowly taking the stage and increasing their presence in national parliaments, it becomes increasingly interesting to look at the influence of this growing political representation of women on legislative outcomes.

1.1 Research Question

Studies show that male and female politicians focus on different policy areas (O'Regan, 2000; Swers, 2002). Not only does an augmentation of women in legislative bodies in developed countries lead to increased spending on social policies (Bolzendahl & Brooks, 2007; Bolzendahl, 2009), it also leads to greater poverty reduction in developed countries (Brady, 2009), and a stronger focus on healthcare (Kittilson, 2008; Lovenduski & Norris, 2003; Paxton & Hughes, 2007). In addition, it has been claimed that male and female legislators vote differently on women's issues because of their gender. (Swers, 1998). Other studies further elaborate on how an increased level of women's political representation goes hand-in-hand with the acceptance of more female-friendly policies (Childs, 2002), and increased legislation on the rights of women and children (Kittilson, 2008).

Although these findings sound promising, there also exists a pool of scholars who argue against these understandings. They reason that the influence of the level of women's political representation is ambiguous (Schwindt-Bayer, 2006). Some even believe that a higher representation of women in the legislature has no effect on legislative behavior at all. Instead, they believe that the enhancement of female-friendly and social policies results from the presence of critical actors in parliaments (Childs & Krook, 2009). Apart from the disagreement

among scholars about the influence of women's political representation, it is important to note that all these studies focus primarily on developed countries. It is therefore questionable whether the results can be extended to developing states.

The main body of research that specifically looks at women's legislative representation in developing countries focusses on the factors that determine the level of women's representation. Matland (1998) was one of the first scholars in the field of women's representation to separate the data of developing countries from developed countries. According to his findings, most theories on the causal factors that lead to more women in parliament that are based on results from developed states do not hold true for developing countries. Subsequent research by Viterna, Fallon, and Beckfield (2008) corroborates Matland's finding that the explanatory power of theories based on results from developed countries is low for developing countries.

So far, only limited research has focused on developing countries and the influence of women's political representation on social and female-friendly policies and their outcomes. Extensive research exists on the latter, but only in relation to developed countries, while research on developing countries generally overlooks the influence of more female legislators on legislative behavior. Nonetheless, a study by Swiss, Fallon, and Burgos (2012) found a positive link between the level of women's political representation and child health in less developed countries and countries that are less globally integrated in terms of international non-governmental organization (INGO) memberships. This result is in line with research on developed countries that mention the prioritization of health as one of the effects of a higher level of women's legislative representation. No further cross-sectional research has been done to verify whether women's political representation has an influence on other development indicators in developing countries.

Access to clean water and sanitation is one of those other development indicators. It is an important component of the sixth Sustainable Development Goal (SDG) of the United Nations (UN). Furthermore, improving people's access to clean drinking water and improved sanitation facilities is of great importance to their health and empowerment. If a positive relationship between an increased level of women's political representation and access to clean water and sanitation was to be found, the strategy on the attainment of the sixth UN SDG could be significantly impacted. In addition, a positive link would increase the importance of the multitude of studies on the factors that influence the level of women's political representation in developing countries, as these factors could become focal points in the quest for sustainable development. It would thus be interesting to check whether there is a positive link between

women's political representation and access to clean water and sanitation in developing countries, similar to the established positive link between the number of female legislators and child health. This leads to the following research question:

What is the influence of women's political representation on access to clean water and sanitation in developing countries?

1.2 Aim

The general aim of this thesis is to contribute to the existing body of literature on women's political representation, to make sound inferences about causality, and to find results that can be generalized to all developing countries. More specifically, it aims to add to the rather limited existing knowledge about the influence of women's legislative representation on social and female-friendly policies and outcomes in developing countries. Furthermore, the paper wishes to verify whether results from prior studies in developed countries also hold true for developing countries. Overall, the thesis aims to add to the existing pool of literature and to provide helpful insights for future development policies. It attempts to do so by answering the aforementioned research question.

1.3 Sub-Questions

The thesis makes use of the following sub-questions to answer the main research question:

1. What is already known about the effect of women's political representation on social and female-friendly policies and outcomes?

2. How can the variables be operationalized and the possible relationship be researched?

3. What are the outcomes of the analysis?

In what way these questions will be addressed, will be discussed in the next paragraph.

1.4 Research Approach

This thesis will firstly address the three sub-questions separately before answering the central research question. The first sub-question focuses on the existing body of literature. It aims to get to know what is already out there on the topic. A literature review will be performed to address the first sub-question. First, an overview of the concepts and theories related to women's political representation will be given. Then, the literature review will discuss more elaborately the existing knowledge about the influence of women's political representation on

policies and outcomes in general. Subsequently, the review will focus specifically on the influence of women's legislative representation on policies in developing countries. In addition, the literature review will look at comparable studies with the purpose of identifying factors that influence the impact of women's political representation in a significant positive or negative manner. Based on the findings, hypotheses will be formulated and a conceptual model will be constructed.

The second sub-question relates to the research design and the operationalization of variables. A time-series cross-sectional research design will be employed. A time-series cross-sectional research design is a mixture of a cross-sectional and a longitudinal design. It encompasses the collection and analysis of data on multiple variables of multiple cases over time. A (time-series) cross-sectional research design is often characterized by the inclusion of many cases (large N). The chosen research design fits well with the aim of the research. First, the inclusion of numerous cases (large N) allows many developing countries to be incorporated in the analysis. Secondly, the inclusion of multiple variables facilitates the inclusion of many control variables. This positively adds to the internal validity of the research, and thus to the possibility of making sound inferences about causality. Thirdly, the time-series element increases the number of observations which leads to a higher possibility of finding statistically significant results. Furthermore, it allows trends to be observed over time. A more detailed description of the research design and the justification as to why this design has been chosen can be found in chapter three. Moreover, the indicators that have been chosen based on prior studies and the availability of data to operationalize the variables will also be discussed in order to answer the second sub-question.

The third sub-question focuses on the statistical analysis and its results. Given the time-series cross-sectional research design, a panel regression analysis will be performed. A panel regression analysis is a statistical analysis that uses three-dimensional data (multiple units, multiple variables, and multiple measurements in time). Before performing the analysis, it will be verified whether the assumptions of linear regression analysis hold. After such an assessment, the most appropriate model will be chosen and the analysis will be conducted. Subsequently, an overview of the results will be provided to answer the last sub-question.

1.5 Academic Relevance

As mentioned above, academics have rather limitedly looked at the influence of a higher legislative representation of women on social and female-friendly policies in developing countries. Although an extensive body of literature exists on the factors that lead to a higher

political representation of women in developed, as well as developing countries (Kenworthy & Malami, 1999; Kunovich & Paxton, 2005; McDonagh, 2002; Paxton & Kunovich, 2003; Paxton, 1997; Hughes, 2009; Fallon, Swiss & Viterna, 2012; Lee, 2015; Stockemer, 2011; Evans, 2016), and on the influence of women's legislative representation on policy outcomes in developed countries (e.g. Swers, 1998; Swers, 2002; O'Regan, 2000; Lovenduski & Norris, 2003; Bolzendahl & Brooks, 2007; Bolzendahl, 2009; Brady, 2009; Kittilson, 2008; Poggione, 2004; Caiazza, 2004), there is a lack of information on the relationship between women's political representation and policies in developing countries. As research on causal factors that lead to more women in parliament has pointed out, the outcomes from research on developed countries cannot always be extended to developing countries (Matland, 1998; Viterna et al., 2008). This thesis has therefore a certain academic relevance. Answering the research question will provide the academic world with an enriched insight into the influence of more women in parliament on social policy outcomes in developing countries. Adding to that, this research will verify whether results from similar research conducted in developed countries hold for developing countries as well. This could enhance the value and importance of existing findings. Lastly, the research is of academic relevance due to its quantitative, large N nature. The limited number of studies that have researched the relationship between women's political representation and social policies in developing countries has predominantly been case studies (Schwindt-Bayer, 2006; Chattopadhyay & Duflo, 2004; Franceschet & Piscopo, 2008; Goetz, 2002; Burnet, 2008; Sater, 2007). Results of a case study are rather difficult to generalize to other countries. This research will use data concerning numerous developing countries. This enhances the chance of finding generalizable results.

1.6 Societal Relevance

Besides its academic relevance, this paper also has implications for society and policies. A positive relationship between women's political representation and access to clean water and sanitation in developing countries could be of added value to the process of realizing the sixth SDG, as access to clean water and sanitation is a significant part of this goal. Furthermore, if women's political representation is found to have a significant positive effect on the attainment of SDG six, it might also positively affect the attainment of other SDGs. This, in turn, might influence future (international) development strategies and the further empowerment of women. Furthermore, a positive relationship between the two variables would provide the proponents of women's emancipation with another strong argument in favor of a greater representation of

women in parliament. Overall, positive results found in this research would contribute greatly to sustainable development and the emancipation of women.

1.7 Thesis Outline

This first chapter served as an introduction to the topic of the research. It focused on the problem analysis, research question and sub-questions, research design, and the academic, as well as societal relevance of the thesis. The second chapter digs deeper into the pool of existing literature and gives an overview of what is already known about women's political representation and the potential relationship between women's political representation and social policy outcomes. By doing so, the second chapter tries to answer the first sub-question. The third chapter relates to the second sub-question. It starts with a detailed description of the research design, followed by the operationalization of the variables. Besides women's political representation and access to clean water and sanitation, other variables that might have an influence on the dependent variables, as identified in chapter two, are also operationalized. Additionally, the third chapter includes an assessment of the reliability and validity of the research. Chapter four contains the empirical analysis and is thus linked to the third sub-question. After some descriptive statistics, it moves on to the linear panel regression analysis and the associated assumptions, to conclude with an overview of the statistical results. A conclusion is given in the fifth and final chapter. It provides an explanation of the results and their implications, and attempts to answer the central research question. In addition, it touches upon the limitations of the research and offers suggestions for future research.

2. Theoretical Background

In this chapter the reader is provided with an overview of the existing pool of literature on women's political representation. More precisely, it focusses on the influence of women's political representation on policies and outcomes in general and in developing countries specifically. Additionally, the chapter discusses the 'Critical Mass' theory, which could be regarded as a sub-theory of the theory on women's political representation. To conclude, the chapter provides the reader with the conceptual model of this research and the hypotheses derived from the literature discussed in this chapter.

2.1 Women's Political Representation

To assess the influence of increased political representation of women on policy outcomes, it is important to understand what the notion of 'representation' entails. The typology created by Pitkin (1967) is often used to explain what is exactly meant by political representation. According to Pitkin there are four types of representation: Formal, descriptive, substantive, and symbolic representation. Formal representation focusses on the formalities connected to representation. It includes the institutional rules and the ways in which representatives are chosen. Based on the notion of formal representation, "to represent simply means to act after authorization or to act before being held to account" (Pitkin, 1967: 59). Descriptive representation, on the other hand, is concerned with the extent to which the characteristics of the representatives correspond with the characteristics of the people who are being represented. Based on this type of representation, "true representation . . . requires that the legislature be so selected that its composition corresponds accurately to that of the whole nation" (Pitkin, 1967: 60). Regarding women's political representation, the percentage of women in a parliament points to the composition and thus the descriptive representation of the given parliament. Substantive representation encompasses the actions of the representatives and to what extent these actions are in line with the preferences and interests of the people who are being represented. Substantive representation is often interchangeably used with 'responsiveness'. The last type of political representation, symbolic representation, is predominantly concerned with whether the people who are being represented feel like they are being represented in a fair and effective way. This means that the symbolic representation can be high, even when the descriptive representation leaves room for improvement.

2.1.1 Integral Model of Representation

According to Pitkin (1967: 10-11), the four different concepts of representation are closely connected and fundamental parts of a coherent whole. This, however, has not stopped scholars from focusing on only one or two types of representation while disregarding the other concepts when conducting research on the overarching concept of political representation. Such empirical work often results in an incorrect and incomplete picture of representation. This common practice of omitting one or two types of representation is also frequently found in the literature on women's political representation. Schwindt-Bayer and Mishler (2005) have criticized this practice and constructed an integral model linking the four dimensions of representation.

By means of cross-sectional data on women's representation in 31 democracies they proved the interconnectedness of the four concepts. The researchers first constructed an integral model based on Pitkin's concept of representation and the alleged interconnectedness of the four different dimensions. Subsequently, they collected cross-sectional data on the four different types of representation. A total of three different measures for formal representation was used: District magnitude as a country's mean number of legislative seats per electoral district, parliamentary versus presidential systems, and single-member district versus proportional representation systems. To measure descriptive representation, the researchers used the percentage of women in the lower house of the national legislature. Substantive representation, on the other hand, was measured using four indicators. These indicators measured gender equality in political rights, gender equality in social rights, national maternity leave policy, and gender equality in marriage and divorce laws. These four indicators were chosen because they are "key issues of particular importance to women" (Schwindt-Bayer & Mishler, 2005: 416). Lastly, data on the question about citizens' confidence in the legislature from the World Values Survey was used to measure symbolic representation. This data was subsequently split into separate measures for men's and women's confidence. After having collected sufficient data, Schwindt-Bayer and Mishler used structural equation modeling procedures to validate the supposed multidimensional conception of political representation. "These [procedures] permit the simultaneous estimation of a complex causal model and of a series of measurement models for the principal concepts or 'latent variables' that are measured with multiple indicators" (Schwindt-Bayer & Mishler, 2005: 416).

The results show, among other things, that there is no significant link between substantive representation and formal representation, nor between substantive representation

and symbolic representation. Notwithstanding, a substantial and statistically significant link was found between descriptive and substantive representation.

Although the four types of representation form a coherent whole together, this thesis focuses solely on the percentage of women in parliament (descriptive representation) and its influence on certain aspects of development (substantive representation). Given the lack of statistically significant relationships between substantive representation on the one hand, and formal and symbolic representation on the other, this research does not expect that omitting the latter two dimensions of representation will distort the research.

2.1.2 Relationship Between Women's Descriptive and Substantive Representation

As mentioned before, scholars have often exclusively focused on one or two types of representation. When women's representation in national legislatures slowly started to increase, most studies focused on the factors that prohibited or facilitated this increase (e.g. Hughes, 2009; Viterna et al., 2008; Lee, 2015; Stockemer, 2011). These studies thus centered on descriptive representation given their focus on women's shares in parliaments and how to enlarge them. After women's political representation started to stabilize, researchers shifted their attention from descriptive representation towards the relationship between descriptive and substantive and/or symbolic representation. A vast majority of these studies concentrated on Western countries.

2.1.2.1 Developed Countries

2.1.2.1.1 Country-Specific Studies

Country-specific research comprises a vast amount of articles. Research on the United States has pointed out that women in states with high rates of female representation introduce and pass more priority bills focusing on children, family, and women's issues than men in the same state and more than women in states with lower rates of female representation (Thomas, 1991). It has also been found that women in Congress vote differently on women's issues compared to their male counterparts. This difference is most apparent when it involves issues related to reproduction or women's health (Swers, 1998). Moreover, female legislators have been found to have unique policy priorities, particularly concerning women's issue. These female legislators have also been found to be more successful in passing legislation concerning women, children, and families into law (Swers, 2002). Other research on the United States has shown that women's legislative representation is positively linked to the existence of female-friendly policies and that women's legislative representation seems to be a better predictor of the

existence of female-friendly policies than women's executive representation (Caiazza, 2004). Furthermore, Paxton and Hughes (2007) found, based on an extensive literature review, that female state representatives are more likely to prioritize bills that concern family, health care, and social services. Another article discusses the finding that female legislatures in the United States hold more liberal preferences on welfare state policy than their male counterparts, even after controlling for constituency demands and other relevant control variables such as ideology (Poggione, 2004). A more recent research has found a strong positive relationship between women's legislative representation and state elderly friendliness (Giles-Sims, Green & Lockhart, 2012).

