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Master's Programme in Innovation &
Global Sustainable Development

Leading through a Pandemic: A study on Female Leadership & Covid-19 Outcomes

by

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Abstract:

The purpose of this thesis is to examine if female-led countries fared the Covid-19 pandemic differently from male-led countries. To do so, I rely on a pooled OLS regression model, using data from 189 countries between January 2020 to March 2022. My results show that countries with female leaders have significantly fewer cases and deaths of Covid-19 than countries with male leaders. This is found to likely be explained by fundamental differences between male- and female-led countries, for example in in terms of health care.

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1.Introduction

When I started writing this thesis, the Covid-19 pandemic just entered its third year. Since the outbreak, millions of people have been infected and died from a disease not widely known three years ago. The question is why some countries have fared the pandemic worse than others. In the search for explanations, attention has been put on governance and politics, including aspects of gender and leadership.

Scholars have previously found a significant and negative relationship between female executive leadership and Covid-19 related outcomes (Abras et al., 2021; Garikipati & Kambhampati, 2021). Potential explanations to these findings have been general differences in behaviours towards risk, leadership styles but also foundational differences between male- and female-led countries. However, these studies examines early and short periods of the pandemic (Abras et al., 2021; Garikipati & Kambhampati, 2021). The question is if this relationship holds over longer periods and throughout different stages of the pandemic. In this thesis, I will attempt to answer that question.

1.1. Research Motivation

Women's empowerment is often thought of as both a goal and a mean to achieve sustainable development (European Union, 2016). Although women make up for approximately half of the world's population (World Bank, 2022a), they only made up for approximately 7% of the world's executive leaders in January 2022. Since 1960 have 63 countries had at least one female leader, but only 14 of these have had more than one. In recent years there has at its most been 18 women holding the highest positions of their countries at the same time (O'Neill, 2022).

Competences and skills are not limited to one type of person. Therefore, misrepresentation can also lead to misallocation (Jones, 2016). At the time of writing this, humanity is facing several crises other than the Covid-19 pandemic, for example climate change (IPCC, 2022), internal and global conflicts (WFPUSA, 2022) and high inflation rates (ILO, 2022). In times of crisis, leadership might be more important than ever. These challenges demand urgent action and calls for both good and efficient leadership.

Female leaders have been rare historically and still are so today. Therefore, there is much left to learn about female leadership, as well as differences between men and women in terms of leadership. By examining the potential impact of female leadership on the pandemic, we will not only understand female leadership better, but also leadership in general.

This research will make several contributions. First, it contributes to explain why some countries has fared worse during the pandemic. Second, it will contribute to an understanding of how leadership impact national outcomes. Third, it will add to the literature of female executive leadership. These learnings will be important for future pandemics, but also for other types of crises. Therefore, this line of research will offer vital policy implications.

1.2. Research Statement

The purpose of this thesis is to investigate if there are differences between male- and female-led countries in terms of cases and deaths after over two years of pandemic. The thesis therefore aims to explore whether female leadership have an impact on Covid-19 outcomes. This will expand the literature, as female-led countries have previously been found to have managed the pandemic better than male-led countries during shorter periods (Abras et al., 2021; Garikipati & Kambhampati, 2021).

Therefore, I do not strive to establish that any gender makes better leaders. In fact, I believe that men and women are equally capable of doing anything. Keeping this in mind, there could still be generalized differences in how men and women lead. By investigating the potential differences in male and female leadership, we may find characteristics and traits that make leadership lead to different outcomes. These characteristics and traits could then be worth enhancing in current leaders and searched for in future ones, no matter the gender.

To fulfil the above-mentioned purpose, this thesis sets out to answer the following research question:

"*Have countries with female leaders to any extent performed differently than countries with male leaders during the Covid-19 pandemic?*".

To answer this question, I use a pooled OLS regression model, based on panel data over reported cases and deaths of Covid-19. The examined period is from January 2020 to March 2022. To examine if there is a general impact of female leadership globally, as many countries as there is data for is examined. This results in a dataset containing 189 countries, where around 150 have all the necessary data.

1.3. Structure

This thesis is structured as follows; Section 2 explains Covid-19 as a disease and some important elements of the pandemic, such as vaccine development, policy responses and consequences. Section 3 is a literature review, where previous research relevant for this thesis is presented. Section 4 describes and discusses the data used in this thesis, while section 5 presents the method and models. Section 6 presents the results and robustness tests, while the conclusions of this thesis are found in section 7. Then follows the list of references and the appendices.

2. Background

This section describes Covid-19 as a disease, the development of the pandemic over time and some of the policies implemented during the pandemic. After that, I discuss some of the consequences that the pandemic is considered to have had so far. Finally, I also discuss the attention (female) leaders have received during the Covid-19 pandemic.

2.1. The Disease & the Virus

Covid-19 is an infectious disease that is mostly spread via respiratory droplets. Common symptoms are coughs, fever, feelings of tiredness and a loss of smell and/or taste. Most often, infected people are mildly to moderately affected (WHO, 2022a), while in some cases, they show no symptoms at all (FHM, 2022a). But the disease can also cause severe illness and death. Severe infections can happen to anyone, but the risk is considered to increase with old age and a variety of underlying medical conditions (WHO, 2022a).

The first cases of Covid-19 were reported to the World Health Organization (WHO) in December 2019. Its cause, a novel branch of a coronavirus named SARS-CoV-2, was identified in January 2020. As Covid-19 spread globally, it was classified as a pandemic in March 2020 (WHO Europe, 2022). Covid-19 has generally spread in wave-like patterns, with periods of high infection rates followed by periods of lower infection rates (John Hopkins Medicine, 2021). At the time of writing this, the total number of reported cases and deaths of Covid-19 have exceeded 522 million respectively six million. In terms of reported cases, the largest epicentres have been in Europe and the Americas (WHO, 2022b). The different continent's development of cases and deaths per million people can be seen in Figure 1 and Figure 2 below.

Figure 1 - Reported Cases per Million by Continent, January 2020 – March 2022.

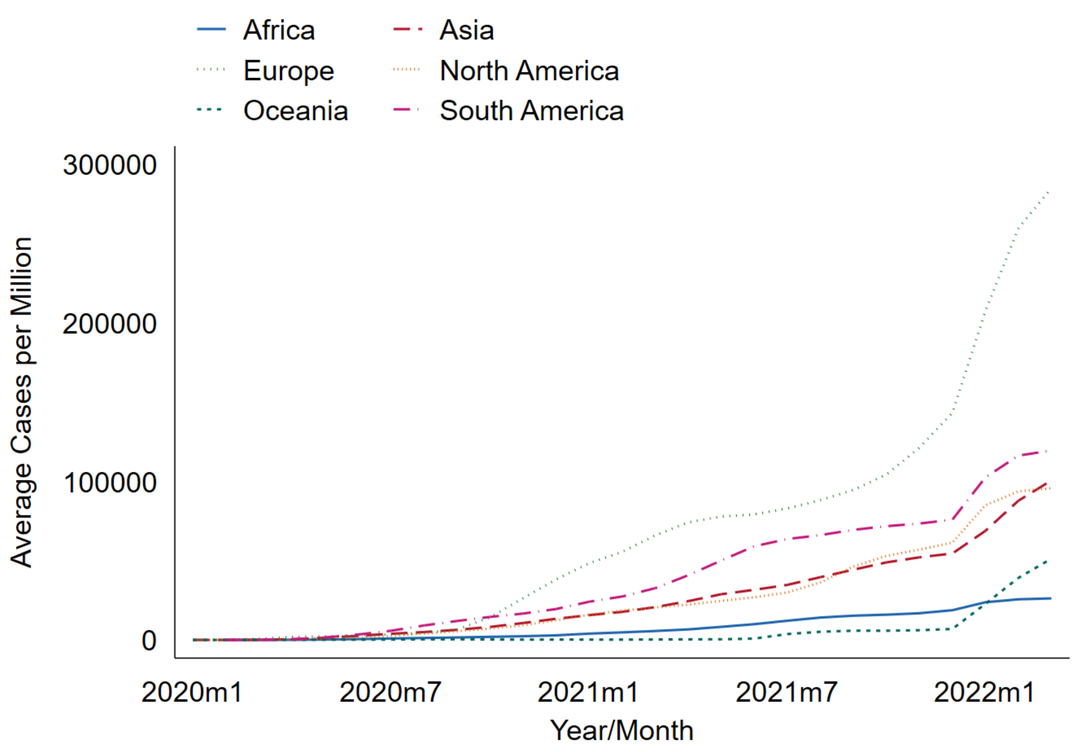
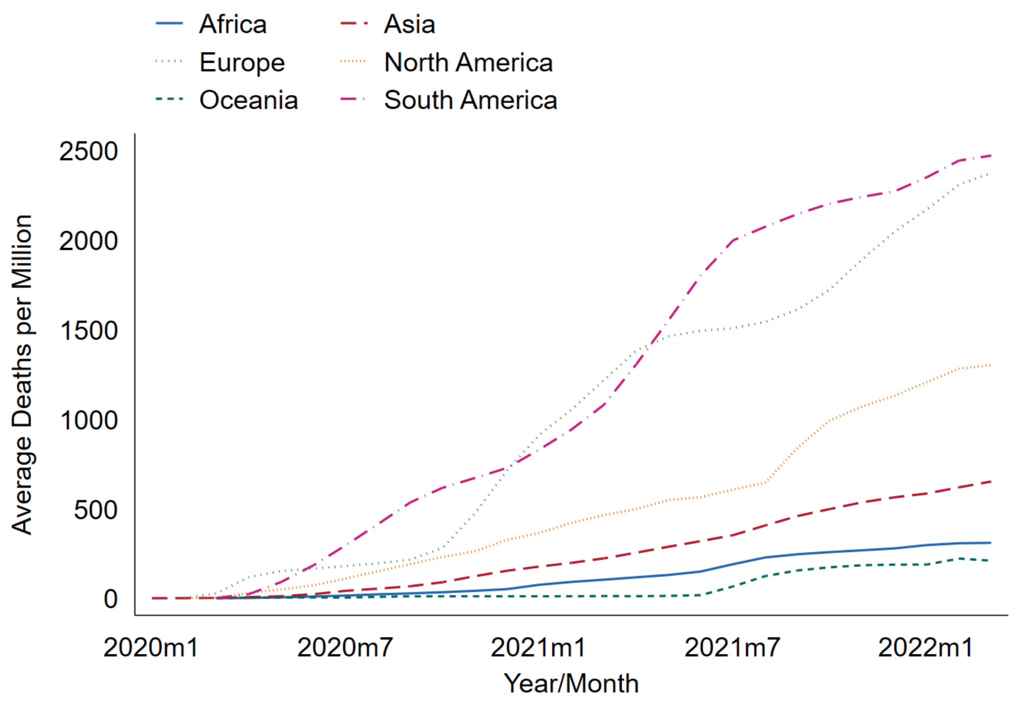


Figure 2 - Reported Deaths per Million by Continent, January 2020 – March 2022.



2.2. Vaccines

Covid-19 vaccines were rolled out for mass vaccination programmes in December 2020, which makes the development of these vaccines remarkably fast. This is the result of high levels of both investment and resources, but also previous knowledge about SARS viruses (Danielsson, 2021). But vaccines did not mark the end of the Covid-19 pandemic, and the perhaps most important explanation to this has to do with vaccine equity.

Globally, Covid-19 vaccines have not been distributed evenly (WHO, 2022c). Currently, more than 65% of the global population have received at least one dose of vaccine. But in low-income countries, the same number is less than 16% (Ritchie et al., 2022a). The uneven distribution can also be seen in the purchasing figures of vaccines. For example, high-income countries purchased almost 70% the number of doses Pfizer-BioNTech planned to produce in 2021 (Gill & Ruta, 2022). As billions of people remain unvaccinated, the pandemic is not likely coming to an end any time soon (Furlong, 2022). Vaccine inequality can therefore be considered to allow the pandemic to continue.

