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WOMEN'S POLITICAL EMPOWERMENT AND SUSTAINABLE FORESTRY

A cross-country analysis

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Abstract

Extensive research argues that women express higher levels of concern regarding environmental degradation and are more likely to act for environmental causes. This raises the question if women's empowerment could lead to better environmental outcomes. Some research finds that women's political empowerment indeed has good environmental outcomes. I argue that sustainable forestry could be an important dependent variable because deforestation is found to differently impact men and women, for example through the gendered division of labor and differentiated access to resources. Therefore, the thesis investigates the relationship between women's civil liberties, civil society participation and elite political participation and sustainable forestry. This is done with a cross-country statistical analysis using a 101 country-sample. It is found that the variable measuring women's civil society participation has a weak positive correlation with the variable measuring sustainable forestry and, contrary to expectations, the other measures of women's political empowerment under controls are negative corelates. All results are statistically insignificant so no strong conclusions can be drawn.

Keywords: Gender, Environment, Women's political empowerment, Sustainable forestry

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1. Introduction

Environmental issues have become more present in international discourse in recent years. However, the effects of biodiversity loss, climate change and clean water problems etc. are only becoming more prominent (IPBES, 2019; IPCC, 2022). As these issues become increasingly pressing, it is important for policymakers and the general public to have knowledge of and understand the drivers of good environmental health. One possible angle is through understanding and reacting to the gendered aspects of environmentalism.

There is a strand of literature that focuses on environmental issues through a gendered perspective. For example, research found that women tend to be more concerned and act more for the environment (e.g. Hunter et al., 2004; McCright & Xiao, 2014) and that women's elite political representation leads to better environmental outcomes (e.g. Mavisakalyan & Tarverdi, 2019). However, there has been less focus on how different dimensions of women's political empowerment (WPE) are correlated with environmental outcomes. The relevant sub-dimensions are women's civil liberties (CL), civil society participation (CSP) and elite political participation (EPP). These have been found to correlate with a reduction of climate change vulnerability and CO_2 emissions (Asongu et al., 2022; Lv & Deng, 2019). This literature calls for more research on how WPE correlates with different environmental dependent variables. An important aspect of the environment is forestry because forests are important to store carbon in the atmosphere and differences can be seen in the relationship between men and forest and women and forests. To better understand what drives sustainable forestry, it is therefore important to see how WPE and its sub-dimensions can correlate with forest outcomes.

Hence, the aim of the paper is to explore how WPE and the sub-dimensions correlates with sustainable forestry and if there are differences in the strength of the correlation among them. To my knowledge, this has not been researched before. Throughout this text the definition of WPE put forward by Sundström et al. (2017, p. 322) will be used as *"a process of increasing capacity for women, leading to greater choice, agency, and participation in societal decision-making"*.

The research question that this thesis seeks to empirically answer is: *Does higher levels of women's political empowerment lead to more sustainable forestry?*

In the text, I argue why WPE and the sub-dimensions are expected to positively correlate with the sustainable forestry variable based on previous research that considers the impact of gender and WPE on various environmental outcomes. This thesis did not find any evidence for these expectations since the results are not statistically significant.

The thesis begins by describing the existing theory and research on women and the environment generally and then, specifically, in regards to forests. Based on this, I develop a theoretical model which leads into how the thesis contributes to literature on what can drive deforestation as well as the literature on the potential relationships of WPE, its sub-dimensions and deforestation. The aim and hypotheses are then presented which leads into what method and data will be used. I then present and discuss the results. Lastly, I conclude the thesis.

2. Theory and existing research

This chapter maps out what previously has been done theoretically and empirically regarding women and the environment in general but also regarding women's political empowerment (WPE) and sustainable forestry. This is important because it explains how and why WPE and its sub-dimensions (civil liberties (CL), civil society participation (CSP) and elite political participation (EPP)) are expected to correlate with the environment generally and forestry specifically. First, the text discusses why women's empowerment matters to environmental outcomes given their differentiated experiences and attitudes compared to men. Second, the text turns to the more specific relationship between women and forests to then support the aim and expectations of this thesis. Lastly, possible underlying variables are discussed.

Women's political empowerment and the environment

This section begins by describing why and how women and men might have different attitudes towards environmental issues, both on citizen and elite political levels. Then it discusses feminist political ecology (FPE) and the differentiated experiences lived by women compared to men regarding the environment. Lastly, the importance of WPE and its sub-dimensions in regards to environmental issues are discussed.

To answer why to expect that WPE matters in regards to the environment, it is crucial to start by asking why to expect gendered differences in the first place. *Gender socialization* has been one of the main theories used for explaining why there are gender discrepancies in a range of

areas. It posits that men and women are raised through gendered socialization and that this produces differences in value orientations for men and women respectively (Davidson & Freudenburg, 1996). Along these lines, the *safety concern hypothesis* and *value structures* are two theories that base their premise on socialization theory but are more precise in describing the impact of gender on environmental attitudes.

The safety concern hypothesis focuses on the role of women to be caregivers through socialization which, in turn, may make them more concerned for the safety and health of family members and the local community (Davidson & Freudenburg, 1996, pp. 323-325). Viewing environmental degradation as a safety issue will then, according to the theory, make women more concerned for the environment and environmental issues in comparison to men. For example, numerous studies found that women have higher environmental concern compared to men (e.g. McCright & Xiao, 2014; Zelezny et al., 2000). Women are also more likely to take environmental action, especially in the private sphere (Hunter et al., 2004). This research, for the most part, confirms the theoretical assumptions about women having higher levels of concern regarding environmental degradation.

Under the value structures hypothesis, the value structures women more often inherit includes the ethics of care, which links them to other species and the biosphere (Stern et al., 1993). The idea derives from Gilligan (1982, as cited in Stern et al., 1993), who argues that through socialization, women are taught to take others into consideration to higher degree than men and that this leads to stronger altruistic values among women. This can be seen in the actions of female parliamentarians. For example, Ramstetter & Habersack (2019) find that when looking at environmental concern among male and female members of the European parliament (MEP), MEPs express the same level of concern but female MEPs are more likely to support environmental legislation. This could suggest that some politicians "cheap talk" but when it comes to action, female MPs generally act more because they might possess a stronger ethic of care towards the environment than their male counterparts.

In addition, states with higher percentages of female members of parliament (MP) could then be expected to have higher environmental and policy standards if women indeed are more concerned with environmental sustainability. Atchison & Down (2019) find support for this when looking at 18 OECD countries over time by showing that when the number of women in parliament go up so do environmental policy standards. When investigating climate policy

stringency, Mavisakalyan & Tarverdi (2019) conclude that a larger percentage of female MPs makes more stringent policies and that this leads to lower levels of carbon dioxide emissions. Moreover, women's elite political participation (EPP) has been linked to a lower ecological footprint (McKinney & Fulkerson, 2015). This suggests that women's EPP has an impact on environmental policy and outcomes. These results could point to the safety concern hypothesis as well as the value structures hypothesis. If more women have more political power and this leads to actual better outcomes it could be because they have been socialized to be caregivers or hold stronger ethics of care.

There seems to exist somewhat of a consensus that women possess higher environmental concern, however it is also important to see how women and men experience the environment and environmental degradation differently. I will now discuss why and how there are gendered environmental experiences, which makes a WPE perspective critical because women need a forum to voice their experiences and knowledge so that a holistic approach to sustainable environmental management can be achieved.

There are multiple theories about why a female empowerment perspective is important when studying the environment. This thesis will mainly focus on feminist political ecology (FPE) because it allows for a focus on women's lived experiences and women as agents of change, rather than victims of environmental degradation and patriarchy. It is the leading approach when studying gendered aspects of the environment. FPE derives from political ecology (PE) which theorizes that society and nature co-produce each other in the way that capital commodifies and commercializes nature and through this reconstructs society. PE places power differences at the center as there are unequal access to resources because of class and ethnicity (Resurrección, 2017, pp. 75-76). The feminist strand of PE focuses specifically on the gendered relations of power and the division of labor that highly influences the control and access to resources. For example, in Malawi there is a big gap in agricultural production productivity between male and female farmers which can be tracked back to diverse access to machinery and agricultural input (UNEP, 2016, pp. 35-36).

FPE posits that it is *not* through the quality of being a woman that women are affected differently, but through the mechanisms of the sexual division of labor and access to resources. To understand what shapes interests and experiences in an environmental context, FPE takes on a complex reality where gender interacts with the local context, ethnicity, class, culture and

national identity (Rocheleau et al., 1996, p. 5). FPE has focused a lot on women's participation in environmental action where women's roles previously have been left out of the story. For example, FPE stressed the important role of women in the Chipko movement, which started in India to conserve forests from deforestation (Rocheleau & Nirmal, 2015). In this way, FPE addresses the differences of men and women's experiences in regards to the environment.

According to the UNEP (2016, p. 2), there are multiple ways in which women are affected differently from environmental change and degradation. Regarding climate change it can especially effect women relying on agriculture because extreme weather makes production harder and female farmers already lack the same access to technology and resources compared to male farmers (UNEP, 2016, p. 3). More intensive domestic labor often falls on women when disasters hit, which also can add to women's unpaid health-related care work. This is a clear example of how the sexual division of labor can alter the experience of environmental degradation as according to FPE.

As discussed above there are reasons to believe that women have differentiated attitudes and experiences. There has been a lot of research done on women's EPP relationship with environmental outcomes and policy, but there has been less research done regarding other aspects. Since there is theoretical and empirical evidence that women do have different attitudes and experiences also at the citizen level, it is crucial to also see how this impacts other spheres of WPE. The field has not investigated the impacts of gender equality in civic aspects such as civil liberties (CL) and civil society participation (CSP) enough. Because of women's differentiated attitudes and experience, there is reason to expect that all dimensions of WPE could be important for environmental outcomes. There have been two articles which take this into consideration.

There is a big gap in the literature regarding women's political empowerment and its correlation with the environment because most articles only look at elite aspects of empowerment. However, Lv & Deng (2019) find that WPE has a negative relationship with CO_2 emissions, but divided into CL, CSP and EPP these have different strengths of correlation with CO_2 emissions. They request future research to use other dependent variables, e.g. deforestation, to see if their findings hold up. There has been one other study to use these different aspects of gender equality to research the relationship between WPE and climate change vulnerability (CCV) (Asongu et al., 2022). These two studies have not had the aim to specifically investigate

the different dimensions of WPE, though they found that WPE has good environmental outcomes, they also found different results regarding the sub-dimensions. Both found that women's CSP has the strongest positive correlation with the respective outcome variable, however Asongu et al. (2022) find that CL has the weakest correlation whereas Lv & Deng (2019) find that CL has the second strongest correlation out of the three dimensions of gender equality. Hence, there are still ambiguities in the relationship and a need to see how the findings hold up in the assessment of different environmental sustainability challenges.