The pool of literature on the relationship between descriptive and substantive representation in Europe is also significant. An analysis of the official records of plenary debates of the National Assembly of Wales led to the conclusion that women show a stronger inclination to initiate and engage in debates on topics related to gender equality and women's issues (Chaney, 2006). In a later research on the Scottish Parliament, Chaney found that women are more likely to refer to childcare and gender during debates. Additionally, he found no significant gender differences regarding equality of opportunity and health issues, while reproductive rights, control of sexuality, and abuse against women showed vast differences among men and women in their tendency to initiate and engage in debates (Chaney, 2012). Furthermore, research has shown that more women in parliament leads to more female-friendly policies in England (Childs, 2002). Moreover, parliamentary surveys conducted at the Swedish Riksdag pointed out that female politicians more so than male politicians are concerned with social welfare state policies, such as social and family policies and elderly and health care. Results also showed that predominantly female politicians try to advance gender equality (Wangnerud, 2000). Svaleryd (2009) looked at women's political representation in Sweden as well, but instead of focusing on the Riksdag, she focused on local councils. The conclusion that she derived from her analysis is that a higher level of female representation leads to increased spending on childcare and education compared to elderly care. Meanwhile, in the neighboring country Norway, Bratton and Ray (2002) reached the conclusion that descriptive representation indeed affects policy outcomes. This effect was most evident in the early stages of the policy life cycle. This indicates that "policy innovation or early adoption may be more closely related to descriptive representation than is the expansion or maintenance of existing policy" (Bratton & Ray, 2002: 436). They also found a significant positive relationship between the percentage of women in the municipal council and the provision of child care. With regards to Belgium, no significant positive relationship has been found between the proportion of women in

parliament and the number of interventions in favor of women (Celis, 2006). Put differently, no clear link between descriptive and substantive representation has been found. However, according to Celis (2006: 85), female members of parliament were "the most fervent representatives and contributed in a unique way to how women were represented". Adding to that, Belgian female MPs "stretched the borders of the political definition of women's interests and made them fit better with the way women themselves defined their interests" (Celis, 2006: 85). Celis therefore argued that a higher degree of descriptive representation indeed led to improved substantive representation in Belgium.

2.1.2.1.2 Cross-National Studies

Cross-national as opposed to country-specific studies are also numerous. In a time-series cross-sectional research on multiple industrialized countries, a significant positive link between female political representation and social and employment policies that benefit women was found (O'Regan, 2000). Another similar time-series cross-sectional analysis on several industrial countries proved that a higher level of women's representation in state legislatures leads to increased spending on social policies such as health care and education (Bolzendahl & Brooks, 2007). This finding was subsequently endorsed by a similar paper on the influence of women's legislative representation on social policy spending in industrialized countries (Bolzendahl, 2009). Kittilson (2008) added to these findings by establishing a positive relationship between the proportion of women in parliament and maternity leave duration and benefits. She did so by performing a time-series cross-sectional analysis. A more recent study on women's political representation and spending on family benefits in 27 OECD countries reported a similar positive relationship (Ennser-Jedenastik, 2017). However, this positive relationship was only found for in-kind spending on family benefits and not for cash transfers. Additionally, a strong interaction effect between female labor force participation and women's political representation was found. This means that expenditure on family-related services was highest when women's political representation as well as female labor force participation was high. When female labor force participation was low, women's political representation had no effect on spending on family benefits. It is furthermore interesting to note that Ennser-Jedenastik (2017) not only looked at the proportion of women in parliament, but also at the share of ministerial posts occupied by women as an indicator of women's political representation. Both indicators had a positive impact on in-kind spending, also when either was excluded. Furthermore, a larger share of women in parliament has been linked to greater poverty reduction in 18 affluent Western democracies (Brady, 2009).

2.1.2.2 Developing Countries

As previously stated, a large part of the literature on the relationship between women's descriptive and substantive political representation focuses on developed, Western countries. Articles that exclusively discuss women's legislative representation in developing countries are limited and often (qualitative) case studies on a single country.

2.1.2.2.1 Country-Specific Studies

A good example of such a case study is the research by Goetz (2002). In her case study on Uganda, she came to the conclusion that, although women enjoyed a high and increased level of political representation, their effectiveness in advancing women's interests was thwarted by the patronage system of the single, leading party. A more recent research by Wang (2013), however, argues that some pro-women laws have been passed in Uganda following the reintroduction of a multi-party system ahead of the 2006 elections. Although the passage of pro-women legislation coincides with the reintroduction of a multiparty system, the latter does not seem to have been a significant factor. Instead, the organizational initiative of the women's caucus, the new working relationships between male and female MPs, and the stronger ties between pro-women actors both inside and outside the parliament seem to have been the main driver behind these newly enacted pro-women laws.

Female politicians in neighboring country Rwanda have also experienced difficulties in effectively influencing policies (Burnet, 2008). Although their political representation and participation increased, their power to influence policy making decreased. This phenomenon has been blamed on the fact that many women civil society organizations lost their strong leaders, and with them the capability to influence the decision-making process, because the strong female leaders left to take one of the newly reserved seats in the national legislature.

A similar negative result has been found in Morocco. Even though the country adopted gender quotas and saw the proportion of women in parliament grow, there was no increase in the initiation and passage of women-friendly policies (Sater, 2007). This disappointing result has been blamed on various factors such as the entrenched political practice and male-dominated culture. Another possible explanation could be the small proportion of women in parliament, namely 10%. Although a significant increase of women's political representation has taken place, 10% is still limited.

Another case study on an African country reported again rather disappointing results. A research on the influence of the gender of the political leader in the constituency on public's perception of the quality of life in Kenya has found no significant impact of women's political

leadership on people's perception of the quality of life. However, it is important to note that the perception of quality of life is strongly subjective due to its value-laden character (Paiva, 1977). It is thus possible that many confounding factors have biased the results (Nyaondo, 2015).

Moreover, research on women's political representation in Tanzania has found that an increased share of women MPs leads to a better inclusion of women's interests, concerns, and perspectives in parliamentary debates and in the policy-making process (Yoon, 2011; Yoon, 2013). Policy successes include legislative changes concerning the protection of female employees from sex discrimination, maternity leave, the protection of women and girls from rape, sexual abuse, and female genital mutilation, the right to own land, and spousal consent in mortgaging matrimonial homes. In addition, the larger share of women in the Tanzanian parliament has caused women's issues to be included in the budget process. Poverty, children's health and education, child labor, HIV/AIDS, water, agriculture, marriage, maternal health, energy, and community development have all been mentioned as women's issues.

An important study on the influence of women's representation in a country beyond the African continent is the research conducted by Chattopadhyay and Duflo (2004). By means of randomized experiments in two Indian districts they found that female council leaders invest more in public goods more closely linked to women's concerns such as drinking water in both districts and roads in only one. The authors did not find any other factor besides gender that could have caused this increased investment in the aforementioned public goods.

Another country-specific research on a developing country beyond the African continent is the research by Franceschet and Piscopo (2008). In their paper on women's substantive representation in Argentina they discuss the results from their analysis of data on bill introductions and legislative successes, and data from the multiple interviews they conducted. Based on their findings, they concluded that elected women successfully gendered the legislative agenda, but not the legislative outcomes. According to them, legislative success depends on institutional rules, including formal as well as informal norms.

Other research focusing on Argentina, as well as Colombia and Costa Rica, describes how female legislators focus more strongly on issues related to women's equality and children and the family than their male counterparts. In addition, it was found that gender is not a significant factor concerning topics such as education, health, and the economy. Regarding bill initiation, significant gender differences were found. Female legislators were more likely to initiate and sponsor bills on women's issues, children and the family, education, and health. Additionally, female legislators were less inclined to sponsor bills regarding the economy,

agriculture, and fiscal affairs. These findings are based on statistical analyses of data from surveys on legislators' preferences and archival data on bill initiation (Schwindt-Bayer, 2006).

2.1.2.2.2 Cross-National Studies

Alongside these country-specific articles, research on multiple developing countries has also been conducted. An excellent example is the article by Swiss et al. (2012). With a sample of 102 developing countries, they looked into the relationship between women's proportions in national legislatures and child health. Using four indicators of child health, namely the rate of measles immunization, DPT immunization, infant survival, and child survival, and a time-series cross-sectional research design, they arrived at the conclusion that women's political representation leads to better scores on child health indicators in developing countries. This finding was especially significant for countries that experienced low levels of economic and social development. International ties, particularly with international non-governmental organizations, were also found to influence the aforementioned finding, but in a negative direction. Democratic status, on the other hand, did not exert a significant effect.

Another research, with a sample of 50 developing countries, has linked women's empowerment to child malnutrition (Burroway, 2016). The cross-sectional design included multi-level models to look at the relationship on the individual and national level. To measure women's empowerment, the author looked at women's education, control over reproduction, representation in national politics, and life expectancy. Regarding child malnutrition, the research used data on stunting and wasting among children under five. Stunting stands for a low height-for-age and results from long-term malnutrition. Wasting stands for a low weight-for-height and is the result of recent or sudden food deprivation and thus acute malnutrition (UNICEF, 2015). Control variables included inter alia Gross Domestic product (GDP) per capita and various individual level variables such as household size, the mother's employment status, and the mother's education level. Results showed that a higher degree of women's empowerment corresponds with lower levels of child malnutrition. The strength of this relationship has been found to be equal to or even larger than the relationship between economic development and child malnutrition. When looking specifically at women's representation in politics, it becomes clear that the effects were generally weaker than those connected to the other measures of gender inequality. Furthermore, the share of women in parliament had a significant impact on wasting, but not on stunting. An explanation the author offers is that women are perhaps better at tackling short-term malnutrition problems (wasting), but do not yet have enough power to address the underlying long-term causes (stunting).

A third quantitative (time-series) cross-sectional research on developing countries used a sample of 51 low and middle income countries for the cross-sectional part, and 20 countries for the longitudinal part (Quamruzzaman & Lange, 2016). By means of a multi-level analysis the authors found a negative relationship between women's political representation and infant mortality and a positive relationship between women's political representation and measles vaccination status. A higher level of women in parliament thus leads to a lower infant mortality rate and a higher measles immunization rate. Additionally, it has been found that health spending by the state significant mediates the relationship between women's legislative representation and child health. Besides public spending on health, the research also controlled for variables on the individual level, such as the child's gender and the mother's level of education and country-level variables such as GDP per capita, foreign aid, and the level of democracy.

Besides cross-national studies on developing countries only, there are also some papers that cover as many countries as possible, depending on the availability of data. Although the samples also include developed countries, most countries are classified as developing countries. Westfall and Chantiles (2016) included all countries as recognized by the United Nations in their sample. By means of a time-series cross-sectional analysis they found a statistically significant link between the percentage of women in the legislature and women's health measured as female life expectancy, maternal and infant mortality, and fertility rate. Control variables used in the research include, among others, GDP, the level of freedom, and foreign aid. Clayton and Zetterberg (2015), on the other hand, included all states with a population of over one million people for their time-series cross-sectional analysis. Results showed that increased women's political representation is linked to increases in state health expenditure, but not to spending on education or the military, nor to the overall amount of public expenditures. For this research, multiple variables such as GDP per capita, female labor force participation, and foreign aid were used as control variables.

2.1.3 Critical Mass

A sub-theory of the theory on the relationship between descriptive and substantive representation is the 'Critical Mass' theory. The theory stems from a field study performed by Kanter (1977). In her article, she described the dynamics and processes that take place in groups with varying proportions of sub-groups. In total, she identifies four group types: Uniform, where the ratio of socially and culturally different people in a group is 100:0, Skewed, with a ratio of 85:15, Tilted, where the ratio is 65:35, and Balanced with a ratio of 60:40 or 50:50.

Kanter's field study took place in a large industrial corporation where women made up a minority (15%) in a male-dominated (85%) workforce. Women were described as 'tokens' and their position was associated with phenomena such as performance pressure due to visibility, isolation and women turning against their own gender due to polarization, and role entrapment due to assimilation. According to Kanter, the ratio should shift in favor of women to overcome these problems and to give women the power to establish change. As she puts it: "Women need to be added to total group or organization membership in sufficient proportion to counteract the effects of tokenism" (Kanter, 1977: 988).

Although Kanter laid the groundwork for the 'Critical Mass' theory, it is not until the article by Dahlerup (1988) that the theory is applied to women's legislative representation and behavior. Dahlerup tested the 'Critical Mass' theory by applying it to Scandinavian countries, where women in parliament have changed from a small minority into a large minority. Based on in-depth interviews, multiple surveys, and data on women's political representation and the strategies women have used to improve their representation, Dahlerup concluded that it is difficult to apply the idea of a turning point to the social sciences and that the concept of critical acts might be a good alternative. Critical acts are acts that "change the position of the minority considerably and lead to further changes" (Dahlerup, 1988: 296). Despite Dahlerup's rather skeptical stance towards the concept of a critical mass, many authors view her, together with Kanter, as the founder of the 'Critical Mass' theory. This is because of the "multiple strands and occasional inconsistencies in Dahlerup's arguments", which leave room for interpretation about the importance of mass as opposed to acts (Childs & Krook, 2008: 731). For example, Dahlerup mentions that "the presence of women politicians in great numbers does make it seem rather hopeless to try to remove women from the public sphere today. So, numbers do count" (Dahlerup, 1988: 285), and that "the higher the proportion of women, the more social conventions will change" (Dahlerup, 1988: 290). Additionally, she argues that "the opportunity for women to form majority coalitions . . . increases when they constitute 30 per cent, rather than 5 per cent" (Dahlerup, 1988: 294).

Regardless of Dahlerup's rather dubious stance on critical mass, many researchers have built on the theory of 'Critical Mass' and multiple studies have proven the working of a critical mass. Other scholars have found a critical mass to be a contributing, but not the single, nor a sufficient factor in advancing policy on women's issues. A third group of scholars dismisses the theory of 'Critical Mass' altogether and argues instead in favor of critical actors and critical acts. The article by Childs and Krook (2008) is a good example of this third stance on critical mass. The authors argue in favor of changing the way of thinking from "*when* women make a

difference" to "*how* the substantive representation of women occurs" and from "what *women* do" to "what *specific actors* do" (Childs & Krook, 2008: 734).

2.1.3.1 Empirical Evidence

As mentioned before, numerous scholars have found evidence in favor of the 'Critical Mass' theory. Swiss et al. (2012) found that countries that passed a 20 per cent threshold of women in parliament scored better on child health indicators than countries that had not passed the threshold. Moreover, a research on women's legislative representation in Swedish local councils and public spending on childcare, elderly care, and education established that women's representation had to reach a minimum of at least 30 per cent for women's political representation to be translated into policy change (Svaleryd, 2009). Furthermore, in her evaluation of studies on women in American state legislatures, Swers (2002: 174) concluded that "sex differences in the policy priorities of members gain strength as the proportion of women in the legislature approaches a certain threshold". In addition, the research by Quamruzzaman and Lange (2016) found evidence of a high threshold for infant death, but a low threshold for measles vaccination. A possible explanation is that policies on measles vaccination are more likely to be supported by male politicians as they more directly affect child health. A bigger support by male politicians means that less women are needed to pass legislation on the given topic and thus explains the low threshold. Infant death, on the other hand, is caused by direct and indirect factors. This blurs the link between specific policies and child health and may therefore lead to less support by male politicians and thus the need for a higher level of women's political representation.

Other scholars have found instead that a critical mass is important, but not the only, nor a sufficient factor to enact policy changes. In her observations of the New Zealand parliament, Grey (2002) found that a critical mass of women had been successful in changing the political agenda and part of the political culture, but had not resulted in the passage of more women-friendly policies. As explanation, Grey argues that "for critical mass to be a viable concept, it must take account of the influence of entrenched attitudes and positional power" (2002: 30). Kittilson (2008) adds to that by stating that it is not sufficient to focus predominantly on increasing women's share in the legislature, even though she established that a bigger proportion of women in parliament leads to greater maternity and childcare leave policies. Instead, she mentions that women's movements and organizations play an important role as well in getting women's issues on the policy agenda. Moreover, Chaney (2006) found in his case study on the National Assembly of Wales that passing a certain threshold does not

guarantee substantive representation. According to him, it is the interplay between a critical mass and critical actors that matters. In his more recent research on the substantive representation of women in the Scottish parliament he underwrites this finding once more (Chaney, 2012).