2.3. Policies

Throughout the pandemic, the WHO have provided recommendations on how people can limit the risk of both getting sick and spreading Covid-19. These recommendations are formulated similarly to this (WHO, 2022d):

- Get vaccinated.
- Avoid crowds and maintain a social distance between yourself and others of at least 1 metre. Wear face masks when close contacts are inevitable or ventilation poor.
- Maintain a good hand hygiene – regularly wash your hands with soap and water or alcohol-based hand sanitizer.
- Cough and sneeze in your elbow or a tissue.
- If you experience symptoms, or been tested positive for Covid-19, stay home in self-isolation.

To further limit the spread of Covid-19, countries have adopted a variety of policies. The Oxford Coronavirus Response Tracker (OxCGRT) have kept track on policy responses during the pandemic with the stringency index. It measures the level of strictness of pandemic related policies over time, ranging from 0 and 100 (least strict to strictest). The index considers policies in the nine following areas (Ritchie et al., 2022b):

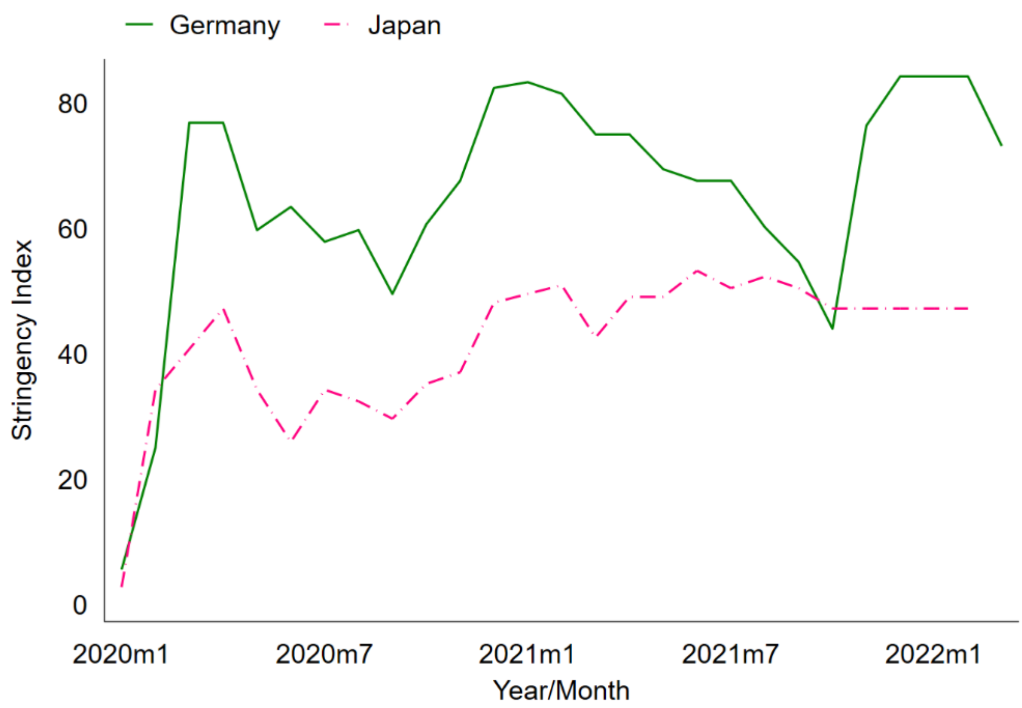
1. International travel controls.
2. Public event cancelations.
3. Public information campaigns.
4. Public transport closures.
5. Restrictions on movements within the country.
6. Restrictions on public gatherings.
7. School closures.
8. Stay-at-home policies.
9. Workplace closures.

In summary, one could say that the policies have in general restricted the gathering and movement of people. Further, the policies have often included aspects of health, such as regulations on face masks, testing, and vaccinations (Ritchie et al., 2022b).

One of the strictest pandemic-related policies has commonly been referred to as lockdowns. A lockdown can be described as a restriction policy that urges people to stay where they are due to some sort of danger. In the setting of the pandemic, that has come to indicate that you should not leave your home (Cambridge Dictionary, 2022).

An example of how pandemic related policies have differed between countries and over time is seen in Figure 3 below. This graph presents the stringency index of two countries - Germany and Japan. The countries were chosen at random from the sample, simply to illustrate clear differences in policy responses. Japan is represented by the dotted line on the lower half of the graph, while the filled in line on the upper part of the graph represents Germany. As can be seen in Figure 3, the two countries have acted quite differently in terms of policy responses. Germany have had stricter pandemic-related policies almost the entire time, apart from a short period during the autumn in 2021.

Figure 3 - The Stringency Index of Germany and Japan.



During the examined period, the German government issued several lockdowns. The first was implemented in the end of March 2020 and came to an end at the beginning of May (Bosen & Thurau, 2021). In the graph, this is seen in the sharp increase during the first months of 2020 and then the decrease towards summer. The second lockdown started in November 2020 and stretched from the second to the third pandemic wave. This lockdown was not fully ended until the summer of 2021, as restrictions were removed a little bit at the time during the entire spring of 2021 (Bosen & Thurau, 2021). This is again seen quite clearly on the stringency index, as the green Germany line consistently declines from winter 2020 throughout the spring of 2021. But during the summer of 2021, the number of cases started to increase again. This led to new restrictions and finally hard lockdown-rules for unvaccinated people in December 2021 (Schmidt & Pleitgen, 2021).

Instead of issuing lockdowns, the Japanese government declared 'states of emergencies.' By doing this, the government could implement contemporary policies to limit the spread of Covid-19. Examples of such policies are limited opening hours for restaurants, restriction on the amount of people there can be inside shopping malls, and travels restrictions (CBS News, 2021). Japan has also had strict traveling policies, and as of today, the country remains the only G7 country to not yet have reopened for tourists (Siripala, 2022).

In the case of Germany, the issuing of lockdowns is related to the pandemic waves. During the times that lockdowns have been implemented, the number of cases and deaths were also on a rise (Bosen & Thurau, 2021; Schmidt & Pleitgen, 2021). In that sense, the policies have developed in similar patterns as the pandemic waves. A potential explanation to this is that stricter pandemic related policies are harder to politically motivate when the spread is low (i.e. between the pandemic waves). A similar pattern can surely be seen in Japan, but as the policies have not been as strict as in for example Germany, it is not as clear. Compared globally, Japan is considered to have fared the pandemic relatively well, and this without lockdowns (Bloomberg, 2021). Therefore, it is safe to say that policy responses can partly explain the spread of Covid-19 within countries, but not everything.

2.4. Consequences

Initially, the pandemic was estimated to cause the largest economic recession since the second World War (World Bank, 2020). This because the pandemic resulted in major losses in incomes and jobs, halted economic growth and reduced access to education and health services (World Bank, 2022b). But already in January 2021, the recovery from the Covid-19 recession was predicted to be the most robust economic recovery in 80 years (World Bank, 2021a). As of January 2022, advanced economies were estimated to recovered in terms of output by 2023. This while developing and emerging economies were estimated to still be 4% below pre-pandemic levels (World Bank, 2022b).

But the pandemic is still estimated to have long-term impacts on the world economy. For example, school closures and limited access to remote learning have caused massive learning losses amongst students, especially for girls and younger children. This is estimated to cost the students more than $17 trillion in lifetime earnings, which is approximately 14% of current global GDP (World Bank, 2021b). This will then likely have further effects on the economy, such as income inequalities and unemployment rates.

As indicated above, already marginalized groups have been hit harder by the pandemic’s consequences (World Bank, 2022; World Bank, 2021a; World Bank, 2021b). Lockdowns, school closures and sick family members have increased the amount of unpaid care- and housework, which is generally performed by women to a higher extent. The share of this work performed by men is estimated to have increased during the pandemic, but it has not done so enough to make the workload more evenly distributed between the genders (World Economic Forum, 2021). Women have also been found to be hit harder than men in terms of employment (World Bank, 2022). The Global Gender Gap report of 2021 further state that the major reason that women reduced their paid working hours or even quit their jobs during the pandemic was related to school closures (World Economic Forum, 2021).

In other words, the Covid-19 pandemic is considered to also have major economic and social consequences. The pandemic can therefore not only be considered a health crisis, but also an economic and social one.

2.5. Female Leaders & the Pandemic

In this thesis's sample, there are 19 female leaders between January 2020 to Match 2022. At most, 14 women were executive leaders at the same time. This can be seen in Figure 4[1] below. A full list of the female leaders included in the sample is presented in Table A in Appendix A. In Figure 5[2], the number of both male and female leaders in the sample are presented.

[1] Figure 4 displays how many female executive leaders there are in this thesis dataset. As this dataset is based on Covid-19 data, all examined countries are not initially included in the examined period. This as there is no data of Covid-19 outcomes from these countries until later stages in the pandemic. In other words, the examined countries and their leaders are progressively added to the dataset as Covid-19 spreads to more and more countries. This explains the form of the line in Figure 4: it starts at a low level, as few countries had reported cases and deaths of Covid-19. Then, the number of countries reporting Covid-19 outcomes sharply increases during the initial months of the pandemic, as Covid-19 spreads. After the sharp increase, the number of countries (and therefore leaders) remain stable for the rest of the period, as they are now included in the dataset.

[2] Figure 5 displays the number of male and female executive leaders in this thesis dataset. Due to the same reasoning as in above footnote, the number of examined countries and leaders are fewer in the initial phase of the pandemic. This explains again the appearance of the line in Figure 5: in the beginning of the pandemic, the spread of Covid-19 was limited to a few countries. Therefore, the number of countries included in the dataset is relatively few. Then, as Covid-19 starts to spread more rapidly, the number of countries included in the dataset sharply increases, and then remains stable for the rest of the period.

Figure 4 - The number of Female Leaders in the Sample.