This section has argued that women play an important part in environmental issues because of their differentiated attitudes and experiences. In turn, these attitudes and experiences could lead to women engaging more in environmental causes and this will lead to actual change for better environmental outcomes. I argue that different dimensions of WPE seem to be important for environmental outcomes and that there is a need for further research. To do this I focus on a dependent variable previously not researched regarding WPE and its sub-dimensions: sustainable forestry. Sustainable forestry is an especially interesting dependent variable because of forests' importance and functions for several parts of the environment and because it has prominent gendered discrepancies. This will be further discussed in the next section. Sustainable forestry can include a range of perspectives, but here it refers broadly to the management of forests being conducted in a sustainable way.

Women's political empowerment and forests

This section starts by considering the importance of forests and women´s differentiated experience and knowledge in relation to forests. Then I discuss through which mechanisms women's CL, CSP and PP respectively can be expected to affect sustainable forestry and based on this, a theoretical model of the possible relationship is created.

Forests are vital for several parts of the earth's environment. The UN Environment Programme (UNEP, n.d.) discusses different ways in which forests are crucial for the environment. Forests are essential to biodiversity. For example, forests hold more than half of animals, insects and plants that are land-based. Forests also have an important role in climate mitigation[1] because forests remove and store carbon from the atmosphere (UNEP, n.d.). For humans, forests can provide shelter and jobs but also water- and food security. Especially for groups that are

[1] Climate mitigation refers to the effort to reduce or prevent the emission of greenhouse gases in the atmosphere.

dependent on forests, deforestation can hit hard, and it can disproportionally and differently effect women.

Lack of control over forest resources is particularly seen in women-headed households and can result in food insecurity, lower incomes and resilience to environmental disasters and change for people that are dependent on these resources (UNEP, 2016). Because of gendered divisions in access to land, forest resources and labor, women are disproportionately affected by environmental degradation as according to FPE (Shandra et al., 2008). Deforestation is known to increase household chores e.g. because it makes it harder to collect necessary resources which in many developing countries is a woman's job, making their workday longer (Shandra et al., 2008). Although this is the case, Varghese & Reed (2012) find that women are excluded from forestry management because of several factors such as social norms and rules of practice, rules of entry, the gendered division of labor, organizational cultures, etc. However, there have been bigger efforts to empower women, both in gaining greater access to resources, but also in economic and political decision making (UNEP, 2016). For example, The Global Environment Facility, which is the financial mechanism for the Rio conventions, adopted a gender-mainstreaming policy in 2011 that has doubled the amount gender-responsive projects in developing countries.

Salahodjaev & Jarilkapova (2020) find that when looking at the percentage of female members of parliament (MP's), a higher share of women is linked with less deforestation. This indicates that WPE is important for more sustainable forestry. However, they do not take any other measure or dimension of WPE into account. Because of women's unequal access to forest and how they are affected by deforestation, it is important to investigate the relationship with different aspects of women's political empowerment in regards to deforestation to compare how PP, CSP and CL are related to deforestation.

The text will now discuss through which mechanisms these sub-dimensions of WPE can be anticipated to correlate with forestry, however the purpose is not to empirically test these. The suggested mechanisms work as theoretical tools to indicate the expected direction of the relationship. It is also important to mention that there could be other mechanisms through which the relationship works that are not discussed here. Thus, I am aware of this empirical and theoretical limitation which is beyond the scope of this thesis. That said, the thesis begins to fill important theoretical and empirical gaps in the literature, by describing some key mechanisms

through which WPE could potentially affect sustainable forestry and empirically assessing the relationship between variation in the sub-dimensions of WPE and sustainable forestry.

First, *civil liberties* refer to having rights and freedoms to make your own choices. These can be given both through laws and regulations, but women might also be restricted by informal culture rather than laws which is important to take into consideration (Sundström et al., 2017). There are two ways in which women's CL is expected to have an impact on forestry. One mechanism is that women's CL are associated with higher quality institutions. In developing countries Njoya (2021) found that women's civil liberties, through reducing the size of the underground economy and corruption, leads to better institutional quality. In turn, institutional quality is correlated with having better environmental outcomes on several indicators, including forest area (Azam et al., 2021), making quality of institution an expected mechanism.

Moreover, there are places where women are denied access to own land which can highly effect women's ability to influence what is done to land. For example, when looking at the years 1960-2010 there has been a big change in favor of women's rights to own property, agency as well as mobility for married women and overall restrictions, however there are still restrictions for women and especially in MENA and South Asia there was little change (Hallward-Driemeier et al., 2013). When exploring forest owners' attitudes in a Swedish context, Umaerus et al. (2019) found that female forest owners to a higher extent thought that biological diversity, preservation of forest landscape and outdoor should be taken into consideration when managing forests. This suggests, together with women's higher concern for the environment, that a larger number of women landowners could have a positive outcome on forests.

Second, *civil society participation* regards women's ability to act as agents and to express themselves in civic forums which is something that can be shaped by existing gendered power relations. Partaking in civil organizations is an important aspect of CSP that could be a mechanism in its correlation with forest outcomes. There are reasons to believe that when women's CSP goes up, so does the amount and strength of women's NGOs. Shandra et al. (2008) found that not only environmental NGOs, but also women's NGOs are correlated with lower rates of deforestation using a 61 nation sample. It is theorized that this is partly because women's NGOs at the local level often provide technical and financial assistance to support agroforestry projects and because they stimulate social movements within nations. Therefore,

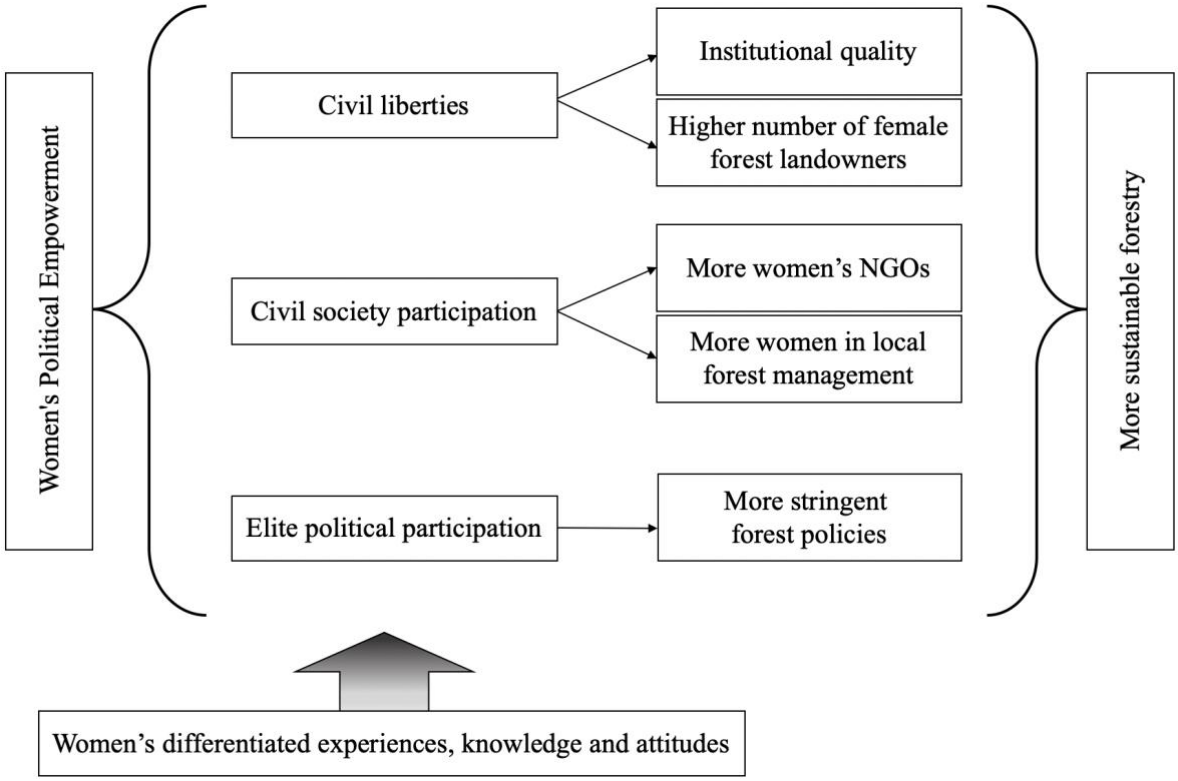
one of the expected mechanisms for the relation between women's CSP and forests are women's NGOs.

Another mechanism that is excepted is the participation of women in local forest management since there is reason to expect that women bring different perspectives, values, concerns and expectations regarding forestry issues according to Varghese & Reed (2012). In Sundarbans mangroves in Bangladesh, women contribute to local forest management with knowledge of sustainable resource harvesting methods, which can positively contribute to both forest conservation as well as wildlife protection according to Begum et al. (2022). Although women do participate in different parts of forest co-management, they are few and it is very much male-dominated. If women are participating more in civil society in general, they are also more likely to be included in forest management. Since women express higher concern for the environment this engagement is expected to have a positive relationship with forests.

Third, *elite political participation* is about how women are represented in the elite legislative processes but also to what extent they can exercise their power as well as men, meaning the equality in the distribution of power. As previously discussed, a higher percentage of female MPs have been correlated with better environmental policies and outcomes (e.g. Atchison & Down, 2019; McKinney & Fulkerson, 2015). When women can hold seats and exercise their power properly, I therefore expect them to vote for forest policies that are better for forests. Hence the mechanism that results in women's EPP having a positive correlation with sustainable forestry is through more stringent forest legislation. Jha & Bawa (2006) found that policy choices can be essential, because if they disregard conservation this can cause loss of forests. This is supported by Salahodjaev & Jarilkapova's (2020) finding that more women in parliament lead to less deforestation in a country, however I have some criticism as to their operationalization of variables which will be discussed further in the method section. Nevertheless, their result still suggests that women's EPP will have a positive relationship with sustainable forestry.

Taking women's CL, CSP and PP together as a measure of WPE will then be expected to have a significant impact on countries' level of forestation and deforestation which is visualized through Figure 1. It is also theorized that the difference in women's experiences, knowledge and attitudes play an important role in how women will exercise their empowerment in regards to forestation based on the literature previously presented.