2.1.4 Access to Clean Water and Sanitation

Overall, many scholars have found clear positive links between the proportion of women in parliament in developed countries and the prioritization of and spending on female-friendly and social policies such as education, health care, and family policies (e.g. O'Regan, 2000; Bolzendahl & Brooks, 2007; Bolzendahl, 2009; Kittilson, 2008). Similar results have been found when samples included as many countries as possible (Westfall & Chantiles, 2016; Clayton & Zetterberg, 2015). Regarding developing countries, cross-sectional multi-country analyses found predominantly positive results (Swiss et al., 2012; Burroway, 2016; Quamruzzaman & Lange, 2016). However, these positive results are all related to health. No cross-sectional multi-country studies on developing countries have looked at the influence of women's political representation on other development indicators such as education, poverty relief, and access to clean water and sanitation. Country-specific studies on developing countries, on the other hand, looked beyond health, but did not always find positive results (e.g. Goetz, 2002; Burnet, 2008; Sater, 2007).

Nevertheless, in Tanzania, an increased share of women in the national legislature has been found to lead to a better inclusion of women's interests, concerns, and perspectives in parliamentary debates and the budget process (Yoon, 2011). Access to water was mentioned as a women's issue. According to Yoon (2011: 89) "issues such as water and energy affect everyone, but affect women more than any other group, because they are the ones responsible for fetching water and firewood every day". For example, in 7 out of 10 households in 45 developing countries, women and/or girls are responsible for collecting water (JMP, 2010: 20). Moreover, Chattopadhyay and Duflo (2004) found that female council leaders in India invested more in public goods more closely related to women's issues, such as drinking water. Although the aforementioned studies are country-specific studies, it is plausible that the results also hold for other developing countries.

Concerning access to sanitation, no scientific paper has linked improved access to sanitation to women's political representation. However, access to sanitation is often seen as a women's issue (O'Reilly, 2010). Privacy and safety for women have been found to be among the main reasons why households spend money on latrines. Furthermore, improved sanitation

facilities lead to family wellness and child survival (Van Wijk-Sijbesma, 1998), which in turn are areas that generally receive more attention from female than male MPs in developed, as well as developing countries (e.g. Kittilson, 2008; Thomas, 1991; Swiss et al., 2012; Burroway, 2016; Yoon, 2011). This gives reason to believe that increased women's political representation in developing countries will not only improve access to clean water, but also access to sanitation facilities.

All in all, access to clean water and sanitation are seen as women's issues in developing countries. Studies on women's political representation in developed and developing countries have pointed out that a larger share of women in parliament leads to a stronger focus on women's issues (e.g. Swers, 2002; Childs, 2002; Westfall & Chantiles, 2016; Bauer, 2012; Yoon, 2011). Higher levels of women's political representation in developing countries could therefore possibly lead to improved access to clean water and sanitation. As these two development indicators of SDG six are often assessed separately, and progress on both indicators not always follows the same trajectory (JMP, 2015), this research uses separate measures for access to water and access to sanitation.

2.2 Conceptual Model

Based on the findings mentioned above, this paper will now formulate a hypothetical answer to the central research question. In addition, it will provide the reader with a conceptual model of the relationship between the dependent, independent, and control variables.

2.2.1 Hypotheses

The central research question this paper tries to answer is 'What is the influence of women's political representation on access to clean water and sanitation in developing countries?'.

Based on the existing body of literature, as discussed in this chapter, the research has formulated to following hypothesis:

H_1: Higher levels of political representation of women lead to increased access to clean water and sanitation in developing countries.

In addition, following up on the 'Critical Mass' theory, this research has formulated a second hypothesis:

H_2: The political representation of women will only lead to policy change after it has passed a 20% threshold.

2.2.2 Control Variables

As can be derived from the first hypothesis, this research expects to find a positive relationship between women's political representation and access to clean water and sanitation. Women's political representation is the explanatory variable of interest of this paper. Nonetheless, some other variables are expected to influence access to clean water and sanitation in developing countries as well and have therefore been included in this research as control variables.

The first control variable is economic development. Economic development has been found to significantly and positively correlate with better scores on development indicators (Swiss et al., 2012; Quamruzzaman & Lange, 2016; Westfall & Chantiles, 2016; Burroway, 2016). Moreover, Jenkins found that the national income of a country is strongly and positively associated with access to improved water sources and improved sanitation facilities in several sub-Saharan African nations (2010). This research therefore expects economic development to account for at least some of the improvements on access to clean water and sanitation.

Foreign aid to the water and sanitation sector has been included as a second control variable. Improving people's access to safe drinking water and improved sanitation facilities is an objective of many bilateral and multilateral aid programs in developing countries (WHO, 2017). Furthermore, scholars have often found foreign aid to significantly and positively correlate with development indicators (Swiss et al., 2012; Quamruzzaman & Lange, 2016; Westfall & Chantiles, 2016; Clayton & Zetterberg, 2015). Foreign aid is therefore expected to cause levels of access to clean water and sanitation to increase.

The third control variable is women's social standing. As stated above, access to clean water and sanitation is regarded as a women's issue in developing countries. It is often expected that women's issues are more frequently and better addressed in countries where women enjoy a better social standing as opposed to countries where women have not yet achieved a better social position (Burroway, 2016; Westfall & Chantiles, 2016). Improved women's social standing is therefore expected to lead to higher levels of access to clean water and sanitation.

Besides these three control variables, this research has also included an interaction variable, namely democracy. Democracy is expected to increase people's access to clean water and sanitation by providing MPs with more legislative power. As stated by, for example, Goetz (2012) and Franceschet and Piscopo (2008), women's legislative power depends inter alia on the actual institutions in place. Democracy can best be regarded as an interaction variable as it is not expected to directly influence the dependent variable, but via interaction with the independent variable.

The four variables have been chosen based on their frequent use in similar studies. Table 1 gives an overview of these studies and the (control) variables that have been incorporated in the research. Although some scholars include public spending on a certain area related to the dependent variable, such as public spending on health when the research focuses on child health, this research has not included public spending on water and sanitation as a control variable. The main reason for omitting this control variable is the lack of data. This does not mean that the research does not expect public spending on water and sanitation to be of zero importance.

Authors	**Dependent variable** Measures	**Independent variable** Measures	**Control variables**	**Critical Mass threshold**
Swiss et al., 2012	**Child health** Measles immunization rate DPT immunization rate Infant survival rate Under-five survival rate	**Women's political representation** Percentage of seats held by women in the lower/single house of the national legislature	Regional dummy variable Population density GDP per capita, constant USD Birth rate Total debt service Female secondary enrollment rate Combined democracy index Count of parliamentary elections Left party in power Aid per capita, constant USD National memberships in INGOs Human rights treaty ratification	20%
Burroway, 2016	**Child malnutrition** Stunting among children under five Wasting among children under five	**Women's empowerment** Female secondary enrollment rate Female employment rate Percentage of seats held by women in the lower/single house of the national legislature Contraceptive prevalence Female life expectancy	Mother's education Mother's employment status Mother's marital status Mother's age Child's age Child's gender Household size Household wealth Head of family's age	N.A.

			Gender of head of family Multiple children Urban residence GDP per capita, PPP corrected	
Quamruzzaman, Lange, 2016	**Child health** Measles immunization rate Infant mortality rate	**Women's political representation** Percentage of seats held by women in the lower/single house of the national legislature	Regional dummy variable Child's gender Year of birth Mother's highest level of education Mother's age at birth of the child Area of residence Socioeconomic status GDP per capita, constant international dollars, PPP corrected Net official development assistance (ODA) per capita, current USD Female labor force participation rate Female secondary enrollment rate Left party in power Combined democracy index Public spending on health	20%
Westfall, Chantiles, 2016	**Women's health** Female life expectancy Prenatal care Maternal mortality rate Infant mortality rate Fertility rate	**Women's political representation** Percentage of seats held by women in the lower/single house of the national legislature	Female literacy rate Democracy GDP, PPP corrected GDP growth rate Public spending on health Net official development assistance (ODA) Muslim majority	N.A.
Clayton, Zetterberg, 2015	**Legislative spending priorities** Public spending on education	**Quota policy strength** Degree of change in women's parliamentary representation that was initiated by a quota policy	Female – male labor force participation ratio Share of population living in urban areas	N.A.

	Public spending on military Public spending on health		Share of population that is elderly (65 and over) Share of population that is young (14 and under) GDP per capita Official development assistance (ODA)	

Table 1: Summarizing Table of Dependent, Independent, and Control Variables

2.2.3 Conceptual Model

In order to visualize the relationship as stated in the hypothesis and the multiple control variables as discussed above, a conceptual model has been constructed (see figure 1).

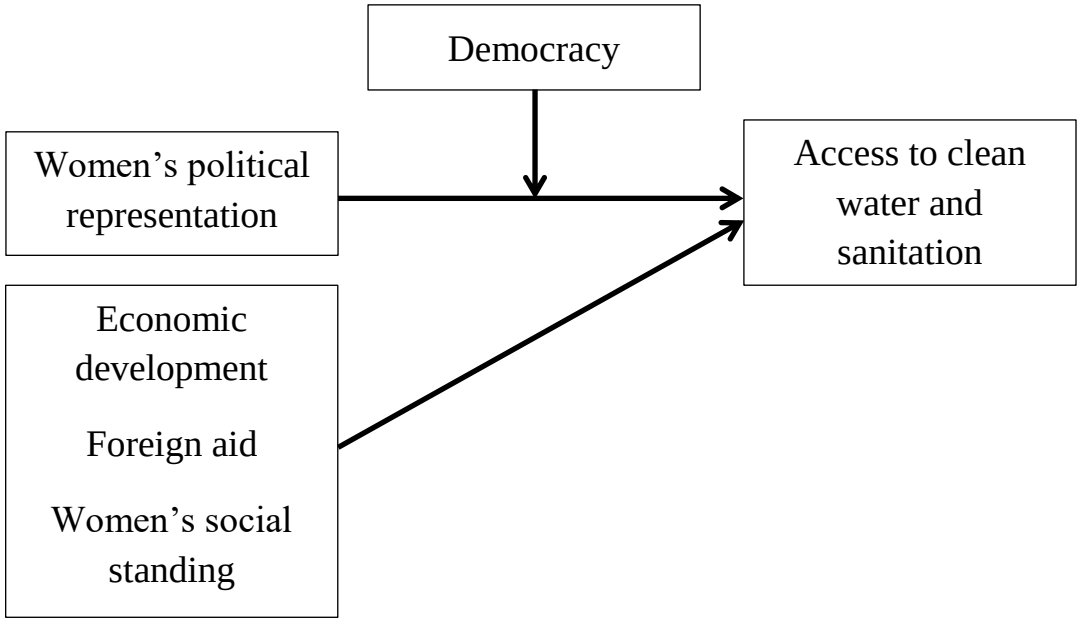

Figure 1: Conceptual Model

3. Research Design

While trying to answer the central research question, this research simultaneously aims to make sound inferences about causality and to find results that can be generalized to all developing countries. To address the aim of the research and to answer the research question, a time-series cross-sectional research design will be employed. This chapter provides the reader with a detailed description and justification of this research design. Furthermore, it mentions the population of the research and how a sample has been chosen. Subsequently, it discusses the operationalization of the dependent, independent, and control variables. To conclude, this chapter assesses the reliability and validity of the research. Taken together, these different sections answer the second sub-question: How can the variables be operationalized and the possible relationship be researched?

3.1 Times-Series Cross-Sectional Research Design

An experimental research design is regarded as the best research design to establish causality between a dependent and independent variable. As this research is interested in causality, an experiment would be the most appropriate research design. Unfortunately, this is not possible. Developing countries are the unit of analysis. Countries are difficult to assign to treatment and control groups. Moreover, the independent variable is a non-manipulable variable. This makes it impossible to influence a country's exposure to the independent variable. The research has therefore opted for a time-series cross-sectional research design (Bryman & Bell, 2011: 41; Justice, 2008: 87).

A time-series cross-sectional research design is a mixture of a cross-sectional and a longitudinal design. A cross-sectional research design encompasses the collection of data on multiple variables of multiple cases at a single point in time, whereas a longitudinal design compares data over time. In general, a cross-sectional research design is not suited to establish causality due to the simultaneous measurement of the variables. It focuses therefore on the detection of patterns of association. Adding a time-series element to the research design allows some causal inferences to be made. Although experimental designs are better at establishing causality, a time-series cross-sectional research design does resolve some of the problems that plague cross-sectional designs (Bryman & Bell, 2011: 53-59; Justice, 2008: 87). Additionally, the incorporation of a time-series element increases the number of observations. This leads to a higher possibility of finding statistically significant results (Eom, Lee & Xu, 2008: 579).

Furthermore, a (time-series) cross-sectional research design is often characterized by the inclusion of many cases (large N). As a cross-sectional research design concentrates on identifying patterns of association, it is interested in variation among cases and variables. The more cases that are included, the better variation can be detected. Additionally, a large sample is desirable as this likely results in a higher external validity and thus a higher level of generalizability (Bryman & Bell, 2011: 56). A large N fits well with the aim of this research. It allows many developing countries to be included in the research, and it leads most probably to a higher generalizability.

Moreover, the chosen research design enables the incorporation of multiple variables which facilitates the inclusion of many control variables. This is important because it allows checking for confounding factors. This positively contributes to the internal validity of the research. Given the wish to make sound inferences about causality, the incorporation of multiple control variables corresponds with the aim of the research.

The current research is closely related to the research conducted by Swiss, Fallon, and Burgos (2012) that looked into the relationship between women's political representation and child health in developing countries. They also employed a time-series cross-sectional research design. Other relevant studies that employed the same research design include the studies by Fallon, Swiss, and Viterna (2012), Bolzendahl and Brooks (2007), Matland (1998), Westfall and Chantiles (2016), Burroway (2016), and Quamruzzaman and Lange (2016). This leads to the conclusion that the chosen research design is in line with prior employed research designs and thus an appropriate choice.

3.1.1 Empirical Method

3.1.1.1 Linear Panel Regression Model

A multitude of statistical models and methods exists to verify whether there is a relationship between the dependent (Y) and independent (X) variable, and to control for confounding factors. A commonly used model is the linear regression model. Linear regression models come in various forms, such as the simple linear regression analysis that solely focuses on the dependent and independent variable, and the multiple linear regression analysis that adds control variables to the simple linear regression model (Chavda, 2008: 352). Linear panel regression models are linear regression models particularly useful when dealing with three-dimensional data (multiple units, multiple variables, and multiple measurements in time), also known as panel data. The general formula of a linear panel regression model is as follows:

$$y_{it} = \beta_0 + \beta_1 x_{it,\,1} + \beta_2 x_{it,\,2} + \ldots + \beta_k x_{it,\,k} + \varepsilon_{it}$$

where y stands for the dependent variable, x for the explanatory variables, β_0 for the intercept, β_k for the regression coefficient, i for the unit of observation, t for the period of time, k for the k^{th} explanatory variable, and ε_{it} for the error term. The error term can be further specified as:

$$\varepsilon_{it} = a_i + u_{it}$$

where a_i stands for the unit-specific error, and u_{it} for the idiosyncratic error (Eom et al., 2008: 586). Adding the dependent, independent, and control variables to the general formula leads to the following model:

1. $$ACC_{it} = \beta_0 + \beta_1 WPR_{it,\,1} + \beta_2 ECO_{it,\,2} + \beta_3 AID_{it,\,3} + \beta_4 WSS_{it,\,4} + \beta_k x_{it,\,k} + \varepsilon_{it}$$

where i stands for a developing country (i = [1…112]), t for a given year (t = [1…15]), β_0 for the intercept, β_k for the regression coefficient, k for the k^{th} explanatory variable (k = [1…4]), and ε_{it} for the error term. Additionally, the following acronyms stand for the different variables that are operationalized in section 3.3:

ACC	Access to clean water and sanitation
WPR	Women's political representation
ECO	Economic development
AID	Foreign aid
WSS	Women's social standing

As explained in the second chapter, there are two different dependent variables. This leads to the following two models:

2. $$WAT_{it} = \beta_0 + \beta_1 WPR_{it,\,1} + \beta_2 ECO_{it,\,2} + \beta_3 AID_{it,\,3} + \beta_4 WSS_{it,\,4} + \beta_k x_{it,\,k} + \varepsilon_{it}$$

3. $$SAN_{it} = \beta_0 + \beta_1 WPR_{it,\,1} + \beta_2 ECO_{it,\,2} + \beta_3 AID_{it,\,3} + \beta_4 WSS_{it,\,4} + \beta_k x_{it,\,k} + \varepsilon_{it}$$

where WAT denotes access to water and SAN access to sanitation. These two models are the final models of interest of this research. However, these models do not include the interaction variable democracy. As specified in chapter two, democracy is expected to influence the relationship between the independent variable and dependent variable. To control for the influence of democracy, this research will also run models 2 and 3 including an interaction term. This leads to the following two models:

4. $WAT_{it} = \beta_0 + \beta_1 WPR_{it,\,1} + \beta_2 ECO_{it,\,2} + \beta_3 AID_{it,\,3} + \beta_4 WSS_{it,\,4} + \beta_5 DEM_{it,\,5} + \beta_6 INTER_{it,\,6} + \beta_k x_{it,\,k} + \varepsilon_{it}$

5. $SAN_{it} = \beta_0 + \beta_1 WPR_{it,\,1} + \beta_2 ECO_{it,\,2} + \beta_3 AID_{it,\,3} + \beta_4 WSS_{it,\,4} + \beta_5 DEM_{it,\,5} + \beta_6 INTER_{it,\,6} + \beta_k x_{it,\,k} + \varepsilon_{it}$

where DEM stands for democracy and INTER for the interaction term of women's political representation and democracy.