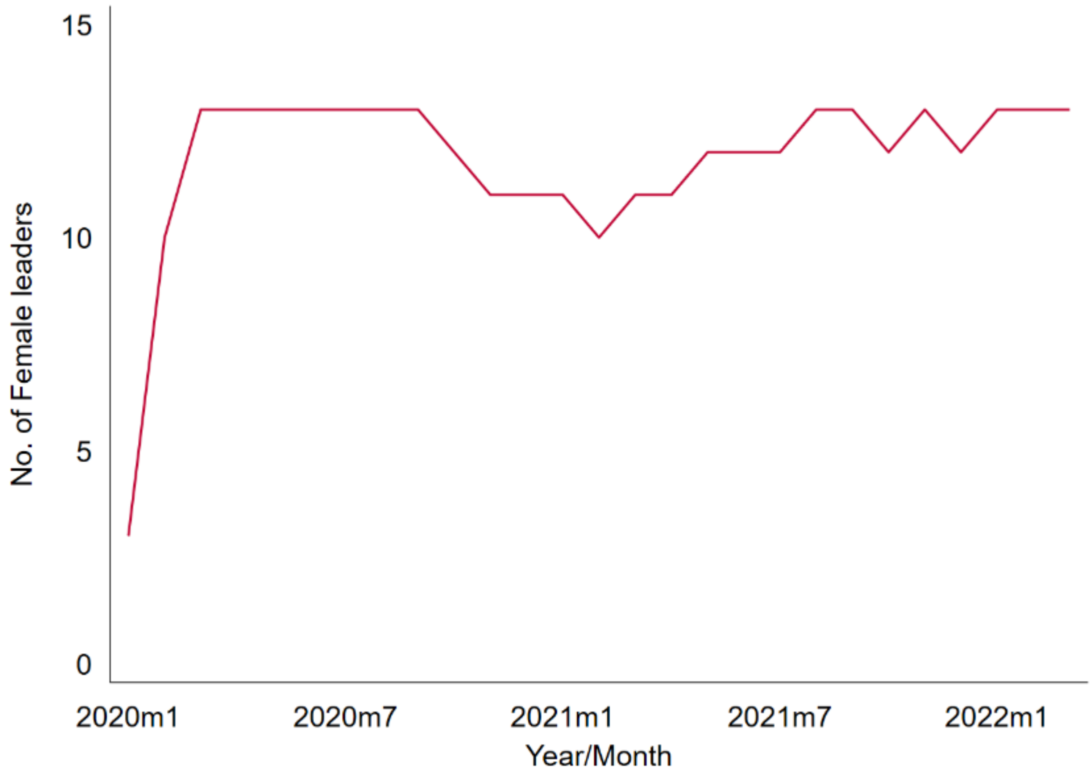
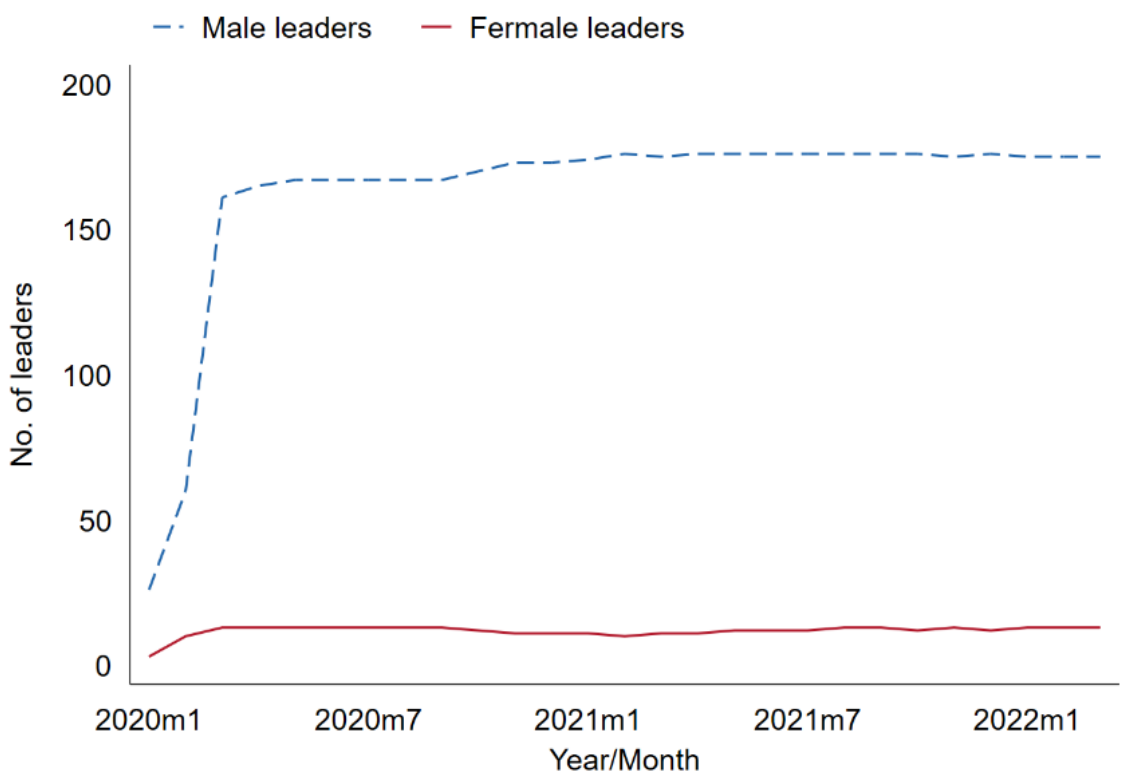


Figure 5 - The number of Male and Female Leaders in the Sample.



According to the sample of this thesis, approximately 7% of the leaders during the examined period were female. That makes men the vast majority amongst executive leaders during the examined period. Although female leaders were few during this period, they have received the media's attention (Bear & Agner, 2021; Bostock, 2020; Henley & Ainge Roy, 2020). One of the main reasons for this is that a paper, first published in 2021, found a significant relationship between female leadership and better pandemic outcomes (Garikipati & Kambhampati, 2021).

It is relatively easy to observe differences in leadership during the pandemic. For example, Norway's Prime Minister Erna Solberg held a press conference in March 2020 specifically for answering the questions of children (Fouche, 2020). Also in March 2020, the United Kingdom's Prime Minister Boris Johnson stated that he "[…] shook hand with everybody […]" when visiting Covid-19 patients at a hospital (The Guardian, 2020). These happenings are common examples in the discussion, said to be portraying differences between men and female leaders in aspects such as empathy and risk-taking behaviour (Garikipati & Kambhampati, 2021). But these happenings are potentially also extraordinary situations. Both Solberg and Johnson have also later been caught breaking their own pandemic rules by holding and attending parties in their private homes (Adami, 2021; Picheta, 2022). So, the question is if there really are clear differences between male and female leaders during the pandemic, or if it is only a popularised theory with limited scientific support.

3. Previous Research

This section presents previous research relevant for this thesis. It starts with the overall topic of female leadership, to then narrow down on female leadership in times of crises and during the Covid-19 pandemic. At the end of this section, a critical discussion about the literature will be held.

3.1. Female Leadership

Clancy et al. (2020) describes gender as "[…] socially constructed and accepted attitudes, values, roles and responsibilities of women and men in a given culture and location." (pp.5). In that sense, gender is assumed to shape individual's actions, aspirations and morals (Clancy et al., 2020). In the literature, the phenomenon 'think manager - think male' describes the perception of men as natural leaders. In line with this, traditional male characteristics are considered to also be good leadership characteristics (Soares & Sidun, 2021; Wiengarten et al., 2017). But as women take on leadership roles, perceptions of leadership have been found to become less gendered (Soares & Sidun, 2021).

Shinbrot et al. (2019) write that women have limited opportunities to become leaders due to several barriers. One type of barrier is related to assets, as women historically have had limited access to finances, education and ownership. Another type of barrier is social. Due to traditional gender norms, women are simply not expected to take on leadership roles to the same extent as men, which might also limit women in doing so (Shinbrot et al., 2019).

Women are typically considered to be more risk-avert than men (Aldrich & Lotito, 2020; Kwan et al., 2020; Wiengarten et al., 2017). An example can be read in Thomson and Lloyd's (2011) book, *Women and the New Business Leadership*. Here, the authors discuss a study from 2005, which showed that female fund holders take fewer extreme risks than their male peers (Thomson & Lloyd, 2011). In theory, this indicates that gender could affect an individual's professional behaviour.

But Maxfield et al. (2010) argue that research on gender and risk often is limited to narrow research settings. Examples of such settings are gambling and investment (Maxfield et al., 2010), which are arguably fields with a masculine definition of risk. In their own research, Maxfield et al. (2010) do not find differences in risk-taking behaviours between men and women in a broader managerial perspective. In fact, their results are no different from studies where gender is not taking into consideration.

Female leaders are generally considered to have more transformational leadership characteristics than male leaders (Kwan et al., 2020; Thomson & Lloyd, 2011; Shinbrot et al, 2019). Being the opposite of transactional leadership, transformational leadership is best described as a less hierarchical form of leadership. Often associated elements of transformational leadership is high moral standards, innovative thinking and an understanding for the development of others' (Kwan et al., 2020; Thomson & Lloyd, 2011; Shinbrot et al, 2019).

When women have political mandates, they are found to at a higher extent to drive policies that increase societal welfare than their male counterparts (Soares & Sidun, 2021). Lv and Deng (2019) also write that societies with a significant share of women on positions of power have been found to be less corrupt and spend more money on social services such as health and education.

3.2. Female Leadership in Times of Crisis

The literature has found a pattern where women tend to be put in positions of power in times of crises. This is called the 'glass cliff' phenomenon, and it changes the doctrine from 'think manager – think male' to 'think crises - think female' (Kwan et al., 2020).

The glass cliff phenomenon can be explained by mainly two factors. One is from the side of the 'employer'. Female leaders are often considered to be more collaborative and loyal than male leaders, which can be desirable characteristics in a leader when times are dire (Kwan et al., 2020; Stewart, 2018). By appointing a female leader, a company or an organization can also send out signals of embracing change, which could attract customers or stakeholders (Wu et al., 2021). Wu et al. (2021) also write that female leader are expected to take the blame to a higher extent than male leaders, but also contribute to solve undesirable situations in case of failure.

The other factor explaining the glass cliff phenomenon comes from the side of the women themselves. Due to the barriers women face in terms of leadership, a woman aspiring to a position of power might not have been able to reach it. A failing organization might have a difficult time finding a leader who wants the job, which gives the above mentioned woman a chance. This as a man aspiring to a position of power can on the other hand relatively easy find another (Kwan et al, 2020; Stewart, 2018). In other words, while a man might not be as interested of becoming the captain of a 'sinking ship', a woman can consider the ship to be an opportunity to proving her worth as a leader, although it is associated with high levels of risk (Stewart, 2018).

But Glass and Cook (2019) state that women taking glass cliff jobs should not be seen as isolated happenings of them taking big risks. Instead, the authors argue that it is the result of a career built on risk and risk-taking behaviour (Glass & Cook, 2019). Therefore, it could be that women taking on leadership roles, both in general but also in times of crises, are less risk-avert than people are in general.

3.3. Female Leadership during the Pandemic

In March 2021, approximately a year after the World Health Organization classified Covid-19 as a pandemic disease, the journal Feminist Economics released a special issue on "Feminist Economic Perspectives on the Covid-19 Pandemic". In this issue, Garikipati and Kambhampati (2021) published their article *Leading the Fight Against the Pandemic: Does Gender Really Matter?*.

Examining 194 countries during the initial months of the pandemic, Garikipati and Kambhampati (2021) investigate if there was a difference between male- and female-led countries in terms of reported cases and deaths of Covid-19. This is done using a nearest neighbour matching method. This method pairs the most comparable male- and female-led countries, based on a number of control variables. Throughout the tests and robustness checks, female-led countries are found to significantly outperform male-led countries in terms of confirmed cases and deaths of Covid-19. Further, female-led countries were found to have issued lockdowns in earlier stages than male-led countries (Garikipati & Kambhampati, 2021).

The same issue of Feminist Economics also contains the article *Women Heads of State and Covid-19 Policy Responses*. Using OLS regressions on 144 countries between January and June in 2020, Abras et al. (2021) draw similar conclusions as Garikipati and Kambhampati (2021): countries led by a woman have significantly fewer confirmed cases and deaths of Covid-19 per million people. But the results differ in a few aspects.

Abras et al. (2021) found that countries led by female leaders are in general larger providers of universal healthcare. When controlling for universal healthcare coverage, the significant and negative effect of female leadership is lost. Considering this, the authors state that access to universal health care is a crucial mechanism in fighting the Covid-19 pandemic. Abras et al. (2021) further argue that if male-led countries provided universal health care to a higher extent, cases and deaths of Covid-19 would be more similar between male- and female-led countries. But in opposite of Garikipati and Kambhampati (2021), Abras et al. (2021) do not find significant differences between male- and female-led countries in terms of speed in implementing policy-responses (Abras et al., 2021).

Windsor et al. (2020) argue that above mentioned research provides an oversimplistic picture regarding the effect of female leadership during the pandemic. According to the authors, countries with female leaders are fundamentally different in terms of culture than male-led countries. For example, female-led countries tend to be democratic states that value feminine traits and ideas of individualism more than male-led countries (Windsor et al., 2020).

Examining 175 countries and controlling for several aspects of governance and cultural traits, Winsor et al. (2020) find no significant effect of female leadership on confirmed Covid-19 cases and deaths. This is done through OLS regressions and nearest neighbour matching. Instead, they find that countries with higher rates of women in parliament performed worse than countries with lower rates of women in parliament. This finding is explained by that there are gender quotas in some democracies, especially in developing countries. The authors argue that these quotas potentially make democracies less efficient and is a symptom of a too rapid and inefficient democratisation process. This would then lead to a less efficient and providing welfare state, which could then result in higher cases and deaths of Covid-19 (Windsor et al., 2020).