Figure 1. Theoretical model



Aim and hypotheses

The aim of this study is to explore how WPE and the sub-dimensions of women's CL, CSP and EPP correlate with sustainable forestry and if there are differences in the strength of the correlation among them. The way that this will add upon existing research is twofold. First, it will increase the knowledge of what can possibly be a driver in sustainable forestry, where previous research only has investigated the EPP dimension of WPE on deforestation. Second, it will complement the research on WPE and its sub-dimensions and environmental outcomes with a different dependent variable as requested by Lv & Deng (2019). Based on what has been theorized above based on earlier research, I specify three hypotheses which this study aims to test:

H1: Women's political empowerment will have a positive relationship with more sustainable forestry and,

H2: all sub-dimensions will positively correlate with sustainable forestry.

In addition, I take into consideration the two other studies that considered these three variables and their relationship with CO_2 emissions and climate change vulnerability. Both found that CSP had the strongest correlation with their dependent variables (Asongu et al., 2022; Lv & Deng, 2019). It is thus likely that this would also be the case for sustainable forestry. Therefore, I also hypothesize that:

H3: women's civil society participation will have the strongest correlation with more sustainable forestry compared to women's civil liberties and women's elite political participation.

Possible underlying variables

It is central to discuss what other factors could affect forests as well as WPE across countries since these could be the reason for potential covariation. These variables will be important to control for to make it possible to isolate the potential relationship of the independent variables and dependent variable as much as possible. There could be other factors that play into the possible relationship, however these are the most commonly used in the field. WPE is an essential part of gender equality. Hence, I predict that when something is correlated to gender equality, it is also correlated to WPE and the sub-dimensions.

One possible factor is *wealth* since there are indications that it influences both gender equality and deforestation. There is a complex relationship between economic development and forests where higher income countries are able to afford afforestation to a higher degree than low-income countries according to Ewers (2006). Low-income countries seem to a higher degree to use forests to try and spur the economy but cannot afford replantation. There is also evidence that wealth will generate gender equality in an S-shaped curvilinear way (Eastin & Prakash, 2013) which means that it could also affect women's political empowerment. Inglehart et al. (2003) find that with rising GDP comes more self-expressive values and that these in turn are linked to gender equality. This makes wealth an important potential underlying variable to control for to make sure the correlation is not spurious.

Another important possible underlying variable to control for is *level of democracy*. There are studies that say democracy reduces deforestation (e.g. Li & Reuveny, 2006) and others that say democracy seems to accelerate it (Midlarsky, 1998), but Buitenzorgy & PJ Mol (2011) find that

there seems to be a Kuznets curve relationship. This suggests that at early stages of democracy, deforestation goes up whereas after a certain level of democracy levels of deforestation goes down. There is also an expected correlation between democracy and gender equality. Some studies have found that there is an indirect effect (Inglehart et al., 2003) and others a direct effect (Andersen, 2022). Whether there is a direct or indirect relationship, higher levels of democracy are linked with higher levels of gender equality.

Population growth has been connected to deforestation and could be an important factor to consider. When populations grow there is a higher need for agriculture which could be a reason for deforestation, however the empirical literature shows that this seems to vary and is uneven among states. For example, states that have high rates of population growth lead to deforestation if they have a low Human Development Index (HDI) score, which is not the case in countries with high HDI (Jha & Bawa, 2006). There is also a relationship between population growth and gender equality since women are the ones getting pregnant and childcare often falls on women. Sen (2001) gives the example of some states in India (Kerala, Tamil Nadu, Himachal Pradesh) that saw a fast drop in fertility rates and how this was linked with different aspects of female empowerment, such as education. With less population growth, it is more likely that women can get an education, work and have time to partake in civil society to a higher extent.

Trade openness could be something that effects both WPE and forests. There is evidence that more trade openness leads to more deforestation in non-OECD countries but that trade openness seems to slow down deforestation in OECD countries (Tsurumi & Managi, 2014). Trade openness here is defined as imports plus exports divided by GDP which is a conventional definition (Mavisakalyan & Tarverdi, 2019). How gender equality is affected by trade openness is a somewhat debated area. Gray et al. (2006) theorizes that women will benefit from globalization through providing women economic resources and opportunities, but also through the spread of ideas and norms about women's place in political, economic and social life. They do find empirical evidence that globalization does improve several aspects of gender equality, such as literacy, health and participation in economy and society. Most of the literature does find that trade openness has a positive effect on gender equality, but there are some studies that get the opposite results as summarized by Aguayo-Tellez (2012).

Another variable to control for is *level of corruption.* This is because corruption is found to have both an indirect but also a direct effect on environmental outcomes. Welsch (2004)

discovers, in a cross-country study, that there is a direct positive relationship between higher levels of corruption and higher levels of several environmental indicators (air and water pollution). It is theorized that this is because the stringency and enforcement of environmental law can be undermined by corruption. It is also found that corruption can enhance or reduce pollution levels depending on the per capita income level. A lot of research has focused on the fact the women tend to engage in less corruption and that female political representation will to lead to less corruption (Dollar et al., 2001). However, there is also evidence that corruption will inhibit gender equality. For example, Sundström & Wängnerud (2016) find that low levels of corruption is important for female representation on local political levels in Europe.

Lastly, *ratification of environmental treaties* could have a large impact on how countries are positioned in their forestation policies. States who ratified environmental treaties are held to higher environmental standards which in turn is likely to lead to more sustainable forestry. There is evidence that states that have ratified environmental treaties that contain obligations to reduce forest loss do have less deforestation (Sommer, 2020). It is also suggested that the Paris agreement can be an important factor for forestry outcomes. There is reason to believe that states who ratify environmental treaties, do ratify more international treaties and conventions in general. This would probably include international treaties regarding gender equality which can be important for WPE. For example, Gray et al. (2006, p. 326) find that the ratification of *Convention on the Elimination of all Forms of Discrimination against Women* (CEDAW) seems to be a crucial factor for women's participation in the economy, literacy and representation in national parliaments.

3. Method and operationalization

This part of the thesis begins by presenting a statistical analysis as the favorable design to test the hypotheses of this study. Then it describes the operationalization and the data used for all variables. Lastly it discusses the limitations of the decisions made in regards to method, operationalization and data. However, the validity and reliability of the thesis is discussed throughout this chapter as it has been guiding the choices made.

Design

The purpose and hypotheses of this study makes it have explanatory and theory testing ambitions and the best method for this is quantitative since the ambition is to get as close to the

contrafactual ideal as possible with help of systematic comparisons (Esaiasson et al., 2017, p. 92). A statistical analysis will be used because it is a powerful tool that can empirically test and compare the correlation among a large number of countries. It also makes it possible to control for underlying variables, to avoid drawing conclusions about spurious or indirect relationships. This is important for the internal validity of the thesis. To conduct the analysis, I will employ ordinary least square (OLS) regressions. This is the logical choice when the dependent variable is on an interval scale level which is the case in this thesis (Teorell & Svensson, 2007, p. 164). This is because it calculates the regression coefficient which gives an estimate of the strength of the potential relationships. First, a bivariate regression between WPE and each sub-dimension will be separately tested with the dependent variable. This enables an overview of the differences in the strength of the relationship of the independent variables with the sustainable forestry variable. The women's CL, CSP and EPP variables possible correlations will be compared to each other to see which have the strongest positive correlation with sustainable forestry to answer H3. Second, using a multiple OLS regression, I will assess the relationships under control of the factors discussed above. The controls will show if the potential correlation remains after including the relevant variables.

The analytical units consist of 101 countries based on data availability. A full summary of the countries included in the sample and their values on the dependent and independent variables can be found in appendix 1. The data for sustainable forestry is based on the years 2015-2020 and the data point that will be used for WPE and its sub-dimensions is 2015. The time-period is chosen because it is the most recent available data for sustainable forestry. WPE and its sub-dimensions are taken from the 2015 data point because the potential correlation with WPE and sub-dimensions at that point is expected to influence the sustainable forestry over the coming time-period.

Operationalization and data

Independent variables

The independent variables are *WPE* and its sub-indicators, women's *CL*, *CSP* and *EPP*. They are operationalized with indicators presented by Sundström et al. (2017), who also provide the dataset with V-Dem (Coppedge, 2021). CL are operationalized by women's freedom of domestic movement, freedom from forced labor, property rights and access to justice. For the CSP, women's freedom of discussion, participation in civil society organization and

representation in the ranks of journalists are used to operationalize the theoretical concept. Operationalization of EPP is constructed by women's legislative presence and political power distribution which is based on an expert evaluation. The WPE is calculated by taking an average of all sub-indicators. These variables are presented in an index published by V-Dem where countries are scored on an interval scale ranging from 0 (low) to 1 (high). This study will use the data from 2015 as discussed above. This is a good measurement for the aim of this study because it systematically measures the different dimensions of women's political empowerment and has been employed previously in similar studies (see Asongu et al., 2022; Lv & Deng, 2019). This is one of the most advanced indicators of gender equality and women's political empowerment, and more comprehensive than using the percentage of female MP's which has been done previously. However, it does have limitations since it can never truly measure all aspects of WPE.

Dependent variable

To operationalize the dependent variable, which is *sustainable forestry* this study use data created by Ritchie & Roser (2021). The raw data comes from UN Food and Agriculture Organization (FAO) which contains information on several aspects of forests, e.g. forest area, deforestation, afforestation and expansion. Since annual numbers on forests can be volatile, the data is collected over 5-year periods and then averaged per year in the FAO data, where the most recent period is 2015-2020 (Ritchie & Roser, 2021). The data is hence cross-sectional. The raw data is monitored, collected and interpreted through national data and then reported to the Forest Resource Assessment (FRA) (FAO, 2020).

Annual forest change is calculated by taking forest expansion (which is sum of afforestation and natural expansion) minus deforestation. Afforestation is the process of planting trees where there has not previously been forest and natural forest expansion is when trees grow back on abandoned agricultural or other kinds of land (FAO, 2020). Deforestation in turn is the process of converting forest to other land uses such as for infrastructure or agricultural purposes.

$$Annual\ forest\ change = \Sigma\ gains\ (forest\ expansion) - \Sigma\ losses\ (deforestation)$$

However, this is measured in hectares per year so it is more fruitful to look at the *annual change in forest area as a share of forest area* which is forest area net change divided by total forest

cover in a given country at the start of the time period. This is the measure that will be used and the data has been summarized and made available by Ritchie & Roser (2021).

$$Change\ in\ forest\ area\ as\ share\ of\ forest\ area = \frac{\Sigma\ \text{forest area net change}}{\Sigma\ \text{total forest cover}}$$

By using data between the years of 2015 and 2020 we get an indicator of how a given country has changed on average annually regarding forest in that amount of time. This is a good measure since it shows the change over time in relation to the amounts of forest a state has. When investigating the relationship between women in parliament and deforestation, Salahodjaev & Jarilkapova (2020) operationalize the dependent variable as forest cover per capita which can be problematic. There are numerous ways in which a countries' forest cover can be different regardless of population size, e.g. territorial size and geographical location can highly affect whether or not a country has much forest in the first place. By looking at the change as a percentage in a country it enables one to isolate the actual change, regardless of a country's predisposition in forest area. Because of this, I argue that this is a better way to measure sustainable forestry. This is also an additional way that my study differs from and contributes to the research by Salahodjaev & Jarilkapova (2020).