In addition to the relationship between the independent, dependent, and control variables as specified above, this research is also interested in validating or rejecting the 'Critical Mass' theory as discussed in chapter two. This research will therefore also run models 2 to 5 with four dummy variables for women's political representation instead of the continuous measure. Replacing the continuous measure with the categorical measure results in the following models:

6. $WAT_{it} = \beta_0 + \beta_1 CM1_{it,\,1} + \beta_2 CM2_{it,\,2} + \beta_3 CM3_{it,\,3} + \beta_4 CM4_{it,\,4} + \beta_5 ECO_{it,\,5} + \beta_6 AID_{it,\,6} + \beta_7 WSS_{it,\,7} + \beta_k x_{it,\,k} + \varepsilon_{it}$

7. $SAN_{it} = \beta_0 + \beta_1 CM1_{it,\,1} + \beta_2 CM2_{it,\,2} + \beta_3 CM3_{it,\,3} + \beta_4 CM4_{it,\,4} + \beta_5 ECO_{it,\,5} + \beta_6 AID_{it,\,6} + \beta_7 WSS_{it,\,7} + \beta_k x_{it,\,k} + \varepsilon_{it}$

8. $WAT_{it} = \beta_0 + \beta_1 CM1_{it,\,1} + \beta_2 CM2_{it,\,2} + \beta_3 CM3_{it,\,3} + \beta_4 CM4_{it,\,4} + \beta_5 ECO_{it,\,5} + \beta_6 AID_{it,\,6} + \beta_7 WSS_{it,\,7} + \beta_8 DEM_{it,\,8} + \beta_9 INTER_{it,\,9} + \beta_k x_{it,\,k} + \varepsilon_{it}$

9. $SAN_{it} = \beta_0 + \beta_1 CM1_{it,\,1} + \beta_2 CM2_{it,\,2} + \beta_3 CM3_{it,\,3} + \beta_4 CM4_{it,\,4} + \beta_5 ECO_{it,\,5} + \beta_6 AID_{it,\,6} + \beta_7 WSS_{it,\,7} + \beta_8 DEM_{it,\,8} + \beta_9 INTER_{it,\,9} + \beta_k x_{it,\,k} + \varepsilon_{it}$

where CM1 stands for the first critical mass dummy variable, CM2 for the second, CM3 for the third, and CM4 for the fourth.

The four dummy variables used in this research represent the following levels of women's political representation: The first dummy variable (CM1) represents levels of women's political representation of 10% or higher but lower than 20%, the second (CM2) represents levels of 20% or higher but lower than 30%, the third (CM3) represents levels of 30% or higher but lower than 40%, and the fourth (CM4) represents levels of 40% or higher.

The dummy variables will be constructed as follows: Observations with a share of women in parliament that falls within the range of the corresponding dummy variable will be assigned a 1, while the observations that do not fall within the range of the corresponding

dummy variable will be assigned a 0. Levels of women's political representation lower than 10% will constitute the reference category.

This thesis has chosen to use these four dummy variables based on the articles by Swiss et al. (2012), Quamruzzaman and Lange (2016), and Svaleryd (2009). Swiss et al. (2012) and Quamruzzaman and Lange (2016) use a dummy variable equal to CM1, while Svaleryd (2009) uses dummy variables equal to CM2, CM3, and CM4. Following Swiss et al. (2012), Thomas (1991), Giles-Sims et al. (2012) and Quamruzzaman and Lange (2016), this thesis expects to find a critical mass threshold at 20%. However, Svaleryd (2009) found results that affirm claims from the United Nations that a critical mass only arises around a threshold of 30% (UN Women, 2017). The use of the four different dummy variables and their corresponding levels of women's political representation will allow this thesis to validate or reject the hypothesis of a critical mass at 20%.

3.1.1.2 Assumptions of Ordinary Least Squares

An often-used estimation method for linear regression models is Ordinary Least Squares (OLS). Whether this estimation method is the best technique to use depends on certain assumptions that should be met by the data. The assumptions are as follows: Firstly, all variables must be measured on a ratio or interval level. However, a nominal or ordinal independent variable can be included in the model by means of a dummy variable. Secondly, the sample size should be sufficiently large. According to Graddy and Wang (2008: 468), the number of observations must exceed the number of independent variables. A general rule of thumb is a ratio of observations to predictors of 10:1 (Graddy & Wang, 2008: 484). Thirdly, the relationship between the dependent and independent variables should be linear. Fourthly, the error term as well as the variables themselves should be normally distributed. Fifthly, there should not be an exact linear relationship between the independent variables. In case this assumption is violated, one speaks of multicollinearity. Sixthly, the error term for a given observation should not be systematically correlated with the error term of other observations. A violation of this assumption is called autocorrelation. Lastly, the error term must have a constant variance for all observations, also known as homoscedasticity. If this is not the case, one speaks of heteroscedasticity (Graddy & Wang, 2008: 467-468). Chapter four contains an assessment of whether the assumptions are met.

3.1.1.3 Choice of Model

The OLS estimation method is frequently used in combination with a linear panel regression model. The specific estimation method used in such a situation is called 'Pooled OLS'. To be

able to use a pooled OLS linear regression model, the aforementioned assumptions have to be met. In case of a violation of (one of) the assumptions, one could opt for a 'Fixed Effects' or 'Random Effects' model. Although more linear panel regression models exist, these three models are the most-commonly used and therefore the focus of this research. To determine which model has the best fit, regressions will be run using the three different econometric models. Subsequent tests will be performed to assess which model is the Best Linear Unbiased Estimate (BLUE). These tests include an F-test to choose between pooled OLS and fixed effects, an LM test to choose between pooled OLS and random effects, and a Hausman test to choose between fixed and random effects (Park, 2011; Eom et al., 2008: 579). After performing the different tests and choosing the most appropriate model, the results of the model with the best fit will be discussed. The actions will be executed using STATA 14.1 MP.

3.2 Population and Sample

As mentioned before, this research focuses on developing countries. It aims to find results that hold for the whole population and thus for all developing countries. To attain this goal, this paper tried to include as many developing countries as possible in its sample. Countries have therefore only been omitted in case of missing data. A list of all the countries that have been included in the sample can be found in appendix I together with the countries that have been omitted due to a lack of data.

In defining developing countries, this paper has followed the example of Swiss et al. (2012) and Brady, Kaya, and Beckfield (2007) by defining a developing country as a country with a GDP per capita less than $5,000 in current dollars. Countries have been defined as a developing country based on their GDP per capita level in 1997. This means that some countries, such as China, Mexico, and Thailand, have been included in the sample even though nowadays they are not considered developing countries anymore. The research decided to do so, because the data on women's political representation that is used in the analysis starts with 1997. Given the fact that 1997 is the first year of the analysis, this research deemed it more appropriate to select countries that were developing countries in 1997 than countries that are nowadays regarded as developing countries.

Brady et al. (2007), as well as Swiss et al. (2012) also used the criteria of a population of at least 500,000 people to select countries for their sample. The main reason for using this criterion was the lack of data for smaller countries. As this research did not encounter these problems to a similar extent, the research decided not to apply the second criteria. Application of the criteria would cause some smaller states to be excluded from the sample. As stated in

section 3.1.1.2, it is important to have a sample size that is sufficiently large. Furthermore, according to Bryman and Bell (2011: 188), "up to a sample size of around 1,000, the gains in precision are noticeable as the sample size climbs from low figures of 50, 100, 150, and so on upwards". A bigger sample size is therefore likely to result in better findings.

The final sample consists of 112 countries. Furthermore, the data covers a time span of 15 years. As mentioned earlier, the data on women's political representation starts in 1997. The time span of women's political representation thus runs from 1997 to 2011. The time span of the dependent variables ranges from 2001 until 2015. This difference is caused by a four-year lag. The measure of women's political representation lags four years behind on the dependent variables to account for the time that might be needed for female members of parliament to enact change. When women are elected to parliament, they might not be able to change policies straightaway. Some topics may be lower on the political agenda and will therefore not be discussed straight after the election of a new parliament. Although the research uses panel data which facilitates the establishment of trends over the years, a lag is still needed for women's political representation as values for a given year are linked to each other. When performing the statistical analyses as described above, it is not possible to link the values of women's political representation for a given year to values of other variables from a different year. Hence the need to use a time lag for the data on women's political representation. Most studies use a lag of five years (e.g. Swiss et al., 2012; Quamruzzaman & Lange, 2016). This choice is often based on the mean electoral term of the sample, which is closest to five. This research makes use of a four-year lag because of the availability of data. There is no data available on women's share in the national legislature prior to 1997. Additionally, as this paper was written in 2017, data on 2016 was not always readily available. 2015 was the most recent year with sufficient data and thus the final year of the time span of the dependent variables. As the research uses a time span of 15 years, a four-year lag for women's political representation was the most feasible option. Although a four-year lag differs from the common practice of a five-year lag, this is not expected to harm the research. Quamruzzaman and Lange (2016) found in their research that a three-year lag resulted in similar findings as a five-year lag. As a four-year lag lies in between a three-year and a five-year lag, the four-year lag is deemed adequate.

A four-year lag is also used for the interaction variable democracy. Democracy is expected to interact with women's political representation. This research therefore deemed it necessary to use the same time span for the two variables. Concerning foreign aid, this research uses a one-year lag. This research expects foreign aid on the one hand to influence access to clean water and sanitation faster than women's political representation, but on the other hand

not straight away. By incorporating a one-year lag for foreign aid, this research tries to account for the time needed to carry out projects and to build or improve water sources and sanitation facilities. The time span of economic development and women's social standing is equal to the time span of the dependent variables.

Using annual panel data that covers 112 developing countries and a time span of 15 years, the data should contain a total of 1680 (112 times 15) observations. However, the data suffers from missing observations. As the research makes use of the listwise deletion method, the total number of observations is lower than 1680. The panel dataset is thus unbalanced. More on the missing observations can be found in the following chapter.

3.3 Operationalization

To verify by means of statistical analyses whether there is indeed a relationship between the dependent variables and the independent and control variables, the variables have to be operationalized. The following section discusses per variable which measure is used to operationalize it. Subsequently, these variables and their measures are summarized in table 2.

3.3.1 Dependent Variables

The dependent variables of this research are access to clean water and access to sanitation. These variables correspond with number six of the UN Sustainable Development Goals (SDGs) (UN, 2017a). Although the sixth SDG covers the availability and sustainable management of water and sanitation, this thesis focuses solely on the availability of water and sanitation for all. To operationalize the dependent variables, the research makes use of two measures as discussed below.

3.3.1.1 Access to Clean Water

The first indicator corresponds with the availability of water for all and measures the share of the population with access to an improved drinking water source. This is a ratio measure given the unique, non-arbitrary zero point when no one has access to an improved drinking water source. The data comes from the World Bank's World Development Indicators Database and is based on data from the World Health Organization (WHO) / UNICEF Joint Monitoring Program for Water Supply and Sanitation. The data is "based on national censuses and nationally representative household surveys" (World Bank, 2017a). Given the fact that the coverage rate is based on household surveys and thus information provided by service users as opposed to service providers, the data does not include nonfunctioning systems (World Bank, 2017a; JMP, 2017).

According to WHO/UNICEF, an improved drinking source is a source that is protected from outside contamination, especially from contamination with (human) feces. This protection can be ensured by the nature of the construction of the water source, or through active intervention. Improved drinking water sources include inter alia piped water into dwelling, plot or yard, public taps, tube wells or boreholes, protected springs, and rainwater collection (JMP, 2017). As the data is predominantly concerned with access to improved water sources, it does not take into account whether the water is safe or adequate. However, improved drinking water sources are more likely than those considered unimproved to provide safe drinking water (World Bank, 2017a).

The measure has been chosen because of the availability of sufficient data, and because it is closely linked to people's access to clean water.

3.3.1.2 Access to Sanitation

The second indicator corresponds with the availability of sanitation for all and measures the share of the population with access to improved sanitation facilities. This is also a ratio measure. The data comes from the World Bank's World Development Indicators Database and is based on data from the WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation. The data is, similar to the first indicator, "based on national censuses and nationally representative household surveys" (World Bank, 2017a). As the information is once more provided by service users instead of service providers, the data does not include nonfunctioning systems (World Bank, 2017a; JMP, 2017).

According to WHO/UNICEF, an improved sanitation facility is a facility that is "likely to ensure the hygienic separation of human excreta from human contact" (JMP, 2017). Improved sanitation facilities include inter alia a flush/pour flush to a piped sewer system, septic tank or pit latrine, ventilated improved pit latrine, and a composting toilet. Additionally, for such facilities to be classified as improved, they must be correctly constructed and properly maintained (JMP, 2017).

The measure has been chosen because of the availability of sufficient data, and because it is closely linked to people's access to sanitation.

3.3.2 Independent Variable

3.3.2.1 Women's Political Representation

The independent variable of this research is women's political representation. This variable is operationalized as the percentage of seats held by women in the lower or single house of the

national legislature. Corresponding data comes from the World Development Indicators Database of the World Bank and is based on data from the Parliamentary Union. The variable is measured on a ratio scale, as there is a unique, non-arbitrary zero point, namely when there are no women in parliament (World Bank, 2017a).

This specific indicator for women's political representation has been chosen based on its widespread use in prior research in the field of women's political representation (e.g. Swiss et al., 2012; Kittilson, 2008; Schwindt-Bayer & Mishler, 2005; Westfall & Chantiles, 2016). Data on the percentage of women occupying ministerial positions is also occasionally used as an indicator of women's political representation (Ennser-Jedenastik, 2017). This research has limited itself to the percentage of women in parliaments due to time constraints and the availability of data.

3.3.3 Control Variables

3.3.3.1 Economic Development

The control variable of economic development is operationalized as GDP per capita in constant 2011 international dollars. Furthermore, this research has opted for a GDP that is corrected for purchasing power parity (PPP). The data comes from the World Development Indicators Database of the World Bank and is measured on a ratio scale.

Gross Domestic Product is "the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products" (World Bank, 2017a). In other words, GDP stand for the total value of all final goods and services produced in a given country in a given year. PPP corrected means that the GDP in real prices has been converted using the purchasing power parity rate so that one dollar in a given country has the same purchasing power as one dollar in the United States (World Bank, 2017a). Various scholars used a PPP corrected GDP as well, such as Westfall and Chantiles (2016), Quamruzzaman and Lange (2016), and Burroway (2016). Given the similarities between the current research and the research conducted by the aforementioned scholars, using a GDP that is PPP corrected seemed to be a rational choice.