3.4. Thoughts on the Literature

The impact of female leadership on Covid-19 outcomes is theoretically based on ideas of gender and gendered differences in people. Considering that men and women face different norms, they are also expected to behave differently in certain situations, for example in positions of power. Although some differences could be the result of differences in biology, some differences are also likely the results of cultural and social norms. Since most men and women have experienced these norms for most parts of their life, the differences aren't necessarily the result of conscious choices or actions, but rather indoctrinated ones.

The Covid-19 pandemic has in many ways affected individual countries but also the entire world. In times like this, leadership becomes crucial to both handle the acute situation, but also for moving forward and recovering. Given this, transformational leadership involves many aspects that could be important; empathy, innovative thinking and strong visions. These are characteristics that female leaders are considered to have to a higher extent than male leaders. The question is if these characteristics have an impact on Covid-19 outcome, and to what extent.

The potential effect of having a more risk-avert leader is harder to discuss, partly due to different perceptions of where the risk lies. For one, the risk could be considered to be related to the rates of confirmed cases and deaths. If this is the case, a leader would adopt policies to limit the spread and save as many lives as possible. But consequences of having too strict pandemic-related policies could also be connected to risks regarding economic stability.

What is described just above displays the trade-off leaders of the world have had to face during the pandemic; limiting spread and saving lives versus economic limitations and social consequences. Being risk-avert could therefore mean more than one thing in relation to the Covid-19 pandemic, and therefore, it is not certain what effect a risk-avert leader would have on pandemic related outcomes.

But the question is what applies in terms of risk when it comes to leadership. Given the findings of Glass & Cook (2019), it could be that women that become leaders are less risk-avert than other women, or even other men. There might therefore not be any significant differences between male and female leaders in terms of being risk-avert.

4.Data

This section describes the data used in this thesis and its sources. I also describe how I constructed a dataset on executive leaders for the examined period. Finally, I explain how data on Covid-19 outcomes is constructed, and the potential challenges this brings to the analysis.

4.1. Sample

The thesis's dataset includes monthly observations from 189 countries, covering the period January 2020 to March 2022. This period ranges from the very beginning of the pandemic to the latest available data at the time of starting to write this thesis. To examine if female leadership have an impact over an extended period, as much data as possible was considered necessary. With this period, many interesting aspects are covered in the pandemic's development - from short-term shocks to impact on a longer term. This time frame will make it possible to get a dynamic picture of female leadership during the pandemic, which is why it was chosen for this thesis.

The choice of examined countries was based on creating a varied picture of the pandemic's development and impact, but also of female leadership. Countries differ in everything from economic development to social foundations, which can create different impacts of both the pandemic and of female leadership. Female leaders are rare globally, they can be found all over the world. Therefore, a wide variety of countries was considered necessary to compare the outcomes of male and female-led countries. The countries included in this thesis sample can be found in Table B in Appendix B.

The dataset on reported Covid-19 cases and deaths was originally based on daily observations (Appel et al, 2022a). Given the examined period, this initially resulted in a dataset with approximately 170,000 observations. To make the dataset easier to manage, the daily information was transformed into monthly. As the data was collected on the 21st of March 2022, the latest daily observation included in the sample is from the 20th of March 2022.

4.2. The Data's Sources

Data regarding Covid-19 cases and deaths are extracted from Our World in Data's (OWiD) *Covid-19* dataset. This dataset contains daily observations of a variety of variables related to the pandemic and is updated daily. The original data collector of the Covid-19 outcome variables is John Hopkins University (Appel et al., 2022a).

For this thesis, I constructed a dataset on political leaders and their genders. The dataset is based on the Leader's list from the *Rulers, Elections, and Irregular Governance* (REIGN) dataset (Bell et al., 2021). The REIGN dataset contains information about leaders, regimes and elections from 1950 and onwards. The dataset was developed by Curtis Bell and maintained by One Earth Future Foundation (Besaw, 2021) up until its last update in August 2021 (OEF, 2022). A detailed description of how I constructed and coded the leadership dataset is found in Section 4.3 respectively Appendix C.

The empirical model of this thesis considers several control variables. Information about the control variables GDP per capita, population densities, shares of elderly population, stringency index and the HDI index is collected from OWiD's Covid-19 Dataset (Appel et al., 2022a). Again, OWiD is not the original data collector, but has extracted this information from sources like the United Nations, the World Bank and University of Oxford (Appel et al., 2022b). Data regarding annual per capita health expenditure, internet usage, the share of population's aged 15-64 and the number of international tourists is collected from the World Bank's *World Development Indicators* database (2022c; 2022d; 2022e; 2022f). Finally, data on the Gender Inequality Index (GII) from is collected from the UNDP (2020a).

4.3. The Construction of the Leadership Data

As mentioned above, I based the leadership dataset on the Leader list of the REIGN dataset, which aims to identify countries' real executive leaders (Bell, 2016). Identifying executive leaders is not always a straightforward assignment, as this position can formally be held by one individual while the real power lies elsewhere.

The identification strategy of the REIGN dataset is not expressed explicitly. But the identification of leaders has been cross validated with the *Archigos* dataset, which is one of the most recognized datasets on political leaders. Bell writes that the identification of leaders is similar in both the REIGN- and Archigos dataset (Bell, 2016), and therefore, it can be likely that their identification strategies are similar as well.

The identification strategy of the Archigos dataset is described as follows; in parliamentary regimes and presidential systems, the leader is coded to be the prime minister respectively the president. In communist states, it is the chairperson of the communist party (Goemans et al., 2009). One of the main differences between Archigos and REIGN is how the executive leader in countries with both a president and a prime minister is identified. While the Archigos dataset consistently encodes the president as the executive leader (Goemans et al., 2009), the REIGN dataset does not have a fixed principle like that (Bell, 2016). This is in line with how other online sources identify executive leaders (Wikipedia, 2022a), and is also how I constructed the leadership dataset. For example, I code the leaders of France and Finland to be the president respectively the prime minister, which is in line with the REIGN dataset (Bell et al., 2021).

The REIGN dataset has previously been used in research on executive leaders during the Covid-19 pandemic (Forster & Heinzel, 2021; Hartwell, 2022). Therefore, it is considered suitable for this thesis as well. Further, information about gender in the REIGN dataset is based on both the Archigos (Goemans et al., 2016) - and the *LEAD* dataset (Mortenson Ellis et al., 2015).

4.4. Challenges of Covid-19 Data

There are some important aspects to keep in mind when using Covid-19 data. One is regarding how the data is structured. John Hopkins University provides numbers on confirmed Covid-19 cases and deaths reported per day. But the day someone get sick or die from Covid-19 is not necessarily the same day it is reported. This is because there usually is a chain of agents between a case and/or death and it being reported to the national statistical agency (Appel et al, 2022a). Therefore, there are potential lags in the data on Covid-19 outcomes.

Further, the reporting of cases can be affected by several aspects that could further affect the data. Reporting of cases and deaths are for example based on testing. Most often, a case or death can only be accounted for in the statistics if it is confirmed by a positive Covid-19 test. As it is not likely that every individual infected by Covid-19 also gets tested, one should expect the number of reported cases and deaths to be underestimated (SVT, 2022),

All countries have neither been testing to the same extent. For example, richer countries have tested more than poorer countries (FIND, 2022). This doesn't necessarily mean that the need for testing is greater in richer countries, but rather that richer countries have had the capital, capacity and infrastructure needed to perform it. Therefore, data from richer countries are potentially overrepresented in the overall data on Covid-19 cases and deaths.

But possibilities to test for Covid-19 have also varied within counties. For example, people living in rural India have had difficulties in accessing Covid-tests due to low access to health care overall. Due to this, the number of cases and deaths of Covid-19 in India is feared to be heavily underestimated (Pandey & Verma, 2021).

Likely, statistical offices also report cases and deaths differently. For example, countries might differ in their definitions regarding who has died of Covid-19. If this is the case, then the data on Covid-19 deaths potentially cover different types of death. For example, Belgian doctors initially reported every death they suspected to be related to Covid-19, in some cases without testing. Also in the beginning of the pandemic, only Covid-19 deaths that occurred in hospitals were reported in Britain up until the end of April 2020 (Morris & Reuben, 2020). In the worst case, differences like these could make the data from different countries difficult to compare.

Regulations on testing can also vary over time. Therefore, the data from a country does not necessarily contain the same information throughout the period. For example, Swedish authorities have previously urged everyone with symptoms of Covid-19 to get tested. But since the beginning of 2022, testing is only encouraged to special groups of people, like health care professionals (FHM, 2022b). At the same time, the number of reported cases in Sweden started to drop (SVT, 2022). This is likely the result of the new regulations on testing, and not only a limited spread of Covid-19 in the country.

Considering all that is mentioned above, the data on cases and deaths of Covid-19 can vary in the kind of information they carry. The data can also be expected to be both over- and underestimated due to testing capacity and regulations of countries. Due to the same reasons, data from richer countries might also be overrepresented. Although the data potentially carries these flaws, there are few other data to consult on the pandemic as of today. And although the data might not perfectly mirror reality, it can at least provide some indications, and from these we can learn. Therefore, the data is considered to be good enough for this thesis, but its flaws will be kept in the mind throughout the research.

4.5. The Difference between Covid-19 Variables

In the models of this thesis, I use data on reported cases and deaths per million as dependent variables. This is because I want the Covid-19 outcomes to be weighed by population. Most countries with larger populations are led by leaders of mainly one gender (i.e. men). In general, the cumulative number of cases and deaths are higher in countries with larger populations. By weighing cases and deaths by population, you get an indication of the magnitude of the spread, which I argue is better when comparing countries in pandemic performance.

What I discuss above is visualised in the below graphs, which display different measures of reported cases and deaths of Covid-19 between male- and female led countries. The two top graphs contain information on cases while the two bottom graphs do the same for deaths. In the left-hand graphs are cumulative numbers of cases and deaths while there are cases and deaths per million people in the right-hand graphs. All graphs show the average values for male- and female-led countries over time.

Examining the below graphs, one can see that different variables tell different stories. Considering cumulative numbers, clear differences can be seen between male- and female-led countries. When using these variables, male-led countries have higher levels of both reported cases and deaths. But the differences become less clear and patterns of development more similar when the per million-variables are used. This indicate that when Covid-19 outcomes are weighed by population, there are not as clear differences between male- and female-led countries. Therefore, the per million-values are of higher interest to examine.