Control variables

I choose to control for all the possible underlying variables that were presented in the previous chapter to make sure that the relationship is not spurious or indirect. The data point for all control variables is 2015, as that is the relevant time-period. The only exception is ratification of environmental treaty, as explained later in this section.

Level of democracy is operationalized by level of electoral democracy specifically. Electoral democracy is employed because it is the basic dimension of democracy that I'm seeking to control for. A broader definition of democracy could include the civil liberties of women that are aimed to be tested which could lead to covariation. The data used is from the V-Dem dataset and specifically the electoral democracy variable (Coppedge, 2021). Countries are ranked on an interval scale from low (0) to high (1).

To operationalize the control variable *wealth,* GDP per capita is used which is a common measure of countries' economic situation also in similar studies such as Atchison & Down (2019). It is presented in US dollars, which is also the case with trade openness.

Trade openness is operationalized as imports plus exports divided by GDP which is a common operationalization (eg. Salahodjaev & Jarilkapova, 2020).

Population growth is operationalized as population density, which is people per sq. km of land area. For *wealth, trade openness* and *population density* data is collected from the World Bank (n.d.) database.

Level of corruption is operationalized as control of corruption in a given state. The data comes from the Worldwide Government Indicators and ranges on a score from -2.5 to 2.5, and is based on the perception of how much of public power is used for private gain. The data is published by World Bank Databank (n.d.).

Ratification of environmental treaties is operationalized by ratification (or no ratification) of the Paris Agreement before 2017. This operationalization was chosen because it has been theorized that ratification of the Paris Agreement can be important for forestry outcomes (Sommer, 2020). The timeframe is chosen based on the fact that a majority of countries have ratified by the end of 2022 and because of the general timeframe of this thesis. If countries ratified within a year[2], it is an indication that they take higher environmental action in comparison to countries who took longer time before ratifying. The data is collected from United Nations Treaty Collection (n.d.).

Limitations

There are several limitations to this method and operationalization. One limitation is that the analytical units are countries. This is because there could be different local contexts within countries that won't be visible in the results. For example, there could be regions where women are able to engage more in civil society and in forest movements which possibly makes a difference, but other regions in the same country where this is not happening. However, because this thesis uses worldwide cross-country data the results will be more generalizable to the bigger

[2] The Paris Agreement was adopted in December 2015.

population of countries. This allows for an aggregated perspective on the correlation of WPE and sustainable forestry which is suitable for the research problem and aim.

The operationalization of sustainable forestry is not a common one in the literature which could be seen as another limitation. However, as I argued above, this measure will be the most appropriate to isolate the potential relationship with WPE and the sub-dimensions because it rules out a lot of the preexisting conditions. Another limitation is that the FAO data is collected from national data, hence, countries could possibly present data that makes them look better than they actually are which could reduce the reliability of the study. This is important to keep in mind, but the FAO is a well-established organization and in their 2021 report stresses the importance of transparency when collecting data and that the nation reports are able to provide references for their original data.

The data used for the analyses is cross-sectional which is sufficient to test the hypotheses. However, it does lack some of the nuance and confidence that longitudinal data can provide which is another limitation in regards to the design and data. By using the most recent available data for forest area change and basing the data points of the independent and control variables in regards to this, the research is as relevant as possible in regards to time. Lastly, omitted variable bias could interfere with the results of the regression analyses and in turn lead to false conclusions. This is something to be aware of and by controlling for relevant variables the risk of omitted variable bias decreases. Since the variables are included on a theoretical basis there might be other variables that are not considered which could be problematic.

4. Results

The chapter begins by presenting descriptive statistics to present information about all variables. Then the bivariate relationships between the independent variables respectively and the sustainable forestation variable are presented. Because of an outlier, a regression analysis is done both with and without the outlier to enable a comparison between the results. After this, multiple regression is employed to control for all the relevant variables. Although the theory assumes WPE and sub-dimensions to potentially affect sustainable forestry, these results cannot say anything about actual causation.

Descriptive statistics

This section provides descriptive statics, which allows an overview of the data for the dependent and independent variables. There is a table-summary of all control variables in appendix 2 (table 7). First, I summarize the WPE and its sub-dimensions. Second, I summarize and present a histogram including the normal distribution of sustainable forestry as well as a map to see regional distribution.

As seen in table 1, there are 101 observations and the score of the independent variable ranges from 0-1, with the CL having the lowest minimum at .007 and EPP having the highest maximum at 1. EPP has the highest mean, which indicates that the countries generally perform better regarding women's EPP than CL and CSP. As seen by the standard deviation and the max and min, CL has the highest dispersion within the population and ranges from .007 to 0.984.

Table 1. Summary of independent variables

Variable	Obs	Mean	Std. dev.	Min	Max
WPE	101	.7671683	.1558404	.288	.965
CL	101	.7096535	.2171288	.007	.984
CSP	101	.7197129	.1815269	.091	.949
EPP	101	.8869802	.1447933	.306	1

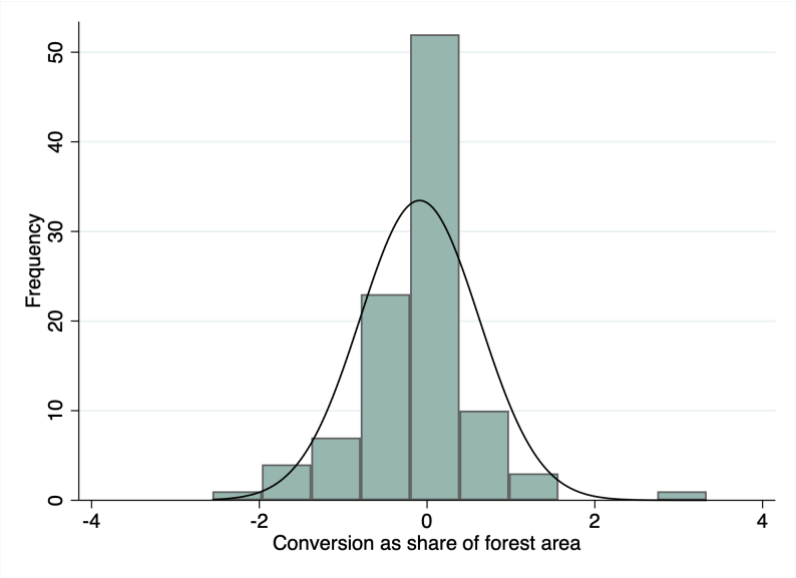
Table 2 shows that the change in forest area range from a deforestation of -2.56% and up to a forest expansion of 3.33%. As will be discussed in the next section, the 3.33% expansion is an outlier compared to the other observations. The mean average is negative, which indicates that for these observations combined there are less forest area between 2015-2020 than before the time period.

Table 2. Summary of dependent variable

Variable	Obs	Mean	Std. dev.	Min	Max
Conversion as share of forest area	101	-.0889814	.7096683	-2.559161	3.333333

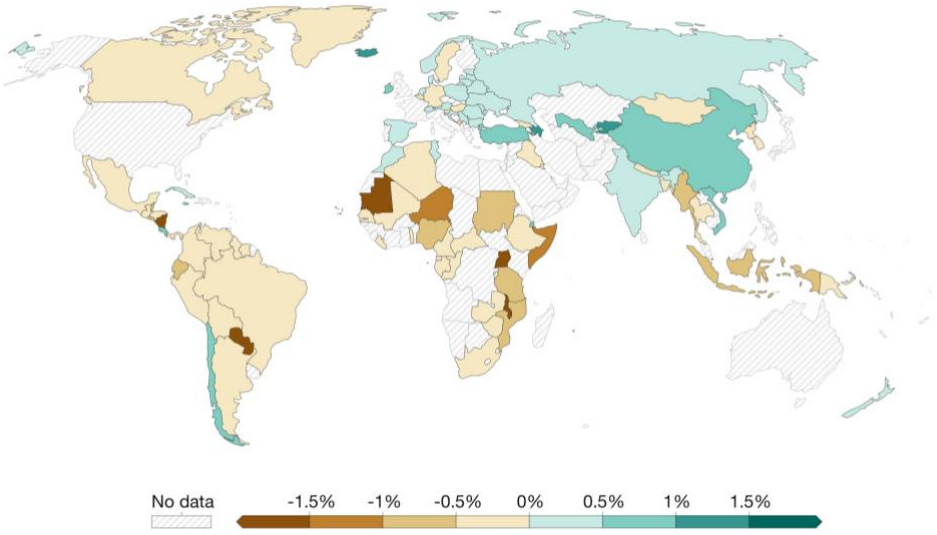
The histogram presented in figure 2 shows that many observations have or are near a 0% change. However, there is enough variation to expect that a potential correlation between sustainable forestry and the independent variables could be visible.

Figure 2. Histogram with normal distribution of dependent variable



There is some variance within regions regarding sustainable forestry as is seen in figure 3, however there seems to be more forest expansion in Europe and Asia generally than in North America, South America and Africa which show more tendencies of deforestation. There could potentially exist contextual differences between regions when it comes to the relationship between the independent variables and the dependent. However, this is not something that is within the scope of this thesis.