Furthermore, constant dollars have been used, which means that the data for each year is shown in the value of a particular base year, in this case 2011 (World Bank, 2017a). By means of constant dollars, one can control for the effects of price inflation and thus look at the true growth of GDP over the years. As this research encompasses a time span of 15 years and is concerned with comparing countries over the years, the use of constant dollars seemed to fit the

research better than the use of current dollars. A contributing factor to this choice is the fact that Swiss et al. (2012), as well as Quamruzzaman and Lange (2016) used constant dollars too.

Moreover, this research has opted for the use of a GDP per capita. Per capita means that the total GDP of a country has been divided by the size of its population. The main reason for this choice is that a GDP per capita facilitates the comparison of countries as it shows the average level of income, and thus the level of development. Additionally, Swiss et al. (2012), Quamruzzaman and Lange (2016), and Burroway (2016) used a GDP per capita as well, which once again strengthened this research's belief in the appropriateness of the measure.

3.3.3.2 Foreign Aid

To control for aid offered by the international community to the water supply and sanitation sector in developing countries, this research uses data from the Creditor Reporting System of the OECD. The data includes official development assistance (ODA) flows, all types of aid, is based on commitments as opposed to disbursements, and is measured on a ratio scale.

According to the OECD, ODA are "those flows to countries and territories on the DAC list of ODA recipient and to multilateral development institutions which are provided by official agencies, including state and local governments, or by their executing agencies, and each transaction of which is administered with the promotion of the economic development and welfare of developing countries as its main objective, and is concessional in character and conveys a grant element of at least 25%" (2017).

Furthermore, commitments are firm written obligations to provide a certain amount of resources for a certain cause to a certain country. Disbursements, on the other hand, are funds that have already been placed at the disposal of a recipient country (OECD, 2017). This research has opted for commitments because data was more widely available.

The specific measure per capita was not available. The final data has therefore been calculated by dividing the total amount of aid to the water supply and sanitation sector by the total population of a given country in a given year. The research has chosen to use a per capita measure because of the same reasons as specified in section 3.3.3.2. Additionally, foreign aid per capita has also been used in other, similar studies (Swiss et al., 2012; Quamruzzaman & Lange, 2016), which enhanced this research's belief in the appropriateness of the measure.

Moreover, the indicator uses constant 2015 US dollars. Arguments in favor of using constant dollars can be found in section 3.3.3.1. Additionally, Swiss et al. (2012) used constant US dollars as well for their measure of foreign aid. Although the measure of economic development uses constant 2011 international dollars, the measure of foreign aid uses constant

2015 US dollars. This difference is caused by the unavailability of data on foreign aid in constant 2011 international dollars.

3.3.3.3 Women's Social Standing

The control variable of women's social standing is operationalized by means of the female labor force participation rate. The measure denotes the share of women aged 15 or higher who are economically active. The data comes from the World Development Indicators database of the World Bank and is based on data from the International Labor Organization (ILO). Additionally, this research uses modeled ILO estimates. This means that the data is harmonized to ensure the comparability over time and across countries (World Bank, 2017a). The variable is measured on a ratio scale.

According to the World Bank, "labor force is the supply of labor available for producing goods and services in an economy. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers" (2017a). It does not include all types of work, such as unpaid work and family work.

The operationalization of women's social standing by means of female labor force participation rate is not completely unknown to academics. Clayton and Zetterberg (2015) and Quamruzzaman and Lange (2016) both used female labor force participation to represent women's social standing. Female secondary gross enrollment rate is also often used to represent women's social standing (Swiss et al., 2012; Quamruzzaman & Lange, 2016; Burroway, 2016). This research could unfortunately not include the latter measure due to an abundance of missing data. Moreover, the variation in labor force participation by women across developing countries is driven by various economic and social factors, including economic development, education levels, social norms, fertility rates, and access to childcare (Verick, 2014). This contributes to the belief that female labor force participation is an adequate measure of women's social standing.

3.3.3.4 Democracy

The variable of democracy is operationalized by means of data from the Freedom House (2017). The Freedom House provides data on political rights and civil liberties on a scale from 1 to 7, where 1 stands for most free, and 7 for least free. To create a single easy-to-use indicator, this research has first reversed the scores, so that 1 stands for least free and 7 for most free. Subsequently, the average of both scores (political rights and civil liberties) has been calculated for each country. The data that is used for this research is thus the reversed aggregate average of political rights and civil liberties. As democracy is expected to be a moderating factor, an

interaction term is used. To arrive at the interaction term, the values of women's political representation are multiplied by the values of democracy per year per country.

The Freedom House data is based on evaluations of "the electoral process, political pluralism and participation, the functioning of the government, freedom of expression and of belief, associational and organizational rights, the rule of law, and personal autonomy and individual rights" (Freedom House, 2017). These topics are related to various aspects of freedom and the level of democracy in a country. This measure is therefore deemed appropriate to use as an indicator of democracy. Additionally, various scholars have used this indicator too to measure democracy (Swiss et al., 2012; Quamruzzaman & Lange, 2016; Westfall & Chantiles, 2016).

Nevertheless, Swiss et al. (2012) and Quamruzzaman and Lange (2016) both used a combined measure to represent democracy. In addition to the data from the Freedom House, they used the Polity IV index as well. This research has decided not to use the Polity IV index to calculate a combined democracy index because of the availability of data. Although the Polity IV index covers the entire time span of this research, it does not include data on all the countries that have been included in the sample, as it only provides data on countries with a population of at least half a million. As described above, this research does not limit itself to countries with a population of at least 500,000 people. Instead, it has included countries in its sample regardless of the size of their population.

3.3.4 Operationalization Table

Dependent variables	**Measures**	**Level of measurement**	**Time span**	**Source**
Access to clean water	Percentage of the population with access to an improved drinking water source	Ratio	2001 – 2015	World Development Indicators database – World Bank
Access to sanitation	Percentage of the population with access to improved sanitation facilities	Ratio	2001 – 2015	World Development Indicators database – World Bank
Independent variable	**Measure**	**Level of measurement**	**Time span**	**Source**
Women's political representation	Percentage of seats held by women in the lower/single house of the national legislature	Ratio	1997 – 2011	World Development Indicators database – World Bank
Control variables	**Measures**	**Level of measurement**	**Time span**	**Source**
Economic development	GDP per capita in constant 2011 international dollars, PPP corrected	Ratio	2001 – 2015	World Development Indicators database – World Bank

Foreign aid	ODA to water supply and sanitation sector per capita in constant 2015 US dollars	Ratio	2000 – 2014	Creditor Reporting System – OECD
Women's social standing	Female labor force participation rate for women 15 years and older	Ratio	2001 – 2015	World Development Indicators database – World Bank
Democracy	Aggregate average of political rights and civil liberties ranging from 1 (least free) to 7 (most free)	Interval	1997 – 2011	Freedom House

Table 2: Operationalization

3.4 Reliability and Validity

In order to guarantee the quality of the research, it is important to assess the reliability and validity of the research design, method, and operationalized variables.

Reliability stands for the quality, consistency, and representativeness of a measure and is closely related to measurement validity. Its main focus is the repeatability of the research. A research scores high on reliability when a repeat trial arrives at the same findings. A high reliability can be established by ensuring the stability of each measure (Brymann & Bell, 2011: 41). This research believes the measures to be reliable as most of the data comes from the World Development Indicators database. This is the primary database of the World Bank on development-related issues. The data comes from officially-recognized international sources and covers a total of 217 economies. The data scores high on consistency and is stable over time (World Bank, 2017c). Furthermore, the database is open to anyone. This means that someone who would like to repeat this research could easily find the exact same data as used here. The measures without data from the World Development Indicators database are foreign aid and democracy. These measures are also deemed reliable. The data from the OECD as well as Freedom House are available to anyone and consistent and stable over time. Moreover, Freedom House and the OECD are renown and reliable sources.

As mentioned above, measurement validity, also known as construct validity, is closely related to reliability. According to Brymann and Bell (2011: 42), measurement validity "[has] to do with the question of whether or not a measure that is devised of a concept really does reflect the concept that it is supposed to be denoting". If a measure is inconsistent and unstable (unreliable), the measure cannot be providing a valid measure of the concept. This means that, for a measure to be valid, it needs to be reliable (Brymann & Bell, 2011: 42). This research believes all measures to be valid. Although the measure for access to clean water looks at access to an improved water source, and not at access to clean water, the two are closely related. Namely, as mentioned earlier, an improved water source is more likely to provide people with

safe drinking water as opposed to an unimproved water source. Regarding access to sanitation, the UN specified that access to sanitation, as part of the sixth SDB, entails access to adequate and equitable sanitation and hygiene (UN, 2017a). This corresponds with the World Bank's definition of an improved sanitation facility. It is therefore safe to say that the measure of access to sanitation indeed reflects the concept that it is supposed to be denoting. Also adding to the measurement validity of both measures is the exclusion of nonfunctioning systems. This namely provides the research with a more accurate score on people's actual access to water and sanitation. As for women's political representation, the chosen measure is widely used to denote women's political representation. The inclusion of the share of women in ministerial positions would have contributed positively to the measurement validity. However, this measure has not been included in the research due to aforementioned reasons. Furthermore, GDP is often used to represent economic development. Additionally, the use of a per capita and PPP corrected value gives a more realistic view of the actual economic position of a country. This measure thus reflects the correct concept. Concerning foreign aid, the measure includes data on aid provided by the international community to the water supply and sanitation sector specifically. It therefore gives a good account of the amount of the total foreign aid that is dedicated to improving people's access to clean water and sanitation. This positively contributes to the measurement validity. Female labor force participation rate is also believed to suffice. A combined measure would have captured women's social standing better. Nonetheless, female labor force participation is caused by a wide variety of economic and social factors and thus manages to capture some of the other dimensions of women's social standing such as educational levels (Verick, 2014). Regarding democracy, the measure is believed to suffice as well. Freedom House is a well-known organization, its data is widely used to operationalize the level of democracy, and its data is based on evaluations of a wide range of aspects related to democracy.

Besides reliability and measurement validity, the internal and external validity of the research should also be evaluated. Internal validity focuses on causality and whether variations in the dependent variable can be attributed to the independent variable (Bryman & Bell, 2011: 42). Causality is difficult to prove with a cross-sectional research design given the fact that the variables are measured at a single point in time. The simultaneous measurement of the variables impedes the verification of whether the independent variable indeed changed before a change in the dependent variable occurred, as causality implies. The time-series cross-sectional research design and the use of a time lag address this problem to some extent. However, the

internal validity is not as strong as it would have been had an experimental research design been employed.

In addition, the inclusion of multiple control variables positively affects the internal validity. By means of control variables, this research verifies whether changes in the dependent variable are related to changes in the independent variable, or whether these changes are caused by other factors. In total, this research uses four different control variables. Not only the mere use of control variables, but also the fact that these control variables are chosen based on their use in existing studies, positively contributes to the internal validity of this research.

External validity centers on the generalizability of results (Bryman & Bell, 2011: 43). The sample of this research includes as many developing countries as possible. In total, the sample contains 112 of the 132 by this research as developing country defined countries. Moreover, this research has made sure to limit the influence of a regional bias by verifying whether enough countries belonging to different regions have been included in the sample. Together, this leads to a higher external validity.

4. Analysis

This fourth chapter attempts to answer the third sub-question. Before it concludes with the findings of the analysis, it addresses the descriptive statistics of the various variables, provides the reader with an assessment of whether the assumptions of linear regression are met, and explains which linear panel regression model has been selected and why.

4.1 Descriptive Statistics

When performing a linear regression analysis, it is a common practice to start with the descriptive statistics. Descriptive statistics provide some general information on the variables, such as the mean, the range, and the standard deviation. Table 3 contains this information on the variables of this research.

Variable	Mean	Median	Min.	Max.	Std. Dev.	Skewness	Ex. Kurtosis	Missing obs.
WPR	13.08	10.80	0	56.30	9.24	1.14	4.65	119
ECO	6517.80	4,831.58	565.60	50,640.18	5906.68	2.35	13.53	8
AID	5.31	1.45	0.0003	263.37	14.12	8.45	109.50	79
WSS	53.10	53.18	10.96	88.93	17.92	-0.18	2.42	0
DEM	3.96	4	1	7	1.59	-0.02	1.96	2
WAT	80.07	85.30	30.80	100	16.27	-0.82	2.58	7
SAN	57.07	58.80	6.80	100	29.16	-0.16	1.58	19

Table 3: Descriptive Statistics

The first summary statistic is the mean. The mean is the average value of all the observations connected to a certain variable (Chavda, 2008: 347). For example, the mean of WPR is 13.08. This means that, in the used dataset covering 112 countries and a time span from 1997 to 2011, the average percentage of women in parliament is 13.08. The fact that 13.08 is a percentage is due to its operationalization.

Secondly, the median is the middle value of a variable. The median is found by ranging the observations in ascending order and taking the middle observation (Chavda, 2008: 348). The mean and median values are important to assess whether the variables are normally distributed. A variable is symmetrically distributed when the mean is equal to the median. When this is not the case, a variable is said to be skewed. A variable can be skewed either to the right or to the left (Mo, 2008: 381). Looking at the values in table 3, it becomes apparent that none of the variables has a perfect normal distribution. Some variables come close to a normal distribution, such as WSS and DEM, while others, such as WPR, ECO, and AID, have a large gap between their mean and median. The distribution of the variables and to what extent they have a normal distribution is discussed more extensively in section 4.2.

Thirdly, the minimum and maximum value indicate the range of the values of a certain variable. For example, the values of WPR range from 0 to 56.30. This means that none of the sample countries have had a share of women higher than 56.30% in the national parliament between 1997 and 2011.

Fourthly, the standard deviation is a measure of dispersion. It is the squared root of the variance and indicated "how closely or how loosely clustered the values are in relation to the mean" (Chavda, 2008: 349). A high standard deviation indicates that the values are widely spread, whereas a low standard deviation suggests the opposite.

Fifthly, skewness and kurtosis are again linked to the distribution of the variables. These two characteristics are therefore discussed in more detail in section 4.2.1.

Lastly, missing observations are the number of observations that do not have a value for that specific variable. As stated in the previous chapter, this research makes use of unbalanced panel data. Although there are quite some missing observations for WPR and AID, the data is still regarded by STATA as highly balanced.

4.2 Testing the Assumptions of Ordinary Least Squares

In section 3.1.1.2 the different assumptions of OLS have been discussed. Before proceeding to the selection of a linear panel regression model, this section verifies whether the data meets the different assumptions of OLS.

The first assumption states that the variables should be measured on a ratio or interval level. As can be read from table 2 in section 3.3.4, this assumption is met. The second assumption states that the sample size must be sufficiently large. This assumption has been addressed in section 3.2 and it can be concluded that the second assumption is also met. The remaining assumptions have not yet been addressed properly and are therefore discussed in separate sections.

4.2.1 Normal Distribution

There are different ways to verify whether variables are normally distributed. The first, more visual option is to generate a histogram of the distribution of a variable and to plot it against a normal distribution (Graddy & Wang, 2008: 482). The second technique is to look at the values of skewness and kurtosis. Skewness arrives when a variable has too many large errors in the same direction, whereas kurtosis means that there are either too many or too few large errors in both directions. A variable is assumed to have a normal distribution when skewness is closest to zero and kurtosis closest to three (Hair, Black, Babin & Anderson, 2010: 71). The third procedure to test for a normal distribution is to perform statistical tests such as the Shapiro-

Wilk or the Jarque-Bera test (Graddy & Wang, 2008: 482). These tests "calculate the level of significance for the differences from a normal distribution" (Hair et al., 2010: 73).

Firstly, this research looked at the histograms of each variable. Although some distributions roughly resembled a normal distribution, other variables did not even come close. Based on the histograms, it is concluded that the variables are not normally distributed. The histograms can be found in appendix II.