Figure 6 - Averages of Total Cases of Male- and Female led countries

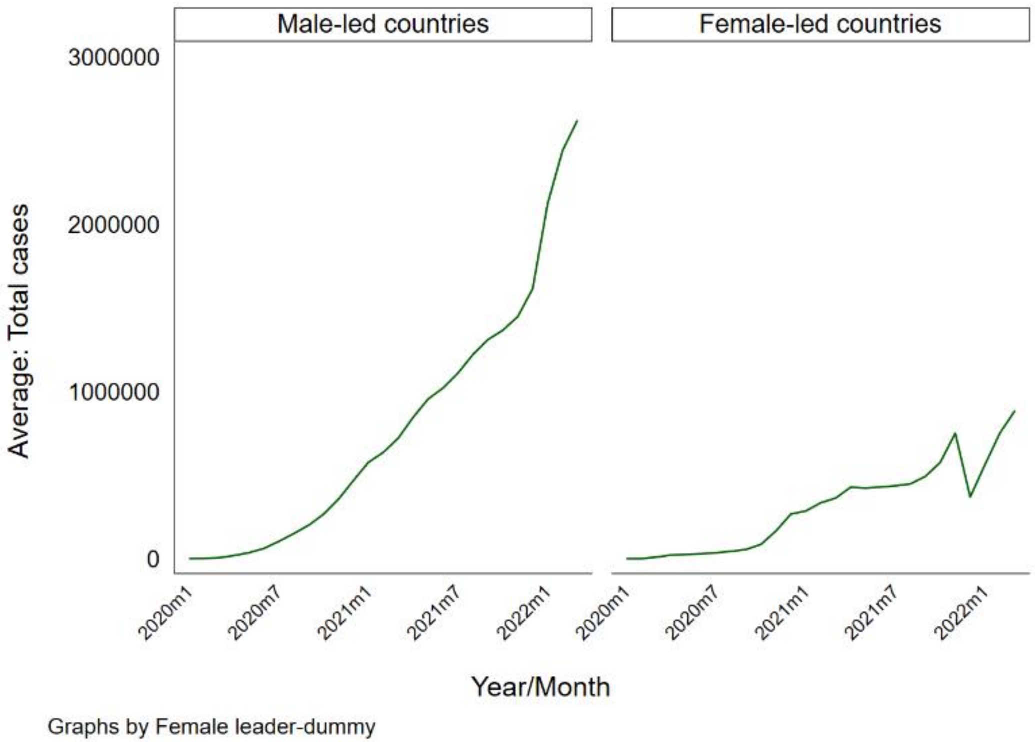


Figure 7 - Averages of Total Cases per Million of Male- and Female-led countries

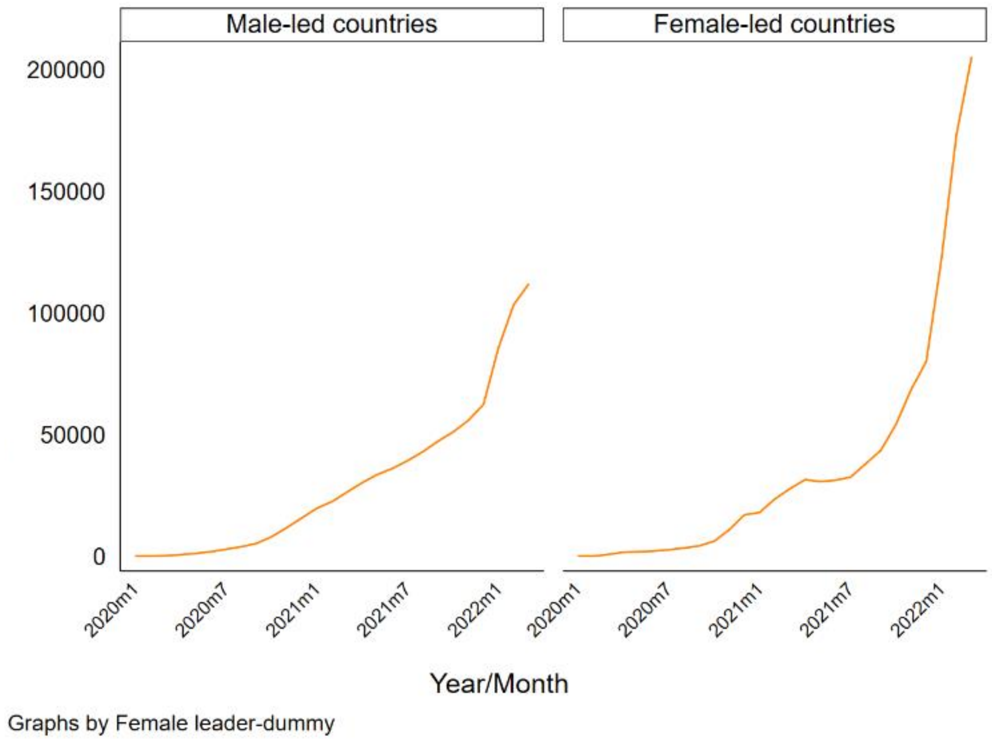


Figure 8 - Averages of Total Deaths of Male- and Female led countries

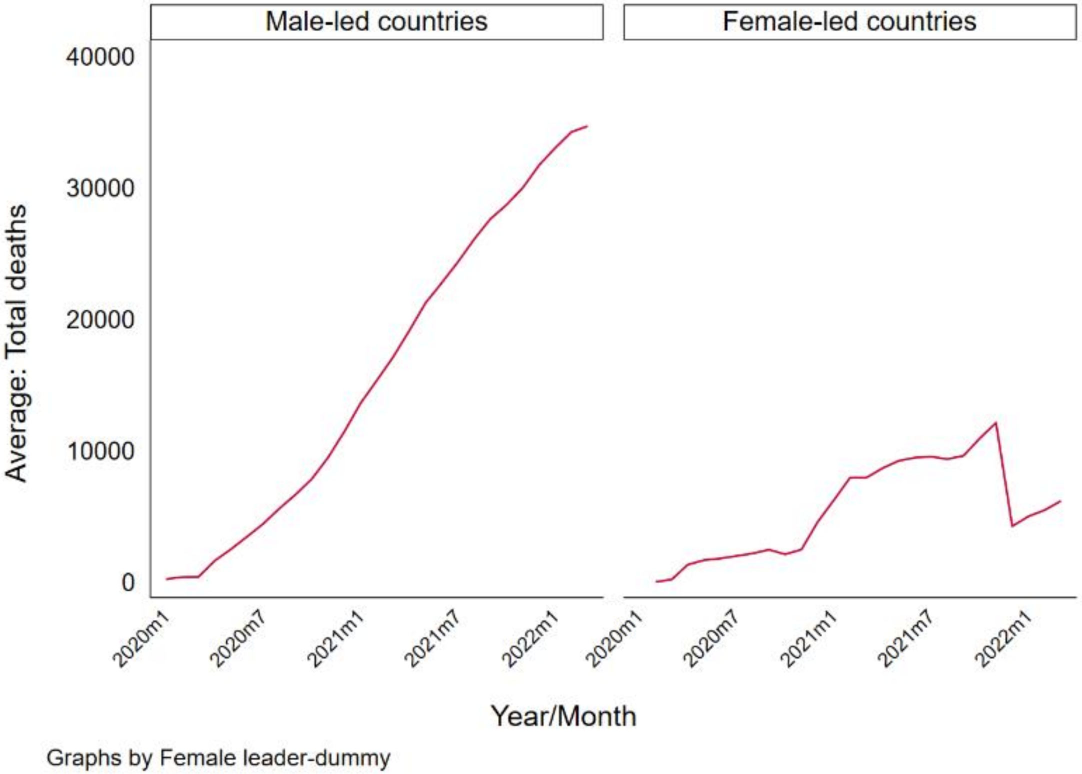
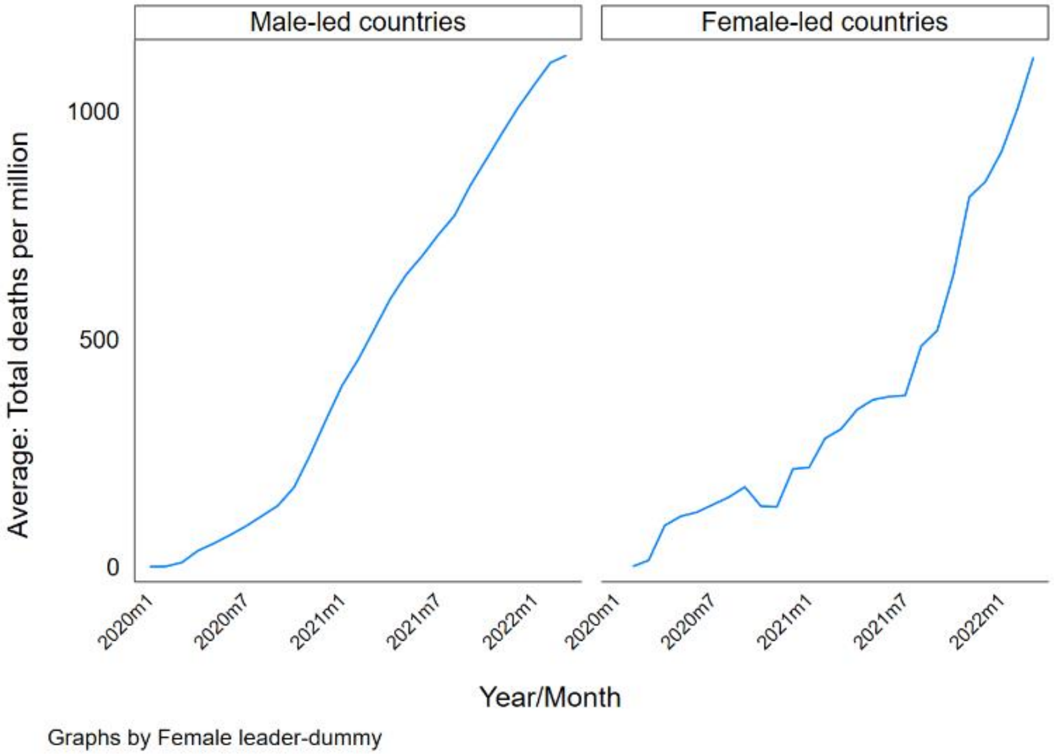


Figure 9 - Averages of Total Deaths per million of Male- and Female-led coun



Further, total cases and death per million were chosen over cases and deaths per capita for intuitive reasons. In Table 1, descriptive statistics are shown for the variables of cases and deaths per million and cases and deaths per capita. When examining the means of these variables, one can see that they really display the same values. For example, the mean for the cases per million for female-led countries is 40,431.3, which equals approximately 4% (≈40,431.3/1,000,000 = 0.04). And the mean of total cases per capita in female lead countries is estimated to 0.04, which is also 4%. As I found the per million variables more intuitive to interpret, I will use these as dependent variables in my models.

Table 1 – Descriptive Statistics of different Covid-19 Outcome Variables

	Female-led countries				Male-led countries			
Variables	Mean	Std Dev.	Min	Max	Mean	Std Dev.	Min	Max
Total cases p. million	40,431.3	78,358.8	0.06	516,901.9	32,706.4	59,321.8	.001	507,200.7
Total cases p. capita	0.0404	0.08	5.96e-08	0.52	0.0327	0.059	7.18e-10	0.51
Total deaths p. million	389.22	573.26	0.02	2,830.25	542.47	850.15	0.003	6,350.98
Total deaths p. capita	0.000389	0.0006	1.82e-08	0.0028	0.000542	0.0008	3.00e-09	0.0064

5. Method

In this section, I describe how I will attempt to answer the thesis' research question. In other words, I will explain and motivate the choice of method, describe the empirical models, and discuss the potential effects of the considered control variables. The robustness tests that will be used in Section 6 are also briefly described here.

5.1. Motivation of Method

When comparing Covid-19 outcomes, I want to base the analysis on pre-pandemic conditions. This is because if the control variables are affected by the pandemic, then the potential impact of female leadership is harder to distinguish. For example, the pandemic has likely affected both the health and the economy of a country. If this is the case, then the impact of the pandemic on the economy could further affect the number of cases and deaths. And if female leadership have an impact on cases and deaths, female leadership could also have an impact on the economy, which could then further have an impact on cases and deaths again, and so on.

By using pre-pandemic conditions, the analysis is based on the foundations on which countries had to tackle the pandemic on. This is considered to describe the countries better, which will be important to understand what differs between male- and female-led countries initially. But it will also make the potential impact of female leadership easier to find. Further, data on some of the controls I wish to include are not available yet. For example, information on Per capita health expenditure of 2022 is not yet available (World Bank, 2022c).

Considering all that is mentioned above, the dataset of this thesis contains both panel (e.g. cases and deaths) and cross-sectional (e.g. GDP per capita) data. In other words, the data on Covid-19 outcomes varies over time for all countries, while many of the control variables only have on value the entire period.

Given this data format, a fixed effect regression model would omit all control variables due to the repetitiveness of the values. Therefore, a pooled OLS regression model is the most suitable method for this thesis [3]. Further, this method has been used before to examine the potential effect of female leadership on Covid-19 outcomes (Abras et al., 2021), which validates its usage in this thesis.