Figure 3. Map visualization of sustainable forestry data 2015-2020



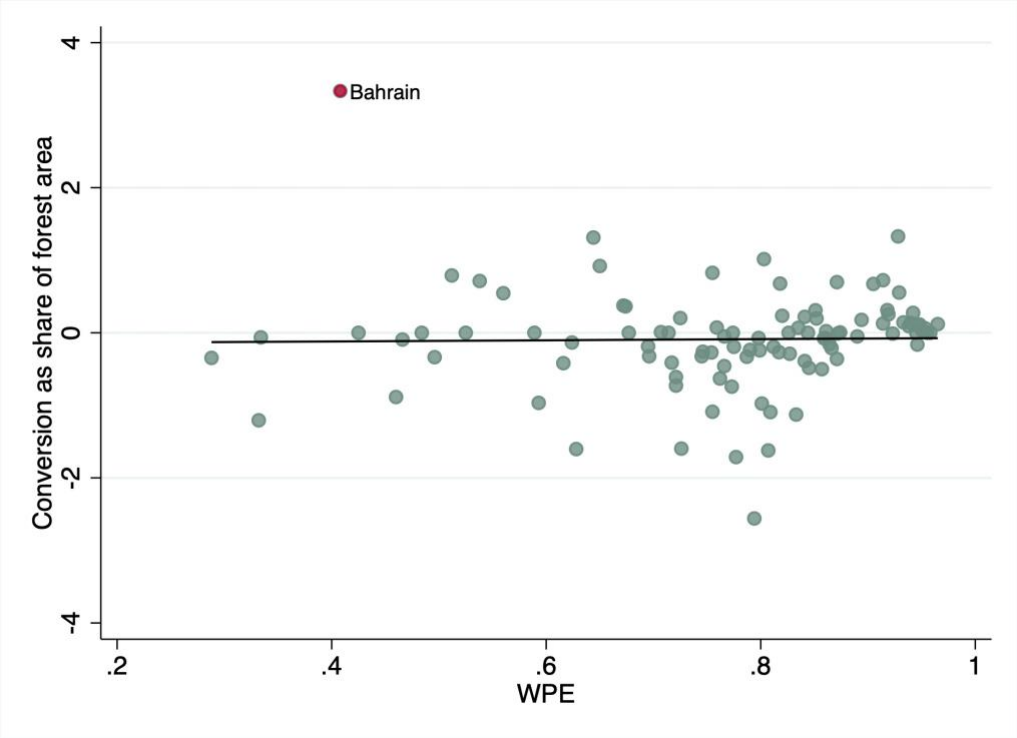
Comment: Change in forest area as share of total forest area. Note that all of these observations are not used in the analyses because some are not available in the WPEI dataset. Source: Raw data: FAO (2020), data calculated and visualized by Ritchie & Roser (2021).

Results

This section presents the results and overall findings in relation to the specified hypotheses. It starts by investigating the bivariate relationships between the independent and dependent variables. This is done by the OLS regressions and scatterplots to visualize the linear correlation. Lastly, the correlation of the independent and dependent variables are exposed to the control variables in multiple OLS regressions.

When looking at figure 4., which shows a scatterplot diagram on WPE and sustainable forestry, it is evident that there seems to be no positive correlation. It also becomes evident that Bahrain is an outlier. Bahrain has a higher forest expansion than the rest of the observations and a relatively low score on WPE. This could influence the outcome since it clearly differs from the other observations. It works against H1 and H2 because it has a big increase in forest area compared to all other observations while also scoring relatively low on the WPE indexes. Therefore, regressions both including and excluding Bahrain is done.

Figure 4. WPE and conversion as share of forest area

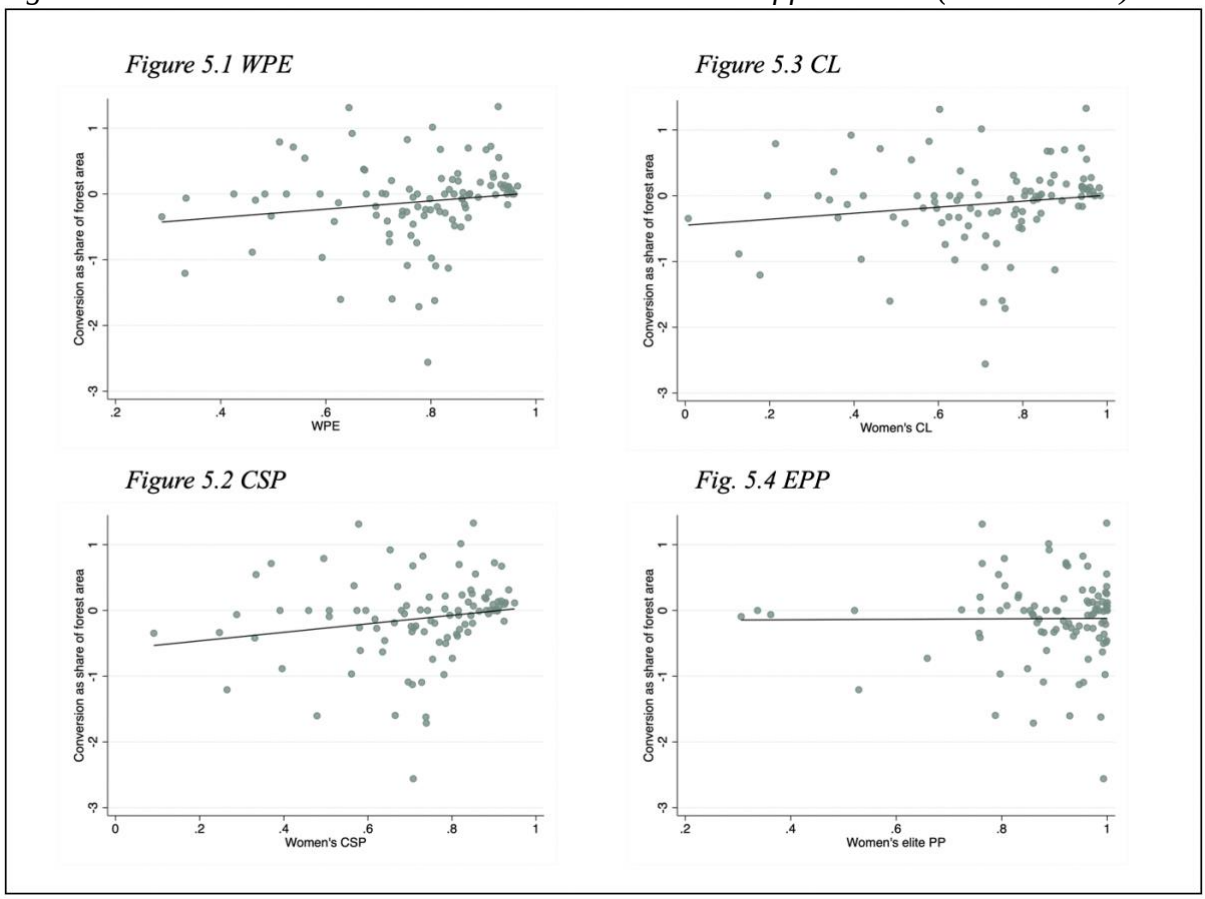


Comment: Conversion as share of forest area is the annual change in forest area as share of total forest area. WPE is scored from 0-1 where 1 indicate high female political empowerment.

In table 3., all results are insignificant since the p-value is higher than 0.05, meaning that the results found can be due to chance. The regression coefficient shows how much sustainable forestation (percentage change in forest area) increase or decrease when WPE and the sub-dimensions, respectively, increase its score with one unit on its own scale. Models 1-4., which includes Bahrain, shows that there is almost no positive relationship for WPE and sustainable forestry as visualized in the scatterplot above. These results are not consistent with H1. Models 1-4. also contradict H2 because it shows a negative relationship (-0.727) between women's EPP and the dependent variable. Out of the sub-dimensions, CSP has a somewhat higher positive correlation on sustainable forestry compared to CL which could be consistent with H3. However, none of these results are statistically significant, so I cannot draw any conclusions about WPE and its sub-dimensions' correlation with sustainable forestry. Since it is clear that Bahrain is an outlier that affects the results on all variables (see appendix 2. figure 6.), I proceed to drop that observation to see if the results change (see table 3, model 5-8).

When dropping Bahrain in scatterplots, there is a weak positive effect of WPE, women's CL and CSP on the conversion of forest area, however there is a big variation in the observations (see figure 5.). Women's EPP seems to have no correlation with sustainable forestry.

Figure 5. WPE + sub-dimensions and conversion as share of forest area (excl. Bahrain)



Comment: The figure shows scatterplots of WPE and each sub-dimension's bivariate relationship with conversion as share of forest area with the exclusion of Bahrain. See fig. 4. for more information on variables. (CSP, CL and EPP are scored 0-1).

When excluding Bahrain in the regression analyses, the B-coefficients remain statistically insignificant (table 3. Model 5-8). However, WPE now has a somewhat stronger positive correlation with the dependent variable (0.627), which could be more consistent with H1. All sub-indices have, even if very weak, a positive correlation with sustainable forestry. However, the effect of women's EPP is basically zero which is not consistent with H2, rather, the result suggests that women's EPP has no relationship at all with the dependent variable.

Table 3. WPE + sub-dimensions and conversion as share of forest area

	(1) Forest incl. Bahrain	(2) Forest incl. Bahrain	(3) Forest incl. Bahrain	(4) Forest incl. Bahrain	(5) Forest excl. Bahrain	(6) Forest excl. Bahrain	(7) Forest excl. Bahrain	(8) Forest excl. Bahrain
WPE	0.0822				0.627			
	(0.18)				(1.53)			
Women's CL		0.220				0.457		
		(0.67)				(1.59)		
Women's CSP			0.274				0.648	
			(0.70)				(1.88)	
Women's EPP				-0.727				0.0368
				(-1.49)				(0.08)
Intercept	-0.152	-0.245	-0.286	0.556	-0.606	-0.449*	-0.592*	-0.156
	(-0.42)	(-1.01)	(-0.98)	(1.27)	(-1.89)	(-2.09)	(-2.30)	(-0.38)
N	101	101	101	101	100	100	100	100
R^2	0.000	0.005	0.005	0.022	0.023	0.025	0.035	0.000

*Comment: t statistics in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001. The table show the result from the regressions analyses of WPE and the sub-dimensions on conversion as share of forest area. Model 1-4 include Bahrain (outlier), whereas model 5-8 exclude Bahrain (outlier).*

For all models in table 3. the value of the R^2 is very low so it is hard to say that WPE and its sub-dimensions has a significant impact on the conversion of forest area, but that there are other variables that play a much bigger part. By adding the previously discussed control variables, a multiple OLS regression is employed to try and isolate the effects of the WPE variables, but first a correlation matrix over all variables used is presented to see how they correlate.

Table 4 shows in a correlation matrix that GDP per capita and control of corruption have the strongest positive correlation with change in forest area. All control variables have a positive correlation with the dependent variable except for population density which was expected. Ratification of the Paris Agreement seems to have practically no correlation with sustainable forestation. Electoral democracy and control of corruption has the strongest positive correlation with WPE.