Secondly, this research looked at the skewness and kurtosis values of the variables, as summarized in table 3. Looking at the table, it can be concluded that none of the variables have a skewness equal to zero. Another conclusion drawn from the table is that there are large differences between the variables. Some variables have a very high, positive skewness (WPR, ECO, and AID), while others have a smaller, negative skewness. Furthermore, none of the variables have a kurtosis value of exactly three. Especially the variables of ECO and AID have severe excessive kurtosis. Based on these values, it is again concluded that the variables do not have a normal distribution.

Thirdly, this research has performed both the Shapiro-Francia and the Jarque-Bera tests in STATA. The P-values of these test can be found in table 4. The Shapiro-Francia test closely resembles the widely-used Shapiro-Wilk test, but is better suited to deal with large sample sizes (N > 1000) (Hair et al., 2010: 74). Even though the sample size of this research is 112, the number of observations is larger than 1000 due to the use of panel data. This paper therefore deemed it more appropriate to opt for the Shapiro-Francia test. Based on the P-values, the null hypothesis of a normal distribution is overwhelmingly rejected. It is thus once more concluded that the variables do not have a normal distribution.

Variable	**Shapiro-Francia P-value**	**Jarque-Bera overall P-value**	**Jarque-Bera Skew. P-value**	**Jarque-Bera Kurt. P-value**
WPR	0.00001	0.0000	0.0000	0.0000
ECO	0.00001	0.0000	0.0000	0.0000
AID	0.00001	0.0000	0.0000	0.0000
WSS	0.00001	0.0000	0.0028	0.0000
DEM	0.00001	0.0000	0.7304	0.0000
WAT	0.00001	0.0000	0.0000	0.0000
SAN	0.00001	0.0000	0.0098	0.0000

Table 4: Shapiro-Francia and Jarque-Bera P-values

Based on the three aforementioned findings, it is safe to say that the variables do not have a normal distribution. To attain a distribution that is closer to normal, variables can be transformed. Transforming a variable means that each value of that particular variable is faced with the same mathematical equation. Common transformations include taking the square root

or the natural log of a variable (Hair et al., 2010: 77-79). Table 5 contains the equations used to transform the variables, as well as their new skewness and kurtosis values, and the new P-values of the Shapiro-Francia and Jarque-Bera tests. WSS, DEM, WAT, and SAN have not been transformed and are therefore not included in the table. The research decided not to transform these variables because the transformations would render the interpretation of the results extremely difficult. WPR, ECO, and AID suffered more severely from skewness and kurtosis. Furthermore, they could be transformed using frequently-used transformations that do not harm the possibility to interpret the results. The histograms of the transformed variables can be found in appendix II next to the histograms of the original variables.

Variable	Transformation	New Skewness	New Ex. Kurtosis	New Shapiro-Francia P-value	New Jarque-Bera overall P-value	New Jarque-Bera Skew. P-value	New Jarque-Bera Kurt. P-value
WPR1	$WPR^{1/2}$	-0.04	3.18	0.00002	0.2950	0.4982	0.1588
ECO1	Ln(ECO)	-0.14	2.12	0.00001	0.0000	0.0192	0.0000
AID1	Ln(AID)	-0.63	3.31	0.00001	0.0000	0.0000	0.0222

Table 5: Transformed Variables

Although the transformations have significantly reduced the skewness of the variables, both statistical tests still indicate a non-normal distribution for all the variable, except for WPR1. This entails that the results of the analysis should be interpreted with caution. As the transformed variables are the variables used in the analysis, the following sections are based on the transformed variables of WPR, ECO, and AID as opposed to the original variables.

4.2.2 Linearity

The assumption of linearity assumes that there is a linear relationship between the independent and dependent variables, as well as between the control variables and dependent variables. The best way to control for linearity is by means of scatter plots (Alm & Mason, 2008: 429; Hair et al., 2010: 76). The scatter plots for each independent/control variable plotted against the dependent variables can be found in appendix III.

Based on the scatter plots, it can be concluded that there is no linear relationship between the independent variable and the dependent variables. However, there is also no non-linear relationship clearly visible in the scatterplots. Moreover, only the control variables of economic development and women's social standing show a somewhat linear relation to the dependent variables. This means that the assumption of linearity is not met.

4.2.3 No Multicollinearity

Multicollinearity occurs when explanatory variables are related to each other. According to the assumptions of OLS, multicollinearity is not allowed. A practical way to test for multicollinearity is to calculate the correlations between the various independent and control variables (Alm & Mason, 2008: 443). Table 6 provides an overview of these correlations. Although some variables correlate more strongly than others, none of the variables correlate to such an extent that they must be omitted for the analysis. The interaction term is a special case. Its construction is based on WPR and DEM. It is therefore understandable that the interaction term correlates with them. All in all, it can be concluded that the data meets the assumption of no multicollinearity.

Variable	WPR1	ECO1	AID1	WSS	DEM	INTER
WPR1	1.0000					
ECO1	0.0943	1.0000				
AID1	0.0274	-0.1947	1.0000			
WSS	0.1896	-0.4777	-0.0380	1.0000		
DEM	0.0165	0.1376	0.1390	-0.0514	1.0000	
INTER	0.6506	0.1749	0.1065	0.0356	0.7232	1.0000

Table 6: Correlations

4.2.4 No Autocorrelation

According to the assumptions of OLS, the error terms of the observations should not be systematically linked to each other. This means that the observations should be independent from one another. As this research uses panel data, it is highly likely to find autocorrelation. A fairly easy way to test for autocorrelation is by means of a statistical test. The Wooldridge test is a test specifically developed to test for autocorrelation in panel data (Wooldridge, 2002: 282-283). The Wooldridge test has been performed for the models of interest (see section 3.1.1.1). Based on the test results, the null hypothesis of no autocorrelation is strongly rejected (P = 0.0000 for each model). This means that the assumption of no autocorrelation is not met.

4.2.5 Homoscedasticity

The assumption of homoscedasticity states that the variance of the error term must be constant for each observation. Various statistical tests exist to test for homoscedasticity, such as the Breusch and Pagan and White tests. After running a simple Pooled OLS regression for each model of interest, the Breusch and Pagan and White tests have been performed. The results are almost identical. The null hypothesis of homoscedasticity is strongly rejected (P = 0.0000 for both tests for each model). In addition, this research has conducted a homoscedasticity test specifically designed for panel data, namely a modified Wald test (Baum, 2001). After running

a fixed effects panel regression for each model of interest, the modified Wald tests have been performed. The null hypothesis of homoscedasticity is strongly rejected (P = 0.0000 for each model). The results are thus in line with the prior findings of heteroscedasticity. It is therefore safe to say that the assumption of homoscedasticity is not met.

4.3 Model Selection

Based on the results of section 4.2, this research concludes that a pooled OLS model is not the Best Linear Unbiased Estimate (BLUE). Multiple assumptions have not completely been met by the data of this analysis, such as the assumptions of linearity, no autocorrelation, and homoscedasticity. As a result, the research will now choose between a fixed effects or random effects model. To decide, the research has performed a Hausman test. A Hausman test compares the fixed versus random effects under the null hypothesis that the difference in coefficients is not systematic. A rejection of the null hypothesis points towards a fixed effects model, whereas a random effects model is preferred in case the null hypothesis is not rejected (Eom et al., 2008: 589). Based on the results of the Hausman tests for the different models of interest (see section 3.1.1.1), the research has decided to go with a fixed effects model. The null hypothesis was namely rejected for each model (P = 0.0000).

To verify whether the fixed effects model fits the data indeed better than a pooled OLS regression model, the research performed F-tests. For both WAT and SAN as dependent variable, the results clearly indicate that a fixed effects model fits the data better than a pooled OLS regression model (P = 0.0000 for each model).

Although evidence in favor of a fixed effects model as opposed to a pooled OLS regression or a random effects model has been found, the data still suffers from autocorrelation and heteroscedasticity. To account for these problems, this thesis will make use of the "cluster" function in STATA. According to Wooldridge (2011, March 1), the "cluster" function is an attractive solution for data that suffers from autocorrelation and heteroscedasticity. The standard errors that this function produces are "completely robust to any kind of serial correlation and/or heteroscedasticity" (Wooldridge, 2011, March 1). Furthermore, this function works well with a 'large N, not so large T' dataset and has no problems dealing with unbalanced panel data. The dataset of this research can be described as 'large N, not so large T' because it includes more countries than years, but at the same time it does not include only a few years. All in all, the "cluster" function appears to be the best solution for this research.

4.4 Results

4.4.1 Main Models

Table 7 indicates per model the coefficients, their corresponding significance levels, and the robust standard errors. The results have been found while performing panel regression analyses based on fixed effects models. The four models are the models as described in chapter three. This means that there are two models per dependent variable: One model without the interaction term and one model including the interaction term. In general, a coefficient says something about the strength and the direction of the relationship between an explanatory variable and the dependent variable. If an explanatory variable increases by one unit, the dependent variable will increase or decrease by the amount of units equal to the coefficient. However, this only holds true when all other factors remain constant (Graddy & Wang, 2008: 460). Additionally, the significance level indicates at what level the coefficient is significant. More detailed information per regression analysis is provided in appendix IV.

Starting with the first model, there is a strongly significant, positive relationship between the percentage of women in the national legislature and access to improved water sources. To interpret the coefficient, it is important to remember that WPR has undergone a transformation. Instead of a one-unit increase in WPR, a one-unit increase in the square root of WPR leads to an increase of access to clean water by 0.8011 percentage point. WPR must increase by more than one unit in order to increase the square root of WPR by one unit. This means that the actual coefficient of WPR is lower than the stated 0.8011. Furthermore, the larger the square root of WPR is, the more units of WPR will be needed to establish a one-unit increase of the square root of WPR. This means that the higher the percentage of women in the national legislature becomes, the bigger the increase must be to increase access to improved water sources by 0.8011 percentage point. Concerning the control variables, all three coefficients are positive. However, ECO and AID are significant at $P = 0.01$, while WSS is only significant at $P = 0.05$. It is again important to remember that some variables have been transformed. The coefficients of ECO and AID should be interpreted as follows: A one percent increase in economic development increases access to water by 0.1217 percentage point, and a one percent increase in foreign aid increases access to water by 0.0019 percentage point. Regarding WSS, a one-percentage point increase in WSS results in a 0.2609 percentage point increase in access to clean water.

Adding the interaction term to the model increases the coefficient of WPR, but simultaneously decreases the level of significance. Furthermore, the coefficients of DEM and

INTER are both not significant. It is therefore impossible to conclude anything based on these coefficients.

Looking at access to sanitation without the interaction term, the coefficient of WPR is positive and significant at P = 0.05. Compared to access to improved water sources, the coefficient of WPR is smaller. This means that the influence of women's political representation on access to sanitation is smaller than the influence on access to clean water. Again, it is important to be aware of the fact that WPR has been transformed. The actual coefficient of WPR is thus lower than the stated 0.6698. Concerning the control variables, a one percent increase in economic development increases access to sanitation by 0.1222 percentage point at a significance level of P = 0.001. Moreover, a one percent increase in foreign aid increases access to sanitation by 0.0009 percentage point. However, the coefficient of foreign aid is not significant. The coefficient of WSS is positive, but only significant at P = 0.100. According to the regression results, a one-percentage point increase in WSS leads to a 0.1516 percentage point increase in access to sanitation.

Adding the interaction term to the regression results in insignificant coefficients for women's political representation, democracy, and the interaction term. It is therefore impossible to conclude anything based on these coefficients.

Besides the coefficients, table 7 also contains the R^2 and adjusted R^2 values. These values are important indicators of the explanatory power of the research. R^2 is also known as the coefficient of determination. It shows to what extent a model is capable of predicting the variability in the dependent variable (Cirincione, 2008: 422). The adjusted R^2 does the same, but also takes into account that a regression model always fits the sample data better than the data of the actual population. The adjusted R^2 is therefore regarded as a better measure of "goodness of fit" (Alm & Mason, 2008: 438). Looking at the R^2 and adjusted R^2 values of this research, it seems like the explanatory power of the regression models is rather limited. However, within the field of social sciences the values are considered moderate to substantial depending on which classification is used to interpret the results (e.g. Cohen, 1988; Chin, 1998; Henseler, Ringle & Sinkovics, 2009). Regarding access to water, the independent and control variables are able to predict about 48.1% of the variability in the dependent variable. Concerning access to sanitation, the independent and control variables are capable of predicting about 47.6% of the variability of the dependent variable.

Dependent / Independent	WAT	WAT Including INTER	SAN	SAN Including INTER
WPR1	0.8011*** (0.2386)	1.2098* (0.6939)	0.6698** (0.3084)	0.2944 (0.7252)
ECO1	12.1748*** (1.5094)	12.1991*** (1.5101)	12.2172*** (1.8269)	12.2018*** (1.8382)
AID1	0.1875*** (0.0633)	0.1851*** (0.0638)	0.0926 (0.0631)	0.0942 (0.0637)
WSS	0.2609** (0.1174)	0.2586** (0.1174)	0.1516* (0.0770)	0.1540* (0.0786)
DEM		0.1837 (0.5744)		-0.1654 (0.5640)
INTER		-0.1055 (0.1679)		0.0974 (0.1660)
Constant	-38.8154*** (14.4247)	-39.5862*** (14.6556)	-55.5682*** (15.6167)	-54.9505*** (15.5913)
Observations	1490	1490	1488	1488
R^2	0.4827	0.4841	0.4775	0.4789
Adj. R^2	0.4813	0.4820	0.4761	0.4767
F	26.15***	18.23***	20.11***	15.21***

Table 7: Results Models 2 to 5: Access to Clean Water and Access to Sanitation

*Significant at P = 0.10 **Significant at P = 0.05 ***Significant at P = 0.01

4.4.2 Critical Mass Models

Besides the regression analyses of which the results have been discussed in section 4.4.1, this research has also run the regressions with four dummy variables for women's political representation. The models including the interaction term have been omitted given the lack of significance in the previous regressions. Table 8 provides an overview of the coefficients, their significance levels, and the robust standard errors. A more detailed overview of the results of the regression analyses can be found in appendix IV.

Looking at the results, it is clear that all dummy variables are significant and positive for both access to water and access to sanitation. Nevertheless, there are difference visible between the coefficients of the dummy variables.

Regarding access to water, the first dummy variable shows that access to water is 1.8522 percentage points higher when women occupy between 10 and 20% of the seats in the national legislature, compared to when women occupy less than 10% of the seats. Even though this is positive, the coefficient for the second dummy variable is at 2.7210 46.9% higher than the first dummy variable, which leads to believe that there is indeed a critical mass around 20%. The coefficient of the third dummy variable is higher than the second dummy variable, but the difference is less than 1%. This too points in the direction of a critical mass at 20%. The coefficient of the fourth dummy variable is smaller than the coefficients of the second and third

dummy variables and at a lower significance level (P=0.10). This result is slightly difficult to interpret, but does not discredit the theory of a critical mass at 20%.

Regarding access to sanitation, the first dummy shows that access to sanitation is 0.7344 percentage points higher when women occupy between 10 and 20% of the seat in the national parliament opposed to when women occupy less than 10% of the seats. Similar to access to water, the second dummy variable has a significantly larger coefficient than the first dummy variable, namely 230% larger at 2.4255. This confirms the existence of a critical mass threshold for women in parliament at 20%. The third dummy variable has a larger coefficient than the second dummy variable, but the difference is only 4.5%. This is in line with a critical mass threshold at 20%. The fourth dummy variable, on the other hand, does not corroborate the notion of a critical mass threshold at 20%. Its coefficient is 57% larger than the coefficient of the third dummy variable and 64% larger than the coefficient of the second dummy variable. This finding implies that there might be a second critical mass threshold at 40%.

In sum, the results corroborate the 'Critical Mass' theory and the notion that a threshold exists at 20%. However, the deviating findings linked to the fourth dummy variable for both access to water and access to sanitation suggest that more research is needed to study what happens after a critical mass threshold at 20% has been met and parliaments shift towards a more gender-balanced composition.