5.2. Baseline Model & Empirical Strategy

To examine the potential effect of female leadership on Covid-19 outcomes, I will use the following model:

$$Covid19Outcome_{it} = \beta_1 FemaleLeader_{it} + \beta_2 StringencyIndex_{it} + \beta_3 GDPperCapita_i + + \beta_4 PerCapitaHealthExp_i + \beta_5 PopulationDensity_i + \beta_6 Older65_i + \beta_7 GII_i + \delta_c + \mu_t + \varepsilon_{it}$$

$Covid19Outcome_{it}$ is either the total reported Covid-19 cases per million *or* total reported Covid-19 deaths per million of country i at time t. These variables display the number of reported cases and deaths per million people in every country during the examined period.

$FemaleLeader_{it}$ is a dummy variable, indicating the gender of the leader of country *i* in month and year *t*. The variable takes the value 0 and 1 if the leader is male respectively female. This variable will be used to investigate the potential effect of female leadership on Covid-19 outcomes. The estimation of this effect is captured by β_1. Given the purpose and question of this research, this is the main explanatory variable of interest.

$StringencyIndex_{it}$ is a variable indicating the strictness level of the pandemic related policies implemented in country *i* at time *t*. This variable is an index and takes values between 0 and 100, where higher numbers indicate stricter policies. This index is produced by the Oxford

[3] The initial plan was to use a Propensity Score Matching (PSM) method. The idea of this method is to give every individual in a sample a score, based on several control variables. When a score is generated, the individuals in a treatment group get matched with individuals in the control groups, based on these scores. The positive aspect of this method is that potential bias created by small treatment groups are removed. The negative aspect is that for the matching to succeed, the balancing property must be satisfied. To fulfil the balancing property, the treatment and control groups must be considered similar enough given the control variables (Garrido et al., 2014). I attempted to perform the analysis with a PSM method, using similar variables as Garikipati and Kambhampati's (2021) paper. But I did not manage to satisfy the balancing property, meaning that male- and female-led countries were too different to base a matching on in the raw-data format. For the matching to work, the data would have had to be processed and categorized, which I found to create risks for misleading results. Therefore, the PSM method was not considered to be a suitable model for this thesis.

Coronavirus Response Tracker and is based on nine parameters discussed in section 2.3 of this thesis. The potential effect of the stringency index is captured by the term β_2.

The impact of the stringency index is beforehand not certain. On one hand, stricter policies potentially limit the spread of Covid-19. In that sense, a higher value on the stringency index could have a negative impact on Covid-19 cases and deaths. But on the other hand, countries with higher numbers of cases and deaths could also be the ones having the strictest pandemic-related policies. This to limit spread of Covid-19. Therefore, it cannot beforehand be certain what effect of this variable will be.

$GDPperCapita_i$ represents country i's GDP per capita and $PerCapitaHealth_i$ represents the average per capita health expenditure of country *i*. Both variables are in current value US$. β_3 will present the impact of GDP per capita, while β_4 will do the same for per capita health expenditure.

It is once again not certain what effect these variables have. Richer countries and countries that invest more in health care could be more prepared and able to handle the pandemic. The impact of these variables could then lead to fewer cases and deaths of Covid-19, and therefore be estimated to have a negative impact on Covid-19 outcomes. But these countries could also have performed mass-testing to a larger extent. Therefore, numbers on cases and deaths from richer countries and countries that invest more in health care are potentially overrepresented in the statistics, which could indicate that the number of reported cases and deaths are higher. Therefore, these variables could also have a positive effect on cases and deaths.

$PopulationDensity_i$ displays the population density of country i, and measures how many people that live within a square kilometre in every considered country. $Older65_i$ represents the share of country *i's* population that is aged 65 or older. The effect of these variables is captured by the notations β_5 respectively β_6.

Initially, higher population densities and/or larger shares of an elderly population could be thought to have led to more cases and deaths of Covid-19. When population densities are high, social distancing is harder to maintain, and old age is considered to increase the risk for severe infections of Covid-19. But countries with higher population densities or a larger, elderly population could be aware of this, and take extra safety precautions and higher emphasis on preventing measures. Therefore, it could instead be that countries with higher population densities and larger share of an elderly population have fewer reported cases and deaths of Covid-19.

GII_i represents country i's value on the UNDP's Gender Inequality Index of 2019. This index takes the value of 0 to 1, were 0 equals total equality between men and women. UNDP base the index on three main indicators: reproductive health, empowerment and economic status. Reproductive health is measured in maternal mortality ratios and adolescent birth rates. Empowerment is measured by the shares of seat held by women in national parliaments, and the share of the men and women that have finished at least secondary education. Finally, economic status is measured by labour force participation rates of men and women over the age of 15 (UNDP, 2020b). This variable is important to add as it controls for aspects of gender equality that could affect the pandemic outcomes of a country, as it more sufficiently captures how gender equal a country is than the female leadership dummy. The impact of the GII is captured by the notation β_7.

A lower score on the GII indicates higher gender equality. Therefore, if the impact of GII is found to be positive, countries with higher levels of gender inequality have performed worse during the pandemic. In other words, more gender equal countries would be estimated to have managed the pandemic better. But if GII is estimated to be negative, countries with higher levels of gender inequality are estimated to have performed better during the pandemic.

Previous research has found that more gender equal countries have fared worse during the pandemic (Windsor et al., 2020). Therefore, more gender equal countries could be expected to have higher numbers of confirmed Covid-19 cases and deaths. But if more representative leadership is to be considered more effective, it could be that countries with higher number of women in parliament (i.e. one of the factors considered in GII) could fare better during the pandemic.

Finally, δ_c and μ_t captures continent respectively time fixed effects, while ε_{it} is an error term.

Descriptive statistics for all the elements of the baseline model is found in Table 2 below. From these figures, we can determine that female-led countries in general have higher population densities than male-led countries. The population of countries led by women are also generally richer, older and more gender equal. Female-led countries also have generally higher per capita health expenditures, but also less strict policy responses to the pandemic. Several T-tests declare that all these differences are statistically significant. These T-test can be found in Appendix D.

Table 2 - Descriptive Statistics of Baseline Model

	Female lead countries				Male lead countries			
Control variables	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max
Total Cases per Million	40,431.28	78,358.85	0.6	516,901.9	32,706.39	59,321.82	0.00	507,200.70
Total Deaths per Million	389.22	573.26	0.02	2,830	542.47	850.15	0.00	6,350.98
Stringency Index	50.40	20.96	2.78	100	55.64	20.72	0	100
GDP per capita	34,540.54	19,029.86	2,683.30	64,800.06	17,430.95	19,076.08	661.24	116,936.60
Per Capita Health Exp. 2019	3,721.70	2,838.41	40.34	9,666.34	984.96	1,660.43	19.85	10,921.01
Population Density	717.52	1,933.49	3.40	7,039.71	208.66	659.99	1.98	7,915.73
Share of pop. aged 65 or older	15.72	5.04	3.11	21.45	8.20	5.98	1.14	27.05
Gender Inequality Index 2019	0.15	0.15	0.02	0.55	0.36	0.19	0.02	0.79

We can also see in Table 2 that while male-led countries have a lower mean in terms of cases per million, female-led countries have a lower mean in terms of deaths per million. These differences are also statistically significant at a 5% level of significance for cases and 1% level of significance for deaths. This gives the implication that male-led countries have had fewer cases, but more deaths than female-led countries.

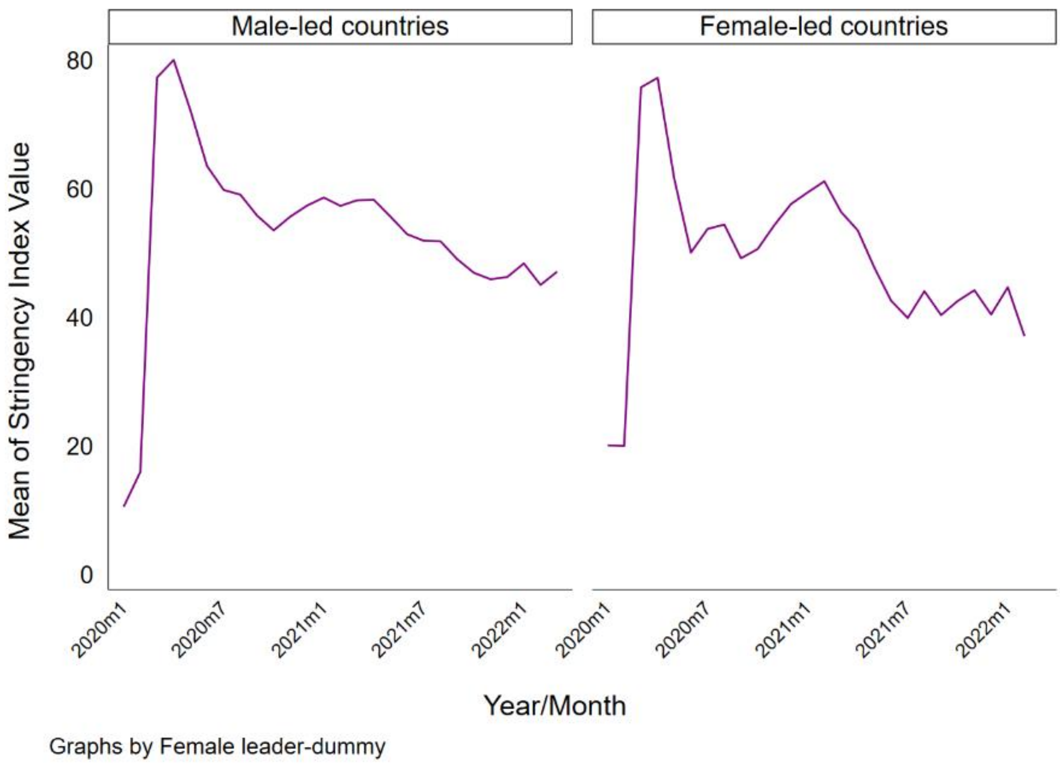
Altogether, one must state that male- and female-led countries are significantly different from each other. To avoid oversimplistic or even misleading results, this must be taken into consideration when performing the analysis. But one can also find significant differences in the means of terms of Covid-19 cases and deaths. This indicate that there potentially is a difference in how well male- and female-led countries have managed the pandemic.

5.3. Extended Model

To further explore the potential relationship between female leadership and Covid-19 outcomes, the base model is extended with two interactive control variables. The first interaction is between $FemaleLeader_{it}$ and $StringencyIndex_{it}$. By interacting the stringency index with female leadership, we can see if the impact of the stringency index differs between male- and female-led countries.

As the stringency index measures the strictness of pandemic-related policies, it could be used as a proxy for attitudes toward risk in the rule of a country. If course, this only works if the risk of the pandemic is considered to be linked to health outcomes, and not for example economic or social outcomes.

Figure 10 - Mean of the Stringency Score of Male- and Female-led countries



As was seen in Table 2 and Figure C (Appendix D), male-led countries have significantly higher values in terms of the stringency index. Although the difference in the mean is small, male-led countries are still found to have in general stricter pandemic-related policies than female-led countries. In Figure 10 above, the mean of the stringency index of male- and female-led countries are displayed over time. Overall, one can see that the development of the stringency index looks similar, but that female-led countries initially start at a higher level. Both male- and female-led countries have an initial peak right after the beginning of the pandemic, and another peak during the winter of 2021. Since the summer of 2021, female-led countries start to have lower levels on the index than male-led countries, and continuously have that up until more present days.

Individuals (at least not in democratic states) do not always rule a country alone. But it could be that the governance or overall risk-taking behavior differs between male- and female-led countries, and this would then be captured by this interactive variable. By adding the interactive stringency variable, we will see if the impact of stricter policy responses differs between male- and female-led countries. If it does, it could provide some explanation to potential differences in cases and deaths between the countries.