Table 4. Correlation matrix of all variables

	Change in forest	WPE	Elec. Dem.	GDP Per cap.	Trade openness	Pop. dens.	Corr. control	Rat. Paris Agr.
Conversion as share of forest	1.0000							
WPE	0.1531	1.0000						
Electoral democracy	0.1387	0.7751	1.0000					
GDP per capita	0.2326	0.4519	0.5226	1.0000				
Trade openness	0.1349	0.1593	0.1253	0.3776	1.0000			
Population density	-0.1311	-0.0084	- 0.0768	0.2494	0.5247	1.0000		
Control of corruption	0.3107	0.6438	0.7052	0.8374	0.3905	0.2191	1.0000	
Ratification of Paris Agreement	0.0380	0.1064	0.0914	0.1484	0.1080	0.1117	0.1720	1.0000

Because some analytical units are missing data in regards to the control variables, only 91 of countries among the sample are included in the results below. The missing observations could impact the result because the reasons for the missing data could possibly be that they are more closed countries with less transparency (see appendix 3 for list). Based on the regression only including that sample, the B-coefficients remain statistically insignificant, however slightly different compared to the regression only without Bahrain. For WPE, women's CL and CSP, the positive correlation was somewhat stronger whereas EPP had a very weak negative correlation (see appendix 3, table 8.). This could be important to take into consideration when comparing the results with regressions including controls.

In table 5, the coefficients remain statistically insignificant according to the t-value for WPE and the sub-dimensions[3]. Under controls (all other variables held constant), women's CSP is the only one of the independent variables that kept a positive value, however, the correlation is weaker than before the inclusion of controls. This could potentially be consistent with H3. WPE, women's CL and EPP instead show a negative correlation when including the controls which is not consistent with H1 and H2.

The adjusted R^2 implies that the independent variables, respectively, together with the control variables hold from 12,7% - 13,7% of the explanatory power. This would suggest that there are other, more important factors, to consider when understanding what drives countries' sustainable forestation. What can be seen is that population density as well as control of corruption in all models is statistically significant. For example, under control of all variables in table 5. model 1., one unit increase in the control of corruption score indicate a 0.368 increase in forest conversion as percentage of forest area.

[3] All multiple regressions are unstandardized and therefore the results of the independent and control variables cannot be compared since they have different scales and measurements.

Table 5. WPE + sub-dimensions and conversion as share of forest area including controls (excl. Bahrain)

	(1) forest	(2) forest	(3) forest	(4) forest
WPE	-0.162 (-0.23)			
Women's CL		-0.135 (-0.26)		
Women's CSP			0.312 (0.59)	
Women's EPP				-0.544 (-1.00)
Electoral democracy	-0.513 (-1.14)	-0.500 (-1.08)	-0.699 (-1.62)	-0.481 (-1.26)
GDP per capita	-0.00000476 (-0.76)	-0.00000473 (-0.75)	-0.00000387 (-0.62)	-0.00000514 (-0.83)
Trade openness	0.00194 (1.27)	0.00203 (1.30)	0.00195 (1.28)	0.00161 (1.04)
Population density	-0.000251** (-2.83)	-0.000253** (-2.84)	-0.000250** (-2.83)	-0.000242** (-2.73)
Control of corruption	0.368** (2.64)	0.369** (2.66)	0.342* (2.50)	0.383** (2.84)
Ratification of Par. Agr.	-0.0339 (-0.27)	-0.0354 (-0.29)	-0.0457 (-0.37)	-0.0278 (-0.23)
Intercept	0.316 (0.62)	0.273 (0.76)	0.0617 (0.15)	0.688 (1.25)
N	91	91	91	91
Adj. R^2	0.127	0.127	0.130	0.137

Comment: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Regressions of WPE and respective sub-dimension including control variables and sustainable forestry. The coefficients are unstandardized.

To make sure that the results in table 5. are not caused by multicollinearity, I employ the variance inflation factor (VIF). Multicollinearity is caused by covariation in the variables and will affect the B-coefficient as well as detecting significant coefficients. However, only Control of Corruption has a VIF-value that is considered too high as seen in table 6.[4] since values under 4 are usually viewed as normal (Sundell, 2010). This indicates that there could be some covariance that effects the results. When running regressions without control of corruption, the VIF values are good but the coefficients among the independent variables stay statistically insignificant (see appendix 4.). All independent variables but EPP have positive coefficients and women's CSP has almost the same level of correlation as when running no control and Bahrain was excluded. This could indicate that the covariance did cause some changes in results but also that control of corruption is an important variable in the relationship.

Table 6. VIF-values

Variable	**VIF**
Control of corruption	5.80
GDP per capita	3.56
Electoral democracy	3.38
WPE	2.92
Trade openness	1.56
Population density	1.50
Rat. Paris Agreement	1.05

Comment: This is based on the regression presented in table 5. Model 1.

To summarize, because of a lack of statistical significance, these results are not generalizable to the larger population of countries. After excluding Bahrain there could be some support of all hypotheses but these results are volatile. There is no support of H1 or H2, when controlling for relevant variables, rather, WPE, CL and EPP have a negative correlation with sustainable forestry. As predicted in H3, women's CSP seems to have the strongest positive relationship with sustainable forestry compared to the other WPE sub-dimensions. It also seems that women's EPP has the weakest positive relationship. This is consistent across the regression models. The next chapter will discuss these results in regards to what was theorized.

[4] When looking at VIF for all models in table 5. the results are very similar so only WPE variable is presented since it is average of the sub-dimensions. In all models was control of corruption the only variable with a VIF over 4.

5. Discussion

This section seeks to relate the results back to the theoretical discussion and to the hypotheses. There are some ambiguities in regards to the correlation between WPE and sustainable forestation, and I cannot draw any conclusions about the relationship since all results were statistically insignificant. However, I will still discuss the results in relation to the hypotheses but keep in mind that these results are not statistically significant. H1 predicted that WPE would positively correlate with sustainable forestry which is not supported when controlling for underlying variables. Since WPE is an average of its sub-dimensions the text till now go through these respectively to discuss the results.

Before controlling for other variables, women's civil liberties showed a weak positive correlation with the dependent variable but after the controls it had a small negative correlation. When not including control of corruption, it again had a slight positive relationship. This was not expected in regards to what was theorized, which was that women's CL would strengthen institutional quality and provide more female forest owners which in turn would result in a better forest outcome. One reason for the outcome could be that even if women legally have the ability own land, there might still be a male majority of forest owners.

As predicted by H3, women's CSP consequently showed a higher degree of positive correlation with the dependent variable in comparison with the other WPE independent variables. This could suggest that if women have higher access to partake in women's NGOs and local forestry management, this could positively affect sustainable forestry. As seen by Begum et al. (2022), women tend to bring their differentiated experiences and knowledge to forest conservation and this has fostered forest resources in Bangladesh. If women are more empowered to engage in civil society, they also have the possibility to voice their concerns which could possibly lead to more sustainable forestry. The fact that CSP had the highest positive correlation compared to the other sub-dimensions was not surprising since this had been the case in previous studies with different dependent variables (Asongu et al., 2022; Lv & Deng, 2019).

Women's EPP had a negative correlation with sustainable forestry after controlling for relevant variables and basically no correlation before controls. This contradicts what Salahodjaev & Jarilkapova (2020) found when operationalizing women's political empowerment as only percentage of female MP's, whereas the one used here also included an indicator of distribution

of power. They also had another operationalization of change in forests or deforestation which might explain different results. Since a lot of research has found that more female MP's will lead to better environmental outcomes in a range of areas, these results are surprising.

Overall, the results were not as expected and go against what has been previously understood about how women's political empowerment correlate with environmental outcomes. For example, both Asongu et al. (2022) and Lv & Deng (2019) found that WPE and all sub-dimensions reduced vulnerability to climate change and CO_2 emissions respectively. To the contrary this study suggests that WPE and its sub-dimensions have no significant effect on sustainable forestry at all. However, I would argue that this conclusion might be premature. One reason for having these results might be that the measurement used for women's CL, CSP and EPP are too general and aggregated. For example, it would have been better to see if and to what extent women are participating and have power in environmental departments or governing bodies that work with forestry in regards to EPP. However, there are no good, systematic measurements across a global sample of countries for this.

Another reason for these results might be that owning forests, the forestry industry and forestry politics remains a male-dominated sphere even if WPE goes up in a country, as hinted in the discussion above. Even though women are expected to have different experiences, attitudes and knowledge that will affect how they exercise their empowerment in regards to forests, it might be that women still lack a voice because of social norms characterizing that particular area. As previously discussed, Varghese & Reed (2012) found several different reasons for women's exclusion in forestry management, e.g. social norms and the gendered division of labor. This is another limitation for this paper since it cannot take this into consideration when only employing regression analysis.

It might be that regional context is very important, and that if the results had been divided by region there could possibly be different results. As seen, the distribution of change in forest area had some differences between regions, which could also be the case for WPE and its sub-dimensions. For example, there could be regions where the possible relationship is more or less prominent. However, this was out of the scope of this paper.

6. Conclusion

The aim of this paper was to explore how WPE and its sub-dimensions of women's CL, CSP and EPP correlate with sustainable forestry and if there are differences in the strength of the correlation among them. This was done by testing the hypotheses, which were based on what had been previously theorized and empirically investigated in the current literature. However, no strong conclusions can be drawn because the relationships lacked statistical significance across all results testing the hypotheses. There is no strong evidence that WPE has a positive correlation with sustainable forestry, which is inconsistent with the expectations of H1. The same goes for H2 because EPP showed a weak negative relationship or no relationship at all with the dependent variable. However, there could be some support for H3 because women's CSP throughout the regressions showed a stronger positive relationship compared to the other WPE independent variables. Although, this result must be interpreted with caution since the correlation was weak and insignificant across all regression models.

Even though the results found no evidence or statistical significance that women's political empowerment is related to better forest outcomes, there is still a need to take women's voices and concerns seriously. Because of gendered differences in how men and women are affected by deforestation, women might have other needs and solutions to forest related problems. Previous research has found that women's political empowerment in some cases is correlated with better environmental outcomes (Asongu et al., 2022; Lv & Deng, 2019), which means that this also could be true for environmental issues other than forestry.

In conclusion, this thesis cannot provide a satisfactory answer to the research question made which was: *Does higher levels of women's political empowerment lead to more sustainable forestry?* There is no substantial or significant relationship found. Future research should continue to investigate how WPE and its sub-dimensions are correlated with different environmental outcomes since this thesis found no real correlation which is contradictory to previous findings. There might also be a need to take the local or regional context into consideration which was not the aim or scope of this thesis. This is something that could play an important part in the ability to observe the relationship if this is more nuanced locally, so it might be something for future research to take into consideration.

References

Aguayo-Tellez, E. (2012). The impact of trade liberalization policies and FDI on gender inequalities: a literature review.

Andersen, T. B. (2022). Does democracy cause gender equality? *Journal of Institutional Economics*, 1-19.

Asongu, S. A., Messono, O. O., & Guttemberg, K. T. (2022). Women political empowerment and vulnerability to climate change: evidence from 169 countries. *Climatic Change, 174*(3), 1-26.