Concerning economic development, the coefficients are strongly significant, positive, and quite similar to the coefficients found in the previous regressions. A one percent increase in economic development increases access to water by 0.1223 percentage point and access to sanitation by 0.1215 percentage point. Looking at foreign aid, only the coefficient connected to access to water is significant. A one percent increase in foreign aid increases access to clean water by 0.0017 percentage point. The coefficient connected to access to sanitation is rather small and insignificant, which corresponds with what has been found in the previous regressions. Moreover, women's social standing is positively linked to access to water and access to sanitation. However, the coefficient connected to access to water is almost double the size of the coefficient connected to access to sanitation and also at a higher significance level. This means that women's social standing has a larger impact on access to water than on access to sanitation. Namely, a one-percentage point increase in WSS increases access to clean water by 0.2715 percentage point and access to sanitation by 0.1487 percentage point.

Regarding the R^2 and adjusted R^2 values of the two models, both models predict almost half of the variation in the dependent variables, comparable to the findings in section 4.4.1.

About 49.4% of the variation in access to water is explained by the model, whereas about 48.4% of the variation in access to sanitation is explained by the independent and control variables.

Dependent / Independent	WAT	SAN
CM1	1.8522*** (0.4633)	0.7344* (0.4405)
CM2	2.7210*** (0.7546)	2.4255*** (0.7285)
CM3	2.7336** (1.0575)	2.5344** (1.2144)
CM4	2.3950* (1.2355)	3.9852*** (1.3457)
ECO1	12.2285*** (1.4493)	12.1537*** (1.8453)
AID1	0.1656*** (0.0606)	0.0836 (0.0637)
WSS	0.2715** (0.1132)	0.1487* (0.0757)
Constant	-38.3381*** (13.7674)	-53.4046*** (16.1845)
Observations	1490	1488
R^2	0.4944	0.4840
Adj. R^2	0.4920	0.4816
F	15.99***	21.88***

Table 8: Results Critical Mass *Significant at P = 0.10 **Significant at P = 0.05 ***Significant at P = 0.01

4.4.3 Summary

Looking at the results of the analysis, it becomes clear that women's political representation has a positive effect on access to clean water and sanitation. This goes for the continuous as well as the categorical measure. A higher percentage of women in parliament leads to a higher degree of access to clean water and sanitation. It also corroborates the 'Critical Mass' theory stating that a critical mass is needed for women to enact change. Although women are also able to enact change when they possess between 10% and 20% of the seats in the national legislature, findings show that the influence of women's political representation on access to clean water and sanitation becomes much stronger when women pass a critical mass threshold of 20%. This finding is especially apparent in the case of access to sanitation. In addition, the research found a second threshold at 40% with regard to access to sanitation.

Additionally, results show that economic development is an important factor that positively affects people's access to water and sanitation. Women's social standing has also been found to be positively related to both dependent variables. However, the significance level of women's social standing is lower than the significance level of economic development.

Moreover, the significance level of women's social standing is higher in connection to access to water than in connection to access to sanitation. As for foreign aid to the water supply and sanitation sector, a positive influence has been found. However, this result is only significant regarding access to water. Furthermore, no significant results have been found related to the interaction of women's political representation and democracy.

Overall, the results are in line with the two hypotheses stated in the second chapter. In addition, most findings also correspond with the expectations concerning the control variables.

5. Conclusion

This last chapter is devoted to answering the sub-questions and central research question in order to conclude the research. It first addresses the three sub-questions before addressing the results of the analysis and how they answer the main research question. Next, it discusses the limitations and shortcomings of the research. Further, it deals with the implications for future research. To conclude, the chapter touches upon the policy implications of the results.

5.1 Answers to the Sub-Questions and Central Research Question

To answer the central research question, this research made use of three sub-questions. The first sub-question concerned the existing knowledge on the influence of women's political representation on social and female-friendly policies and outcomes. As extensively discussed in chapter two, studies on women's political representation in developed countries have found a positive effect on female-friendly and social policies and outcomes (e.g. Swers, 2002; Childs, 2002; Kittilson, 2008; Bolzendahl & Brooks, 2007). Furthermore, cross-national studies on women's political representation in developing countries found positive effects on child health and women's health (e.g. Swiss et al., 2012; Westfall & Chantiles, 2016), while results of country-specific case studies were not always as clear cut (e.g. Chattopadhyay & Duflo, 2004; Goetz, 2002; Burnet, 2008).

The second sub-question focused on the selection of a suitable research design and the operationalization of the variables. In chapter three it was decided to employ a time-series cross-sectional research design and to perform a panel regression analysis. Furthermore, 112 countries were selected as well as a time span of 15 years. To operationalize the variables, data from the World Bank, OECD, and Freedom House was used.

The last sub-question concentrated on the analysis and its results. As described in chapter four, a fixed effects model was chosen in combination with STATA's "cluster" function to address the limitations of the data. By performing the statistical analysis, results in line with the hypotheses were found. Based on these findings, the research will try to answer the main research question:

What is the influence of women's political representation on access to clean water and sanitation in developing countries?

Looking at the results of the analysis, it can be stated that the influence of women's political representation on access to clean water and sanitation in developing countries is positive. A higher degree of women's political representation corresponds with higher levels of

access to clean water and sanitation, even after controlling for other factors such as economic development, foreign aid, and women's social standing. The influence of women's political representation seems to be slightly stronger on access to clean water than on access to sanitation. This also holds true when looking at a critical mass. Although a critical mass of women in parliament positively affects access to clean water and sanitation, the impact on access to water seems to be larger. Furthermore, the results of the analysis indicate that a critical mass threshold exists around 20%. Women seem to have a much stronger impact on access to clean water and sanitation when they pass the threshold of holding 20% of the seats in the national parliament. Lastly, the influence of women's political representation seems to be independent from the level of democracy of a country as no significant interaction effect has been found.

5.2 Limitations

Although the research tried to limit its shortcomings, it is impossible to eradicate them all. One important limitation of this research is the exclusion of government spending from the analysis. Previous studies have found government spending on health to be positively related to child and women's health indicators (Swiss et al., 2012; Quamruzzaman & Lange, 2016; Westfall & Chantiles, 2016). A similar positive relationship between government spending on the water and sanitation sector and people's access to clean water and sanitation is likely to exist. However, due to a lack of data, this variable had to be omitted from the research. Nevertheless, this variable might have a large impact on the dependent variables.

A second limitation is the use of only one indicator for women's social standing. Due to a lack of data, women's social standing is solely based on female labor force participation rates instead of a combination of the former and female school enrollment rates. Inclusion of the latter would have better depicted women's social standing.

Other shortcomings include inter alia the use of only one indicator for women's political representation, the use of the listwise deletion method instead of the multiple imputation method, and the exclusion of 20 as developing country classified countries due to missing data.

5.3 Research Implications

This research and its results have some implications for future research. First, a positive result was found. This means that a higher political representation of women does not only lead to improved child and women's health, as was found in previous studies (Swiss et al., 2012; Quamruzzaman & Lange, 2016; Westfall & Chantiles, 2016), but also to better access to clean water and sanitation. It would be interesting to see whether women's political representation is also positively linked to other sustainable development goals, such as poverty reduction,

education, and access to energy. Further research is needed to investigate these possible relationships.

Additionally, this research only used one indicator for women's political representation. It would be interesting to investigate whether the same positive results can be found while using a different measure or a combination of measures for women's political representation. The percentage of women occupying ministerial positions would be an interesting measure to look at. Moreover, it would be interesting to test which indicator of women's political representation has the strongest positive influence on development indicators.

Furthermore, even though this research found evidence in support of a critical mass threshold at 20%, it also found evidence suggesting that the influence of women's political representation on access to sanitation strongly increases for a second time when women hold 40% or more of the seats in the national legislature. When women hold 40% or more of the seats in a parliament, that parliament could be classified as a 'Balanced' group based on Kanter's classification (1977). Parliaments in which women hold 15% or 35% of the seats, on the other hand, could be labeled a 'Skewed' or 'Tilted' group. It would be interesting to investigate whether this second surge of the impact of women's political representation on access to sanitation is linked to the shift from a Skewed or Tilted group to a Balanced group. Research into this topic could help to better understand the influence of women's political representation and could potentially form a solid base for sound arguments in favor of gender-balanced parliaments.

In addition, it would be interesting to look more closely at the relationship between foreign aid to the water supply and sanitation sector and access to sanitation. Results of the analysis show that there is no significant relationship between these two variables, even though one would expect them to be related. Looking at this relationship could be of great importance to the international community that provides the aid.

Also, opposed to what was expected, democracy was not found to influence the dependent variables by significantly interacting with women's political representation. According to the results, democracy does not seem to be of any importance. This is not in line with what has been written about democracy and the importance of institutions. It could therefore be fruitful to take a closer look at the relationship between women's political representation and democracy.

Moreover, less than half of the variation in the dependent variables is explained by the current models. This means that this research left some important factors unidentified. Additionally, results show large and significant constants. This points to the importance of

country-specific factors. Further research is needed to identify these factors and to learn more about what significantly contributes to improving people's access to clean water and sanitation.

Lastly, it would be fruitful to include government spending on water and sanitation into the analysis once enough data becomes available. Including government spending offers the opportunity to learn more about the relationship between women's political representation and access to clean water and sanitation. If the relationship is completely mediated by government spending, this means that more women might lead to more funds being devoted to water and sanitation. However, if the relationship is not completely mediated, or not at all, this would mean female MPs use other tactics to improve people's access to clean water and sanitation than merely allocating more financial resources to water and sanitation projects.

5.4 Policy Implications

Besides implications for future research, the results of this thesis also have some implications for policies. As women's political representation has been found to be positively related to certain development indicators, it becomes clear that it might be wise to include female MPs in future development strategies.

Furthermore, improving women's political representation, but also women's social standing, is part of the UN SDG on gender equality. This goal is likely to gain importance as improvements in women's political representation as well as women's social standing have been found to lead to improvements on other development goals such as health and access to clean water and sanitation.

Another important implication of the results is the insignificance of foreign aid to the water supply and sanitation sector on access to sanitation. None of the coefficients of foreign aid in relation to access to sanitation were significant. Thus, it seems like foreign aid has no effect on access to sanitation at all. This might point towards the necessity to rethink the current form of aid offered to the sanitation sector.

Overall, the results demonstrate that women's political representation should not be overlooked in the quest for sustainable development. Although it is only one of the many targets of the fifth SDG, it is positively related to targets of other development goals and could therefore be more important than was once considered.

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Appendix I – List of Countries per Region

Middle East and North Africa (MENA)

Algeria
Djibouti
Egypt
Iran
Iraq
Jordan
Morocco
Tunisia
Yemen

Omitted:
Syrian Arab Republic
West Bank and Gaza

Sub-Saharan Africa (SSA)

Angola
Benin
Botswana
Burkina Faso
Burundi
Cape Verde
Cameroon
Central African Republic
Chad
Comoros
Congo, Rep.
Cote d'Ivoire
Equatorial Guinea
Eritrea
Ethiopia
Gabon
The Gambia
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mozambique
Namibia
Niger
Nigeria
Rwanda
Sao Tomé and Principe
Senegal
Sierra Leone
South Africa
Sudan
Swaziland
Tanzania
Togo
Uganda
Zambia
Zimbabwe

Omitted:
Congo, Dem. Rep.

Europe and Central Asia (ECA)

Albania
Armenia
Azerbaijan
Belarus
Bosnia and Herzegovina
Georgia
Kazakhstan
Kyrgyz Republic
Macedonia, FYR
Moldova
Tajikistan
Turkey
Ukraine
Uzbekistan

Omitted:
Bulgaria
Estonia
Hungary
Latvia
Lithuania
Poland

Romania
Russian Federation
Serbia
Turkmenistan

Latin America and the Caribbean (LAC)

Belize
Bolivia
Colombia
Costa Rica
Cuba
Dominican Republic
Ecuador
El Salvador
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
St. Lucia
St. Vincent and the Grenadines
Suriname
Venezuela

Omitted:
Dominica
Grenada
Trinidad and Tobago

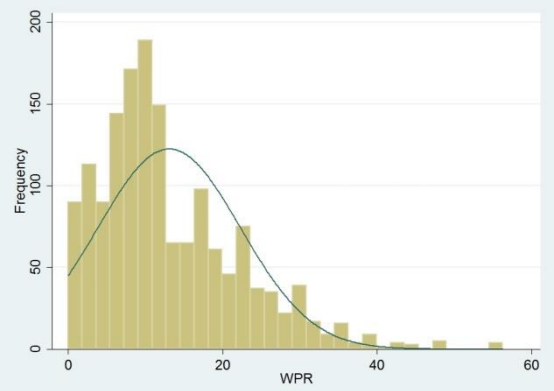
Asia and Pacific (AP)

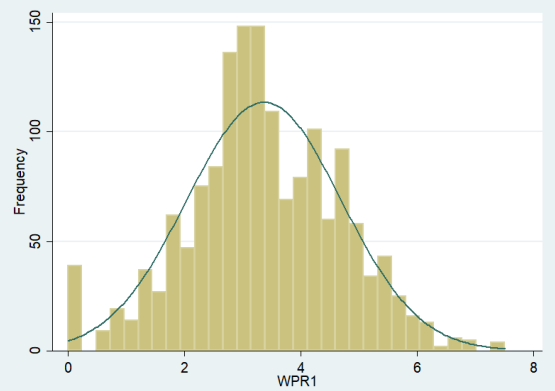
Bangladesh
Bhutan
Cambodia
China
Fiji
India
Indonesia
Lao PDR
Malaysia
Maldives
Mongolia
Nepal
Pakistan
Papua New Guinea
Philippines
Samoa
Solomon Islands
Sri Lanka
Thailand
Timor-Leste
Tonga
Vanuatu
Vietnam

Omitted:
Kiribati
Marshall Islands
Micronesia, Fed. Sts.
Tuvalu

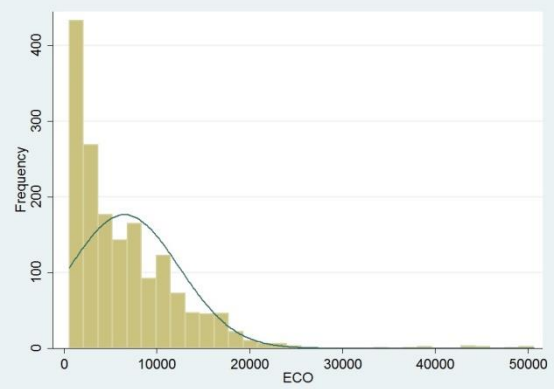
Appendix II – Distribution Histograms

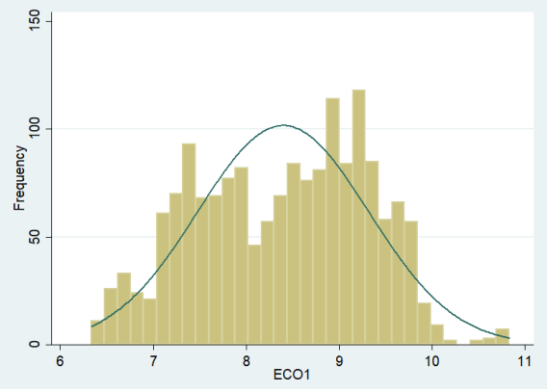
WPR → WPR1



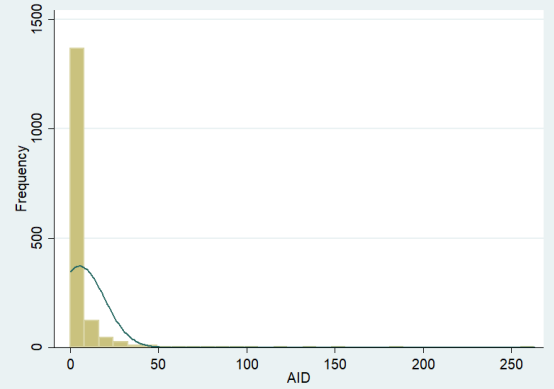


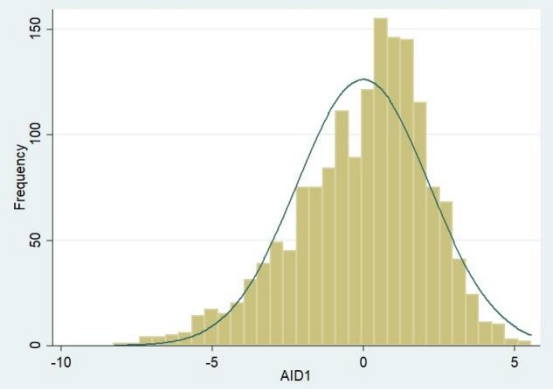
ECO → ECO1





AID → AID1





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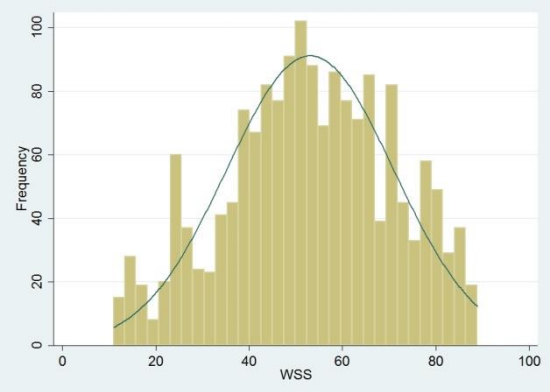