A second interaction variable is made between $FemaleLeader_{it}$ and $PerCapitaHealth_i$. Previous research suggest that female-led countries offer higher levels of universal healthcare (Abras et al., 2021). This indicates that female-led countries either spend more on per capita health expenditures or spend the health expenditures more efficiently. By controlling if the impact of health expenditures differs between male- and female-led countries, I will also be able to explore of these differences hold any explanatory value for Covid-19 outcomes. And therefore, this interactive variable is included in the extended model.

With these additions, the extended model looks like the following:

$$Covid19Outcome_{it} = \beta_1 FemaleLeader_{it} + \beta_2 StringencyIndex_{it} + \beta_3 GDPperCapita_i + \beta_4 PerCapitaHealth_i + \beta_5 PopulationDensity_i + \beta_6 Older65_i + \beta_7 GII_i + \beta_8 FemaleLeader_{it} \times StringencyIndex_{it} + \beta_9 FemaleLeader_{it} \times PerCapitaHealth_i + \delta_c + \mu_t + \varepsilon_{it}$$

The model is the same as the baseline model, with the two interactive variables added separately. β_8 will capture the effect of the stringency index specifically for female-led countries, while β_9 does the same for per capita health expenditure.

5.4. Robustness Checks

To test the validity of the results I will use two robustness checks. This is done to see if the results are consistent in other types of research settings, such as different model specifications and samples.

5.4.1. New control variables

In the first robustness check, new control variables are added to the baseline model. The new control variables are elements that could have explanatory powers for the pandemic outcomes. When doing this, some of the variables included in the baseline model will be dropped. This to avoid several control variables that measure the same thing, i.e. avoid collinearity. This test will see if different model specifications potentially affect the impact of female leadership on cases and deaths of Covid-19.

The first control variable that is added is the Human Development Index (HDI) scores of 2019. This is an index provided by the UNDP, measuring how well countries do in terms of development. Three dimensions are taken into consideration: health, education and standards of living. These dimensions are represented by for example life expectancy, expected years of schooling and GNI per capita (UNDP, 2020b). HDI is an interesting measure as it provides a more through description about the performance of an economy and wellness of people than GDP per capita.

The second new control variable is the share of a country's population that is using the internet. The internet has been an important source of both information and disinformation during the pandemic (Romero & Nelson, 2022). Therefore, it is interesting by itself to see what effect higher levels of internet usage have on Covid-19 related outcomes. But this variable could also be used as a proxy for understanding the communication channels and infrastructures that are available in different countries.

The third new control is the share of population that is young and/or in working age, i.e. 15-64. As older age is considered to increase the risk for a severe Covid-19 infection or deaths, a larger share of a population that is young could potentially limit the number of cases and deaths. But a larger share of this group could also mean that the group of people that lost their job and/or income during the pandemic is larger. Therefore, it might lie in the interest of countries with a larger group of young and/or working people to keep societies as open as possible, to reduce job- and income losses. But this could on the other hand result in higher cases and death numbers.

Finally, the last control variable to be added is the number of international tourists that arrived in the countries in 2019. A higher number of tourists indicate that the economy is more dependent on tourism. As international travel has been limited during the pandemic, the economic impact has likely been large for economies relying on tourism. Further, with higher levels of tourism, the movement of people in these countries could be relatively high. For future learnings on how to tackle pandemics, it is relevant to know more of the impact of tourism.

5.4.2. Dropping Epicentres

Out of the top ten countries that experienced the most cases of Covid-19, only one has been led by a woman (Germany) (Worldometer, 2022). Similarly, Covid-19 and two of the most contagious mutations of Covid-19 is also considered to originate from countries led by men (Indian Express, 2022; WHO Europe, 2022). Countries led by men are therefore overrepresented amongst the countries that have experienced the most cumulative cases, which potentially biases the results.

To check if the impact of female leadership potentially is overestimated, this robustness test runs the baseline model on a limited sample. This means that 12 countries are dropped, out of which 1 is led by a woman. The removed countries are the ten countries which the most reported Covid-19 cases - USA, India, Brazil, France, Germany, United Kingdom, Russia, South Korea, Italy and Turkey. (Worldometer, 2022). Additionally, the origin countries of Covid-19 and the contagious Delta and Omicron-variants - China, South Africa and India – are also dropped (Indian Express, 2022; WHO Europe, 2022).

6. Results

This part of the thesis contains the results and two robustness tests. When presenting the results, I discuss the estimated effect of the control variables on Covid-19 cases and deaths per millions of people. The effects are estimated to be either positive or negative, meaning that the control variables either have an increasing or a decreasing effect on cases and deaths. If an estimated effect is described to have changed, then that means that an effect transformed from negative to positive or vice versa. Throughout the testing, standards errors are clustered at the country level.

Given that the dependent and control variables are measured in different units, it is not possible to interpret the estimated coefficients. This as the dependent variables are measured as a share of Covid-19 cases and deaths of a population, while for example population densities is measured in another type of share. Therefore, the focus will not be put on the actual numbers of the estimated effects. Instead, the analysis will emphasize on the type of effect a control variable is estimated to have (positive or negative), as well as its magnitude (small or large) and its significance.

6.1. Baseline Results

Table 3 below present the results obtained with the baseline model. In this analysis, different fixed effects are used to examine several dimensions of female leadership. In columns (1) and (4), the results of a regression using only fixed continent effects is presented. The results in columns (2) and (5) have only time fixed effects, while both continent- and time fixed effects are used simultaneously in columns (3) and (6).

Table 3 – Results from Baseline model

Variables	Total cases per million			Total deaths per million		
	(1)	(2)	(3)	(4)	(5)	(6)
Female leadership	-19,782.61*	-14,954.06	-15,806.72*	-533.25***	-439.30***	-455.27***
	(10,547.11)	(9,593.46)	(8,600.50)	(115.83)	(118.56)	(103.45)
Stringency index	-347.64***	67.20	61.12	-5.43***	-4.21**	2.83**
	(74.10)	(58.33)	(60.86)	(1.49)	(1.80)	(1.25)
GDP per capita	0.21	0.31**	0.22	-0.00	0.00	0.00
	(0.15)	(0.15)	(0.14)	(0.00)	(0.00)	(0.00)
Per capita health exp. 2019	0.15	-0.86	0.43	-0.03	-0.04	-0.03
	(1.74)	(1.77)	(1.74)	(0.04)	(0.04)	(0.04)
Population density	-2.80	-4.79**	-2.29	-0.06***	-0.12***	-0.05**
	(2.50)	(2.20)	(2.39)	(0.02)	(0.03)	(0.02)
Share of pop. aged 65 or older	-96.80	1,505.95**	30.54	20.30	55.93***	22.42
	(987.67)	(727.76)	(918.21)	(16.07)	(12.71)	(14.06)
Gender Inequality Index 2019	-50,747.49**	-52,755.43**	-41,629.62*	-409.99	-228.06	-284.13
	(23,582.82)	(25,088.68)	(22,333.53)	(415.84)	(435.66)	(385.58)
Fixed continent effects	Yes	No	Yes	Yes	No	Yes
Fixed time effects	No	Yes	Yes	No	Yes	Yes
R-squared	0.21	0.49	0.52	0.30	0.40	0.50
No. of observations	3,640	3,640	3,640	3,470	3,470	3,470
No. of countries	150	150	150	149	149	149

*Standards errors in parentheses. ***, ** and * represents levels of significance of 1%, 5% and 10% respectively.*

According to these results, female-led countries have significantly fewer cases and deaths of Covid-19 in five out of six columns. The effect on cases is significant at a 10% level of significance if continent fixed effects are used. The significant effect on cases is lost when only time fixed effects are used. For deaths, the effect of the female leadership dummy is highly significant at a level of 1% for all columns. These results are in line with the findings of Garikipati and Kambhampati (2021) and Abras et al. (2021), who also found that female-led countries experienced significantly fewer cases and deaths during the pandemic

The results indicate mainly three things. First, that the effect of female leadership on cases per million is larger than the effect on deaths per million. Second, the impact of female leadership on deaths is more significant than on cases throughout the different model specifications. Third, it becomes clear that explaining the pandemic is not an easy task. The results above show that potential explanations to pandemic outcomes are dependent on both context and time. This is seen as some of the control variables at times differ in effect and level of significance between the model specifications.

For example - the stringency index variable is estimated to have a significant, negative impact on cases at a 1% level of significance when only continent fixed effects are used. This can be seen in column (1). But when time fixed effects are used, both by itself and together with the continent fixed effects, the effect of the stringency index becomes positive and insignificant. For deaths, the stringency index is estimated to have a negative effect when the fixed effects are used separately, but a positive effect when they are used simultaneously. The level of significance is 1% in column (4) and 5% in columns (5) and (6).

To some extent, these varied estimates could have been expected. As is described in section 4.2., most of the control variables can be expected to have either a positive or a negative effect. The estimated effect of these variables then depends highly on context. For example, population density could have a positive effect on cases and deaths in one country, but a negative effect in another. Therefore, it could be difficult to make robust estimations about the general impact of a control variable on the Covid-19 outcomes.

None the less, GDP per capita is estimated to have a small and positive impact on cases, while the effect on deaths is very small. The impact of GDP per capita is found to be insignificant in all columns but column (2). The interpretation of this is that Covid-19 outcomes have not been significantly impacted by the wealth of countries. This is surprising, considering at least that data from wealthier countries are likely overrepresented in the overall Covid-19 data. Similarly, the impact of per capita health expenditure is small and insignificant in all models. In columns (1) and (3) the impact is estimated to be positive, but negative in all other columns.

Population density is considered to have a small, negative impact on cases and an even smaller impact on deaths. The effect is estimated to be insignificant in columns (1) and (3). But in all other columns, the impact is statistically significant at 5% and 1% levels of significance. This indicates that countries with higher population densities managed to identify that they were at risk and managed to limit the harm of Covid-19 better than countries with lower population densities.

A larger share of a population aged 65 and older is estimated to have a negative effect in column (1), but a positive impact in all other columns. The impact is only found to be significant when only time fixed effects are used, at a 5% and 1% level of significance in column (2) respectively column (5).

Finally, GII is found to have a large, negative impact on cases and deaths, which is only significant on cases. This indicates that although a female leader is found to have a negative impact on both cases and deaths, countries with higher levels of gender inequality experienced significantly fewer cases of Covid-19. This finding is in line with previous research, indicating that countries with higher levels of gender equality managed the pandemic worse (Windsor et al., 2020).

6.2. Extended Results

As discussed above, the stringency index measures the strictness of the pandemic-related policies of a country and could therefore be related to a perception of risk. Therefore, I want to investigate if the impact of the stringency index can help explain that female-led countries have significantly fewer cases and deaths of Covid-19.

Previous research has also stated that female-led countries in general invest more in healthcare (Abras et al., 2021). This indicates that there are potential differences in health care expenditures between male and female-led countries, which could also help explain the results above.

To examine if the stringency index and per capita health expenditure can help explain the above results, the two interactive variables described in section 5.3 is added to the baseline model. The result of this extended model is presented in Table 4 below. All control variables are not presented, but only the variables of interest for this discussion. This to save space, as the estimates of the other control variables are similar to the baseline results. Column (1) and (5) presents the results from the baseline model. They are presented again to make potential differences easy to see.