Atchison, A. L., & Down, I. (2019). The effects of women officeholders on environmental policy. *Review of Policy Research, 36*(6), 805-834.

Azam, M., Liu, L., & Ahmad, N. (2021). Impact of institutional quality on environment and energy consumption: evidence from developing world. *Environment, Development and Sustainability*, *23*(2), 1646-1667.

Begum, F., de Bruyn, L. L., Kristiansen, P., & Islam, M. A. (2022). Forest co-management in the Sundarban mangrove forest: Impacts of women's participation on their livelihoods and sustainable forest resource conservation. *Environmental Development*, 100731.

Buitenzorgy, M., & PJ Mol, A. (2011). Does democracy lead to a better environment? Deforestation and the democratic transition peak. *Environmental and Resource Economics, 48*(1), 59-70.

Coppedge, M., John Gerring, Carl Henrik Knutsen, Staffan I. Lindberg, Jan Teorell, Nazifa Alizada, David Altman, Michael Bernhard, Agnes Cornell, M. Steven Fish, Lisa Gastaldi, Haakon Gjerløw, Adam Glynn, Allen Hicken, Garry Hindle, Nina Ilchenko, Joshua Krusell, Anna Luhrmann, Seraphine F. Maerz, Kyle L. Marquardt, Kelly McMann, Valeriya Mechkova, Juraj Medzihorsky, Pamela Paxton, Daniel Pemstein, Josefine Pernes, Johannes von Römer, Brigitte Seim, Rachel Sigman, Svend-Erik Skaaning, Jeffrey Staton, Aksel Sundström, Ei-tan Tzelgov, Yi-ting Wang, Tore Wig, Steven Wilson, Daniel Ziblatt. (2021). *V-Dem dataset v.12*. https://doi.org/10.23696/vdemds22

Davidson, D. J., & Freudenburg, W. R. (1996). Gender and environmental risk concerns: A review and analysis of available research. *Environment and behavior, 28*(3), 302-339.

Dollar, D., Fisman, R., & Gatti, R. (2001). Are women really the “fairer” sex? Corruption and women in government. *Journal of Economic Behavior & Organization, 46*(4), 423-429.

Eastin, J., & Prakash, A. (2013). Economic development and gender equality: Is there a gender Kuznets curve? *World Politics, 65*(1), 156-186.

Ewers, R. M. (2006). Interaction effects between economic development and forest cover determine deforestation rates. *Global Environmental Change, 16*(2), 161-169.

FAO. (2020). *Global Forest Resources Assessment 2020: Main report*.

Gray, M. M., Kittilson, M. C., & Sandholtz, W. (2006). Women and globalization: A study of 180 countries, 1975–2000. *International organization, 60*(2), 293-333.

Hallward-Driemeier, M., Hasan, T., & Rusu, A. B. (2013). *Women's Legal Rights over 50 Years: Progress, Stagnation or Regression?* World Bank.

Hunter, L. M., Hatch, A., & Johnson, A. (2004). Cross-national gender variation in environmental behaviors. *Social science quarterly, 85*(3), 677-694.

Inglehart, R., Norris, P., & Welzel, C. (2003). Gender equality and democracy. In *Human values and social change* (pp. 91-115). Brill.

Jha, S., & Bawa, K. S. (2006). Population growth, human development, and deforestation in biodiversity hotspots. *Conservation Biology, 20*(3), 906-912.

Li, Q., & Reuveny, R. (2006). Democracy and environmental degradation. *International studies quarterly, 50*(4), 935-956.

Lv, Z., & Deng, C. (2019). Does women's political empowerment matter for improving the environment? A heterogeneous dynamic panel analysis. *Sustainable Development, 27*(4), 603-612.

Mavisakalyan, A., & Tarverdi, Y. (2019). Gender and climate change: Do female parliamentarians make difference? *European Journal of Political Economy, 56*, 151-164.

McCright, A. M., & Xiao, C. (2014). Gender and environmental concern: Insights from recent work and for future research. *Society & Natural Resources, 27*(10), 1109-1113.

McKinney, L. A., & Fulkerson, G. M. (2015). Gender equality and climate justice: A cross-national analysis. *Social Justice Research, 28*(3), 293-317.

Midlarsky, M. I. (1998). Democracy and the environment: an empirical assessment. *Journal of Peace Research, 35*(3), 341-361.

Njoya, L. (2021). Institutions Quality and Shadow Economy in Developing Countries: the Role of Women's Civil Liberties. *Available at SSRN 3990280*.

Ramstetter, L., & Habersack, F. (2019). Do women make a difference? Analysing environmental attitudes and actions of Members of the European Parliament. *Environmental politics*.

Resurrección, B. P. (2017). Gender and environment from `women, environment and developmen´to feminist political ecology. In S. MacGregor (Ed.), *Routledge Handbook of Gender and Environment* (pp. 71-85). Routledge.

Ritchie, H., & Roser, M. (2021). *Forest and deforestation*. ourworldindata.org. Retrived 2022-11-14 from https://ourworldindata.org/forests-and-deforestation

Rocheleau, D., & Nirmal, P. (2015). Feminist political ecologies: Grounded, networked and rooted on Earth. In R. Baksh & W. Harcourt (Eds.), *The Oxford Handbook of Transnational Feminist Movements* (pp. 793-814). Oxford University Press.

Rocheleau, D., Thomas-Slayter, B., & Wangari, E. (1996). A feminist political ecology perspective. *Feminist political ecology: Global issues and local experiences*, 3-26.

Salahodjaev, R., & Jarilkapova, D. (2020). Women in parliament and deforestation: cross-country evidence. *Journal for Nature Conservation, 55*, 125830.

Sen, A. (2001). Population and gender equity. *Journal of Public Health Policy, 22*(2), 169-174.

Shandra, J. M., Shandra, C. L., & London, B. (2008). Women, non-governmental organizations, and deforestation: a cross-national study. *Population and environment, 30*(1), 48-72.

Sommer, J. (2020). Global governance in forestry: a cross-national analysis. *International Journal of Sustainable Development & World Ecology, 27*(6), 481-495.

Stern, P. C., Dietz, T., & Kalof, L. (1993). Value orientations, gender, and environmental concern. *Environment and behavior, 25*(5), 322-348.

Sundell, A. (2010). *Läsarfråga: Multikollinearitet i dummyvariabler*. Retrived 2022-12-14 from https://spssakuten.com/2010/03/02/lasarfraga-multikollinearitet-i-dummyvariabler/#more-112

Sundström, A., Paxton, P., Wang, Y.-t., & Lindberg, S. I. (2017). Women's political empowerment: A new global index, 1900–2012. *World Development, 94*, 321-335.

Sundström, A., & Wängnerud, L. (2016). Corruption as an obstacle to women's political representation: Evidence from local councils in 18 European countries. *Party Politics, 22*(3), 354-369.

Teorell, J., & Svensson, T. (2007). *Att fråga och att svara : samhällsvetenskaplig metod* (1. uppl. ed.). Stockholm : Liber.

Tsurumi, T., & Managi, S. (2014). The effect of trade openness on deforestation: empirical analysis for 142 countries. *Environmental Economics and Policy Studies, 16*(4), 305-324.

Umaerus, P., Nordin, M. H., & Lidestav, G. (2019). Do female forest owners think and act "greener"? *Forest policy and economics, 99*, 52-58.

UNEP. (2016). *Global Gender and Environment Outlook.*

UNEP. (n.d.). *Why do forests matter?* Retrived 2022-11-20 from https://www.unep.org/explore-topics/forests/why-do-forests-matter

United Nations Treaty Collection. (n.d.). *CHAPTER XXVII ENVIRONMENT: 7. d Paris Agreement, Paris, 12 December 2015*. Retrived 2022-12-10 from https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-7-d&chapter=27&clang=_en#1

Varghese, J., & Reed, M. G. (2012). Theorizing the implications of gender order for sustainable forest management. *International Journal of Forestry Research, 2012*.

Welsch, H. (2004). Corruption, growth, and the environment: a cross-country analysis. *Environment and Development Economics, 9*(5), 663-693.

World Bank. (n.d.). *World Bank Open Data: Free and open access to global development data* https://data.worldbank.org

World Bank Databank. (n.d.). *World Governance Indicators*. Retrived 2022-12-12 from https://databank.worldbank.org/source/worldwide-governance-indicators/preview/on

Zelezny, L. C., Chua, P. P., & Aldrich, C. (2000). New ways of thinking about environmentalism: Elaborating on gender differences in environmentalism. *Journal of Social issues, 56*(3), 443-457.

Appendix

Appendix 1

Country *(N=101)*	***Forest change %***	***WPE***	***Women's CL***	***Women's CSP***	***Women's EPP***
Algeria	-.071575	.798	.644	.795	.97
Argentina	-.360175	.871	.833	.811	.994
Austria	.092497	.938	.954	.898	.981
Azerbaijan	1.31368	.644	.603	.578	.763
Bahrain	3.33333	.408	.399	.384	.426
Bangladesh	0	.714	.651	.595	.903
Belarus	.31065	.851	.778	.845	.953
Belgium	0	.945	.97	.882	.999
Bhutan	.072923	.759	.806	.692	.81
Bolivia	-.458779	.766	.671	.64	.999
Brazil	-.288368	.827	.78	.818	.903
Bulgaria	.313071	.918	.874	.935	.972
Burundi	0	.589	.195	.574	.98
Cameroon	-.271575	.754	.694	.621	.973
Canada	-.010809	.923	.939	.865	.993
Cape Verde	.678426	.818	.858	.707	.925
Central African Republic	-.133612	.624	.384	.617	.871
Chile	.698565	.871	.899	.817	.922
China	.92099	.65	.393	.653	.89
Colombia	-.330176	.787	.648	.838	.899
Costa Rica	.554346	.929	.951	.856	.999
Croatia	.17794	.894	.903	.881	.918
Cuba	.364322	.674	.352	.671	.999
Denmark	.120061	.965	.981	.927	1
Djibouti	.714286	.538	.462	.37	.763
Ecuador	-.501358	.857	.798	.785	.993
El Salvador	-.742109	.773	.616	.754	.964
Equatorial Guinea	-.335713	.496	.362	.247	.88
Estonia	.143742	.933	.94	.917	.962
Ethiopia	-.418734	.616	.521	.331	.985
Gabon	-.05036	.766	.771	.687	.858
Georgia	0	.844	.804	.904	.842
Germany	0	.958	.984	.899	.999
Guatemala	-.323498	.696	.493	.734	.875