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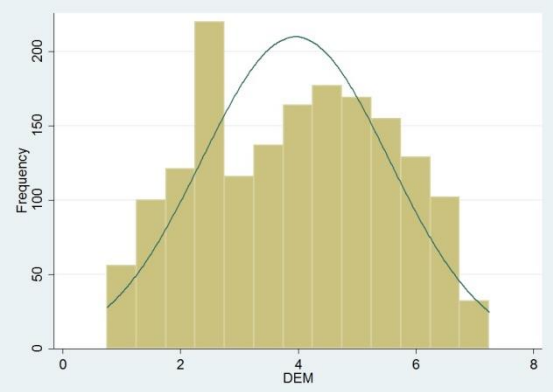
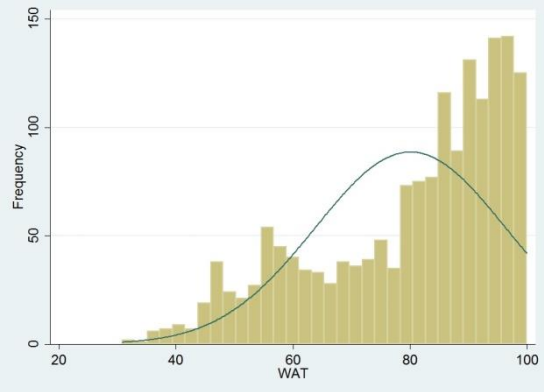
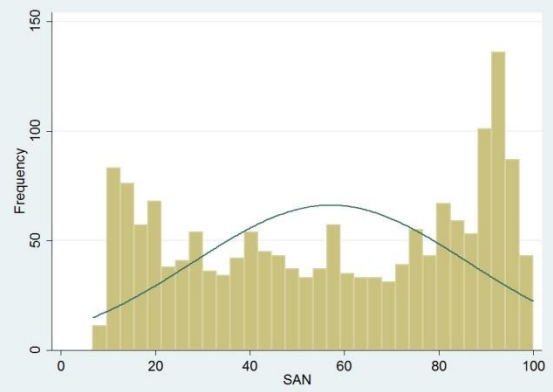


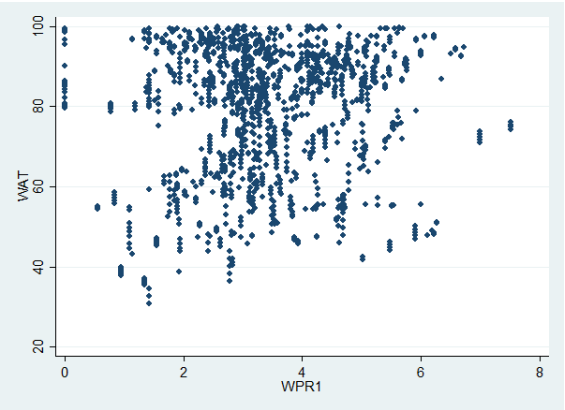
WAT

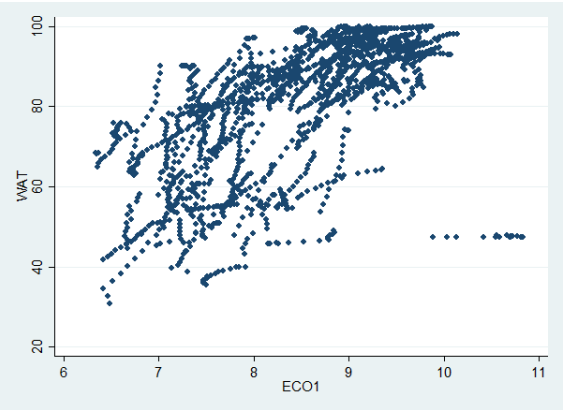


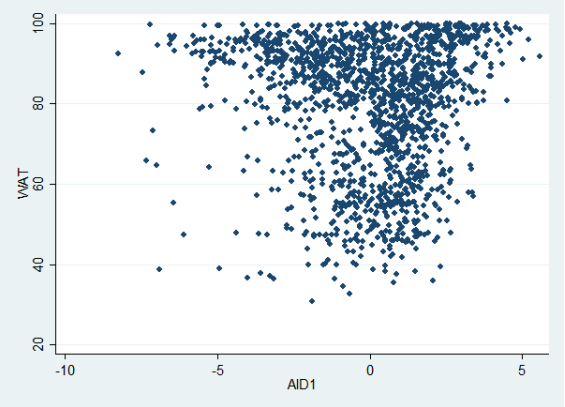
SAN

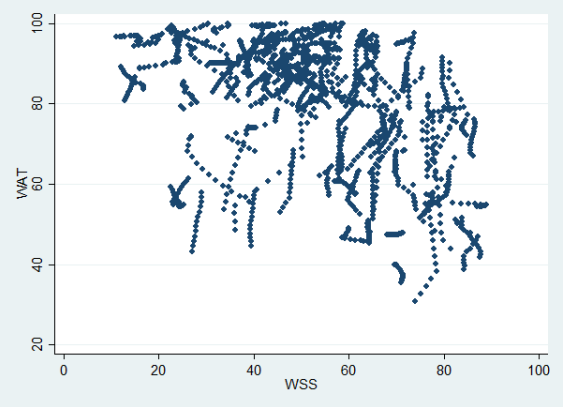


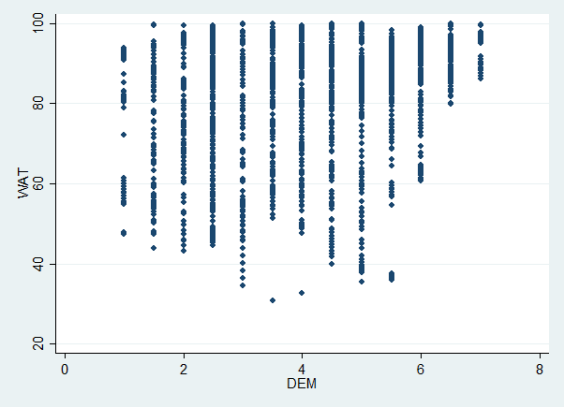
Appendix III – Scatter Plots

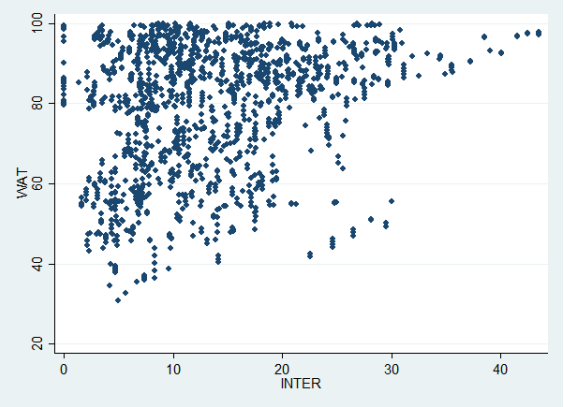


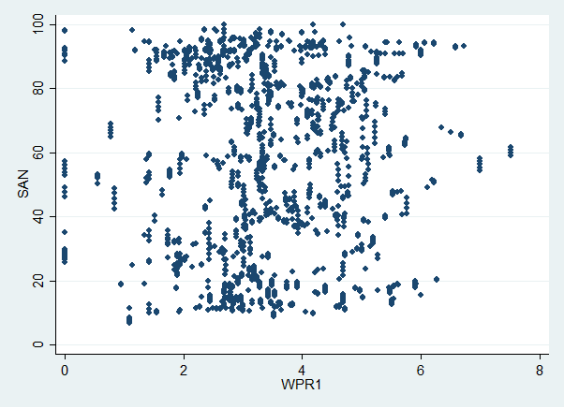


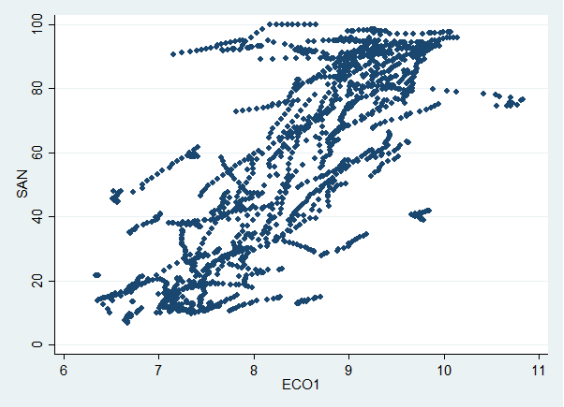


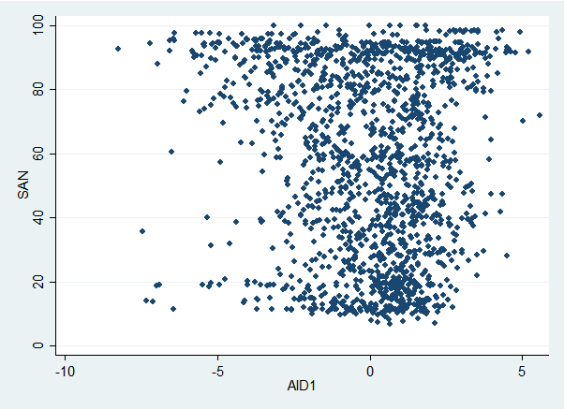








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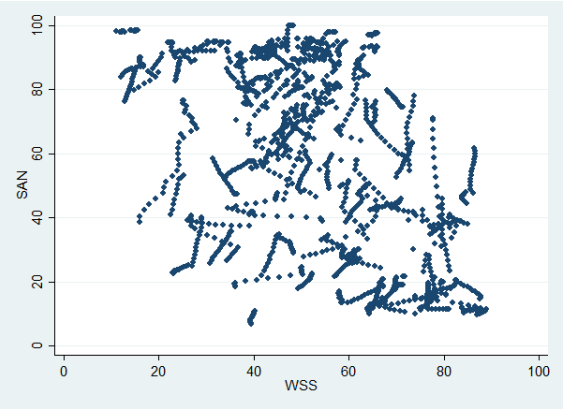
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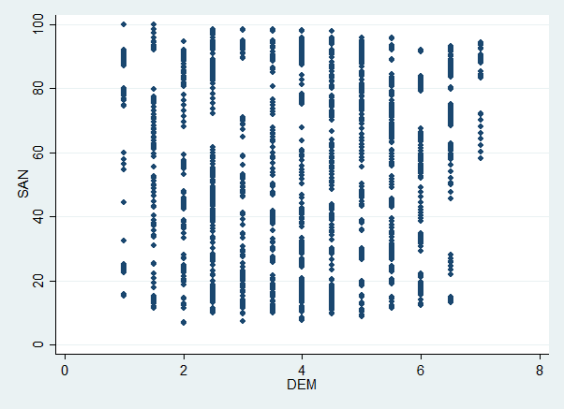
WSS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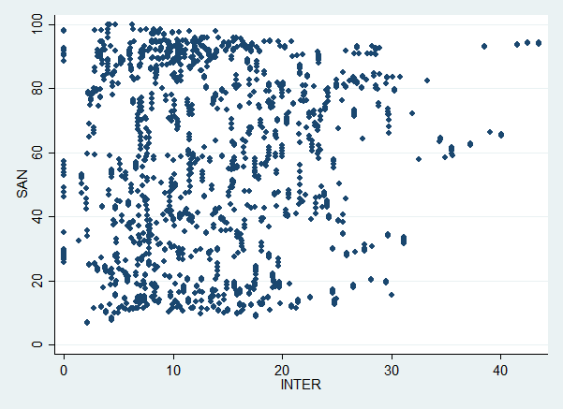
DEM


SAN
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INTER

Appendix IV – Test Results

WAT			
Variables	**Coefficient**	**Robust Std. Err.**	**P-value**
WPR1	0.8011	0.2386	0.001
ECO1	12.1748	1.5094	0.000
AID1	0.1875	0.0633	0.004
WSS	0.2609	0.1174	0.028
Constant	-38.8154	14.4247	0.008
F-test	26.15		
DF	111		
R^2	0.4827		
SSE	9541		
SEE	9.2712		
N	1490		

WAT_INTER			
Variables	**Coefficient**	**Robust Std. Err.**	**P-value**
WPR1	1.2098	0.6939	0.084
ECO1	12.1991	1.5101	0.000
AID1	0.1851	0.0638	0.004
WSS	0.2586	0.1174	0.030
DEM	0.1837	0.5744	0.750
INTER	-0.1055	0.1679	0.531
Constant	-39.5862	14.6556	0.008
F-test	18.23		
DF	111		
R^2	0.4841		
SSE	9514		
SEE	9.2583		
N	1490		

SAN			
Variables	**Coefficient**	**Robust Std. Err.**	**P-value**
WPR1	0.6698	0.3084	0.032
ECO1	12.2172	1.8269	0.000
AID1	0.0926	0.0631	0.145
WSS	0.1516	0.0770	0.051
Constant	-55.5682	15.6167	0.001
F-test	20.11		
DF	110		
R^2	0.4775		
SSE	8742		
SEE	8.9148		
N	1488		

SAN_INTER			
Variables	**Coefficient**	**Robust Std. Err.**	**P-value**
WPR1	0.2944	0.7252	0.686
ECO1	12.2018	1.8382	0.000
AID1	0.0942	0.0637	0.142
WSS	0.1540	0.0786	0.052
DEM	-0.1654	0.5640	0.770
INTER	0.0974	0.1660	0.559
Constant	-54.9505	15.5913	0.001
F-test	15.21		
DF	110		
R^2	0.4789		
SSE	8719		
SEE	8.9030		
N	1488		

WAT_CM			
Variables	**Coefficient**	**Robust Std. Err.**	**P-value**
CM1	1.8522	0.4633	0.000
CM2	2.7210	0.7546	0.000
CM3	2.7336	1.0575	0.011
CM4	2.3950	1.2355	0.055
ECO1	12.2285	1.4493	0.000
AID1	0.1656	0.0606	0.007
WSS	0.2715	0.1132	0.018
Constant	-38.3381	13.7674	0.006
F-test	15.99		
DF	111		
R^2	0.4944		
SSE	9325		
SEE	9.1656		
N	1490		

SAN_CM			
Variables	**Coefficient**	**Robust Std. Err.**	**P-value**
CM1	0.7344	0.4405	0.098
CM2	2.4255	0.7285	0.001
CM3	2.5344	1.2144	0.039
CM4	3.9852	1.3457	0.004
ECO1	12.1537	1.8453	0.000
AID1	0.0836	0.0637	0.192
WSS	0.1487	0.0757	0.052
Constant	-53.4046	16.1845	0.001
F-test	21.88		
DF	110		
R^2	0.4840		
SSE	8632		
SEE	8.8587		
N	1488		