Guyana	-.049834	.89	.835	.887	.974
Honduras	-.323492	.745	.625	.705	.941
Hungary	-.075698	.859	.893	.845	.86
Iceland	1.3289	.928	.95	.851	.999
India	.376122	.672	.652	.567	.806
Indonesia	-.609232	.721	.712	.582	.885
Iraq	0	.525	.315	.459	.797
Ireland	.72482	.914	.939	.901	.922
Jamaica	.67364	.905	.866	.918	.963
Kuwait	0	.425	.55	.391	.337
Kyrgyzstan	1.01533	.803	.702	.821	.889
Latvia	.114111	.948	.949	.949	.965
Liberia	-.38951	.841	.797	.813	.936
Lithuania	.128029	.914	.959	.839	.972
Malawi	-1.7131	.777	.758	.739	.86
Maldives	0	.484	.422	.508	.521
Mali	0	.677	.59	.68	.761
Mauritania	-1.60275	.628	.485	.479	.929
Mauritius	.234987	.82	.84	.824	.832
Mexico	-.192625	.775	.596	.759	.99
Moldova	.005176	.874	.868	.891	.884
Mongolia	-.007829	.872	.831	.908	.906
Montenegro	0	.826	.84	.815	.854
Morocco	.203353	.725	.687	.746	.759
Mozambique	-.630601	.762	.662	.635	.991
Myanmar	-.965943	.593	.417	.561	.797
Nepal	0	.774	.627	.742	.985
Netherlands	.254913	.919	.944	.848	.999
New Zealand	.093433	.947	.943	.925	.998
Nicaragua	-2.55916	.794	.711	.708	.993
Niger	-1.08776	.755	.71	.696	.879
Nigeria	-.727606	.721	.738	.801	.659
North Korea	-.345977	.288	.007	.091	.757
Norway	.064245	.953	.966	.913	1
Panama	-.267156	.817	.843	.709	.932
Papua New Guinea	-.093076	.466	.591	.508	.306
Paraguay	-1.59633	.726	.751	.665	.788
Peru	-.236124	.79	.74	.714	.947
Poland	.133758	.94	.94	.91	.991
Republic of the Congo	-.062685	.334	.342	.288	.362
Romania	.197219	.852	.866	.878	.831

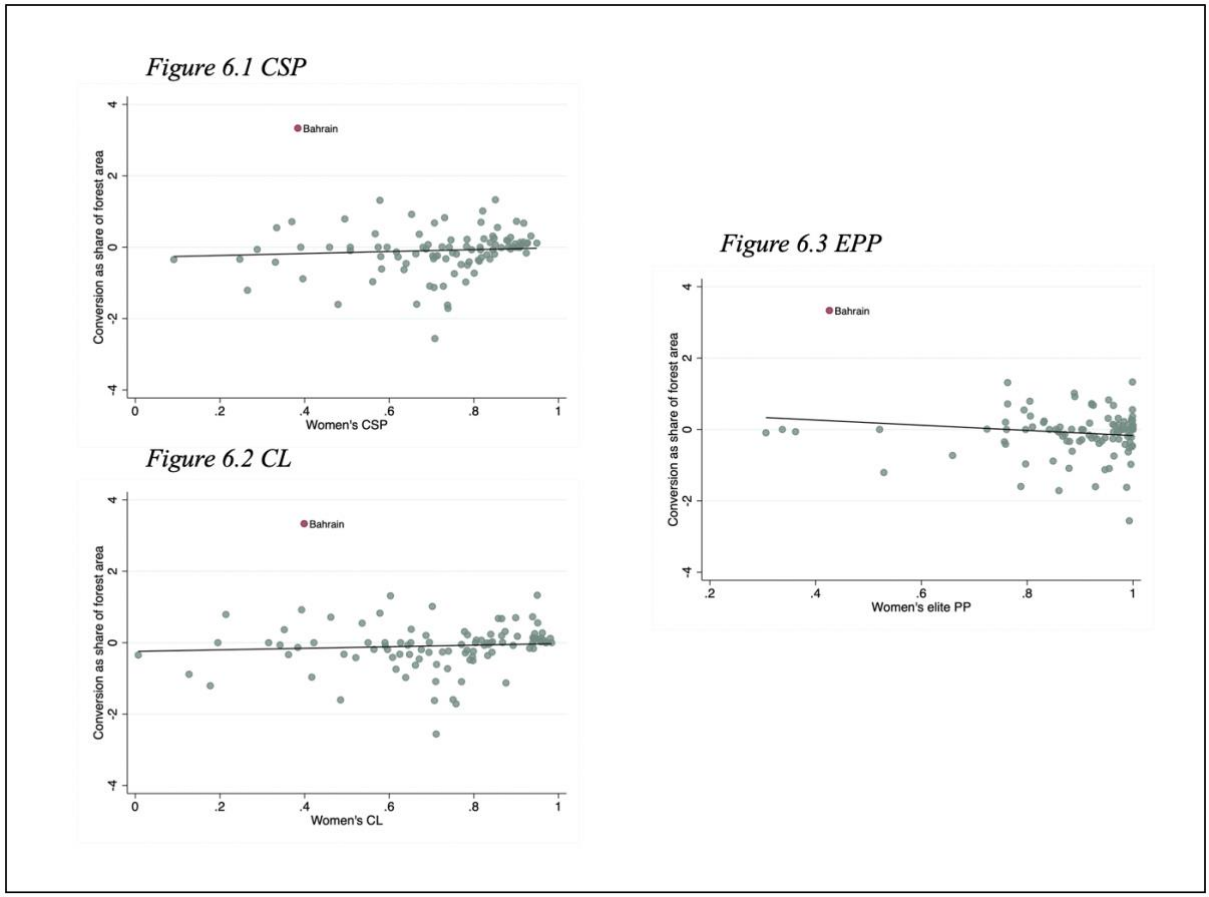
Russia	.009354	.707	.695	.725	.724
Sao Tome and Principe	-1.12727	.833	.876	.706	.947
Senegal	-.483784	.845	.791	.77	.998
Serbia	.022798	.861	.844	.783	.978
Singapore	-1.0929	.809	.771	.728	.955
Slovenia	-.16266	.946	.941	.924	.994
Somalia	-1.20605	.332	.177	.265	.529
South Africa	-.211234	.866	.784	.831	.997
South Korea	-.157803	.864	.932	.75	.917
Spain	.02264	.951	.959	.906	.998
Sudan	-.885375	.46	.127	.396	.849
Suriname	-.072648	.86	.825	.816	.963
Sweden	0	.955	.971	.909	1
Switzerland	.27478	.942	.962	.887	.997
Tanzania	-.975255	.801	.639	.781	.996
Thailand	-.187428	.695	.564	.663	.867
Togo	-.241816	.799	.799	.703	.922
Tunisia	.220119	.841	.785	.784	.983
Turkey	.545577	.56	.536	.334	.794
Uganda	-1.62136	.807	.707	.738	.988
Ukraine	.068344	.835	.818	.851	.862
Uzbekistan	.790274	.512	.214	.495	.805
Venezuela	-.193689	.812	.676	.849	.927
Vietnam	.826704	.755	.578	.731	.954
Zambia	-.411342	.717	.608	.789	.759
Zimbabwe	-.260652	.746	.726	.58	.962

Appendix 2

Table 7. Summary of control variables (excl. Bahrain)

Variable	Obs	Mean	Std. dev.	Min	Max
Electoral democracy	100	.56108	.2469117	.083	.922
GDP per capita	98	12324.9	17653.3	305.5111	84776.14
Trade openness	91	84.99911	49.64571	1.500996	329.4714
Population density	100	205.2421	797.0141	1.92546	7806.773
Control of corruption	100	-.1364581	1.020117	-1.625073	2.274009
Ratification of Paris Agreement	100	.55	.5	0	1

Figure 6. Conversion as share of forest area and women's CSP, CL and EPP incl. Bahrain



Comment: The figure shows scatterplots of WPE and each sub-dimension's bivariate relationship with conversion as share of forest area with the inclusion of Bahrain (outlier). See fig. 1. for more information about the variables. (CSP, CL and EPP are scored in the same way as WPE).

Appendix 3

Table 8. WPE + sub-dimensions and conversion as share of forest area (91-country sample)

	(1) forest	(2) forest	(3) forest	(4) forest
WPE	0.738			
	(1.69)			
Women's CL		0.576		
		(1.91)		
Women's CSP			0.724	
			(1.96)	
Women's PP				-0.000890
				(-0.00)
Intercept	-0.673	-0.514*	-0.627*	-0.0999
	(-1.95)	(-2.28)	(-2.27)	(-0.22)
N	91	91	91	91
R^2	0.031	0.039	0.041	0.000

*Comment: t statistics in parentheses. * p < 0.05, ** p < 0.01, *** p < 0.001. This regression only contains the 91 country sample that is also used when controlling for underlying variables.*

List of countries that were excluded (because of missing data among controls):
Guyana
Liberia
Malawi
North Korea
Papua New Guinea
Sao Tome and Principe
Suriname
Venezuela
Vietnam

Appendix 4

Table 9. WPE + sub-dimensions and sustainable forestry (excl. control of corruption)

	(1) forest	(2) forest	(3) forest	(4) forest
WPE	0.358			
	(0.51)			
Women's CL		0.221		
		(0.42)		
Women's CSP			0.601	
			(1.13)	
Women's EPP				-0.278
				(-0.50)
Electoral democracy	-0.135	-0.116	-0.279	0.0904
	(-0.31)	(-0.25)	(-0.68)	(0.27)
GDP Per capita	0.00000732	0.00000730	0.00000753	0.00000751
	(1.63)	(1.62)	(1.69)	(1.68)
Trade openness	0.00261	0.00248	0.00259	0.00250
	(1.68)	(1.54)	(1.68)	(1.58)
Population density	-0.000227*	-0.000224*	-0.000228*	-0.000221*
	(-2.49)	(-2.45)	(-2.52)	(-2.41)
Ratification of Par. Agr.	-0.0278	-0.0234	-0.0387	-0.0150
	(-0.22)	(-0.18)	(-0.30)	(-0.12)
Intercept	-0.555	-0.438	-0.627*	-0.158
	(-1.38)	(-1.76)	(-2.09)	(-0.33)
N	91	91	91	91
R^2	0.127	0.126	0.138	0.127

Comment: t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Regressions of WPE and subdimensions and conversion as share of forest area including control variables, with control of corruption excluded. The coefficients are unstandardized.

Table 10. VIF-values w/o control of corruption

Variable	**VIF**
Electoral democracy	3.03
WPE	2.69
GDP per capita	1.69
Trade openness	1.52
Population density	1.48
Ratification of Paris Agreement	1.05
Mean VIF	1.91

Comment: VIF-values from table 9. Model 4.