Table 4 – Results from Extended Model

	Total cases per million				Total deaths per million			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female leadership	-15,806.72*	-46.33	11,902.00	30,189.53	-455.27***	-458.32*	-234.71*	-237.10
	(8,600.50)	(16,520.94)	(10,423.36)	(23,140.74)	(98.51)	(238.66)	(139.29)	(229.88)
Stringency index	61.12	84.14	58.24	84.29	2.83**	2.83**	2.79**	2.79**
	(60.86)	(63.02)	(59.67)	(61.55)	(1.25)	(1.33)	(1.23)	(1.32)
Female leadership x Stringency index	-	-313.11	-	-354.94	-	0.06	-	0.05
		(221.43)		(261.35)		(3.44)		(3.18)
Per capita health exp. 2019	0.43	0.40	2.55	2.55	-0.03	-0.03	-0.01	-0.01
	(2.39)	(1.75)	(1.43)	(1.43)	(0.04)	(0.04)	(0.04)	(0.04)
Female leadership x Per capita health expenditure	-	-	-8.07***	-8.20***	-	-	-0.07*	-0.07*
			(1.98)	(2.16)			(0.04)	(0.04)
Fixed continent effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.52	0.52	0.53	0.53	0.50	0.50	0.50	0.50
No. of observations	3,640	3,640	3,640	3,640	3,470	3,470	3,470	3,470
No. of countries	150	150	150	150	149	149	149	149

*Standards errors in parentheses. ***, ** and * represents levels of significance of 1%, 5% and 10% respectively.*

In column (2) and (6), only the interactive stringency-variable is added. The estimated effect female leadership is now both heavily reduced and not significant on cases. The level of significance for female leadership increases on death, but the female leadership-dummy is still similar to the baseline estimations. The interactive stringency-variable itself is not estimated to be significant in either column (2) or column (6). This implies that there are no significant differences in the impact of stricter pandemic-related polices on cases and deaths between male- and female-led countries. This would then indicate that the perceptions of risk in male- and female-led countries do not differ either.

In columns (3) and (7), only the interactive health expenditure-variable is added to the regression. Again, the result differs depending on whether the dependent variable is cases or deaths. Considering cases, one can see that the impact of female leadership is once again changed. When the interactive health expenditure-variable is added, the effect of female leadership becomes positive and insignificant, and the same estimations are made for the impact of per capita health expenditure. This is the same as in the baseline results. This while the interactive health expenditure-variable is negative and significant at a 1% significance level. For deaths, the impact of female leadership shrinks, but is still significant at a 10% level of significance. While the per capita health expenditure is insignificant, the stringency index and interactive health expenditure-variable is significant at a 5% respectively 10% level of significance.

As the interactive health expenditure-variable is found to be significant, there are significant differences in terms of health expenditures between male- and female-led countries. The results also indicate that higher per capita health expenditures led to significantly fewer cases and deaths in female-led countries. This implies that the differences in pandemic outcomes could be explained by differences in terms of health care in male- and female-led countries, which are in line with previous research (Abras et al,. 2021).

In columns (4) and (8), both interactive variables are added to the regression. For cases, the impact of female leadership is still estimated to positive and insignificant, but larger than in column (3). Further, all control variables are insignificant, apart from the interactive health expenditure-variable. For deaths, the estimations are similar to column (7), but the female leadership-dummy is now estimated to have an insignificant effect.

The conclusions from this extended line of testing are the following - there are no differences in the effect of the stringency index between male- and female-led countries, but there are differences in the impact of per capita health expenditures. That the interactive per capita health expenditure-variable is significant implies that the impact of per capita health expenditure is higher in female led countries. Potential explanations to this could be that health expenditures are higher in general or used more efficiently in female-led countries, and therefore have a better effect on limiting cases and deaths of Covid-19.

In terms of cases, the impact of female leadership on cases changes quite abruptly when interactive variables are considered. The same cannot be said when deaths are considered. This again give the implication that female leadership have a more consistent effect on deaths rather than cases.

6.3. Robustness Checks

Finally, I test the validity of the results using the two robustness tests described in section 5.4. The results of these are found in Table 5 and Table 6 and are analyzed separately.

6.3.1. New control variables

Table 5 below contains the results of the first robustness check, where new control variables are added to the baseline model. The first control to be added is the HDI-index of 2019. As signs of collinearity was found, the GII-variable is removed from the model. The result of these estimations can be seen in column (1) and (5).

The estimations of the original controls are overall similar to the baseline results. The major difference is that the impact of having a larger share of an older population on cases changes from positive to negative. Further, the female leadership-dummy remains negative and significant for both cases and deaths, at similar magnitudes and levels of significance as in the baseline results.

The HDI variable is estimated to have a large, positive, and highly significant effect on both cases and deaths. This would imply that the more a country is developed, the more cases and deaths of Covid-19 is reported. This is in line with that high income and highly developed countries are overrepresented in their numbers of cases and deaths, due to more testing.

Table 5 – Adding New Control Variables

Variables	Total cases per million (1)	(2)	(3)	(4)	Total deaths per million (5)	(6)	(7)	(8)
Female leadership	-15,310.18*	-19,047.56*	-15,923.81*	-16,332.28*	-457.72***	-589.15***	-472.15***	-388.43***
	(8,907.93)	(11,445.88)	(8,560.99)	(8,703.82)	(109.51)	(112.35)	(104.21)	(97.31)
Human Development Index	113,273.30***	-	-	-	1,587.15***	-	-	-
	(27,086.54)				(416.53)			
Share of the population using the internet	-	402.73***	-	-	-	2.27	-	-
		(131.19)				(1.85)		
Share of pop. aged 15-64	-	-	500.86	-	-	-	11.20*	-
			(542.86)				(6.72)	
No. Of arriving international tourists 2019	-	-	-	-0.00	-	-	-	0.00
				(0.00)				(0.00)
Stringency index	36.13	133.60	45.37	23.33	1.80	4.09**	2.48*	2.74*
	(69.27)	(104.50)	(63.43)	(71.02)	(1.20)	(1.70)	(1.34)	(1.43)
GDP per capita	0.05	0.13	0.14	0.18	-0.00*	-0.00	-0.00*	0.00
	(0.15)	(0.17)	(0.14)	(0.15)	(0.00)	(0.00)	(0.00)	(0.00)
Per capita health exp. 2019	0.17	0.71	1.24	0.87	-0.03	-0.02	0.00	-0.04
	(1.80)	(1.92)	(1.75)	(1.75)	(0.04)	(0.03)	(0.04)	(0.03)
Population density	-1.76	-1.39	-2.17	-2.21	-0.04*	-0.05*	-0.04*	-0.05**
	(2.35)	(2.63)	(1.94)	(2.44)	(0.02)	(0.03)	(0.02)	(0.02)
Share of pop. aged 65 or older	-489.41	167.55	-	8.18	8.04	20.92	-	20.09
	(832.59)	(998.43)		(970.97)	(12.77)	(14.06)		(14.06)
Gender Inequality Index 2019	-	-	-34,439.37	-42,684.77*	-	-	-529.61*	-70.11
			(21,674.37)	(25,245.26)			(310.20)	(432.72)
Fixed continent effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.51	0.53	0.52	0.53	0.51	0.53	0.49	0.52
No. of observations	3,852	2,912	3,640	3,211	3,616	2,790	3,470	3,050
No. of countries	160	119	150	132	159	119	149	131

*Standards errors in parentheses. ***, ** and * represents levels of significance of 1%, 5% and 10% respectively.*

The second added control is the share of the country population that is using internet. Richer countries have historically had higher access to internet than poorer countries. Therefore, richer countries have also used internet to a higher extent. But internet usage is now increasing in poorer countries (Roser et al, 2022), and there are no signs of collinearity between GDP per capita and internet usage. Due to this, GDP per capita remains in the model. However, collinearity was found with the GII-index, which was then again removed.

The results controlling for internet usage are found in column (2) and (6). Internet usage is found to have a positive and highly significant effect on cases, but a low, insignificant impact on deaths. This would indicate that countries with higher usage of internet have experienced significantly more cases of Covid-19, but not significantly more deaths. Further, the other estimations look like the ones of the baseline model, and a negative and significant effect of female leadership is still found on Covid-19 cases and deaths.

The third added control checks if the size of the population that is young and/or in working age have an impact on cases and deaths of Covid-19. The estimation of this model is found in columns (3) and (7) above.

The estimated effects of female leadership and other controls on cases are again similar to the baseline estimations. This while the impact of a larger share of a younger population and/or a larger workforce is insignificant on cases. But on deaths, the impact is positive and significant at a 10% significance level. Countries with a larger share of a younger population and/or workforce therefore did experience more deaths of Covid-19. GDP per capita does now also have a negative and significant effect at a 10% level of significance.

Finally, the impact of tourism is controlled for. This is the only model that contain all variables that were originally in the baseline model, and its results are found in columns (4) and (8). The estimated effect of international tourists is insignificant and small. This imply that higher numbers of arriving tourists' previous years do not have an impact on cases and deaths. Overall, the other control variables are very similar to the baseline estimates. The impact of female leadership on both cases and deaths remains robust.

Throughout this robustness test, female leadership is estimated to consistently have a significant, negative effect of similar magnitudes as in the baseline results. Therefore, the baseline results are to be considered robust. In other words, this line of testing supports the notion that female-led countries did manage the pandemic differently from male-led countries.

6.3.2. Dropping epicentres

The second robustness test that the baseline model is estimated on a sample where large epicentres and origin countries of Covid-19 are dropped. Table 6 presents the results of this robustness test.

Table 6 – Without Epicentres & Origin Countries

	Total cases per million	Total deaths per million
Variables	(1)	(2)
Female leadership	-12,065.46	-375.94***
	(9,657.49)	(91.47)
Stringency index	69.37	2.65**
	(62.99)	(1.29)
GDP per capita	0.25*	0.00
	(0.15)	(0.00)
Per capita health exp. 2019	-1.70	-0.08***
	(1.75)	(0.03)
Population density	-2.47	-0.05**
	(2.52)	(0.02)
Share of pop. aged 65 or older	171.41	21.92
	(937.91)	(13.40)
Gender Inequality Index 2019	-53,572.93**	-502.19
	(20,362.79)	(381.49)
Fixed continent effects	Yes	Yes
Fixed time effects	Yes	Yes
R-squared	0.51	0.49
No. of observations	3,331	3,174
No. of countries	138	137

*Standards errors in parentheses. ***, ** and * represents levels of significance of 1%, 5% and 10% respectively.*

When examining the above results, the general impression is that they are similar to the baseline results. GDP per capita gets a negative effect on cases, and the level of significance of both per capita health expenditure and population density becomes highly significant at a 1 on deaths. But there is one vital difference; when examining the limited sample, the impact of female leadership on cases loses its significance. This while a negative and strongly significant impact remains on deaths. This robustness test find that the baseline results are only robust on deaths, but not on cases.

6.4. Discussion

From these results, I draw four major conclusions. First, female-led countries have significantly fewer deaths of Covid-19. This result is found throughout the testing and the robustness checks. In most settings, this applies for Covid-19 cases as well. Therefore, I can conclude that there is a relationship between female leadership and better Covid-19 outcomes over an extended period. But the relationship is not as consistent or universal on all Covid-19 outcomes as previous research has suggested (Abras et al., 2021; Garikipati & Kambhampati, 2021).

Second, although the impact of female leadership is more consistent on deaths, it is larger on cases. In the baseline results, one can see that the impact of the female leadership-dummy on cases is estimated to be four to five times larger than the impact on deaths. The question is then why this is the case.

A potential answer could be found in conclusion three, which is that the impact of certain controls variables differs between male-and female-led countries. In line with previous research, an important difference seems to lie in health care (Abras et al., 2021). This is seen in Section 6.2, where significant differences in the effect of health care expenditure between male- and female-led countries is found. Therefore, the reason why female-led countries experienced fewer cases seem to be related to health care, but the same cannot be said about deaths and health care.

I wonder if this could be explained further by aspects connected to data. Given that there is some sort of spread of Covid-19 in a country, some of the infected will inevitably die. This due to the mortality rate of Covid-19. That someone dies with symptoms of Covid-19 is a strong indicator for a Covid-19 related death. Therefore, deaths are potentially more accurately reported than cases. This while cases of Covid-19 are recognized to be underestimated and depending heavily on the access to testing. Due to these underestimations, the numbers on reported cases might not give an as accurate description of reality as the number of deaths. This could then also give not as accurate estimations of impacts.

But on the other hand, female-led countries generally spend more money on health care. As mentioned previously, this has been found by previous research (Abras et al., 2021). But it is also found in this thesis, by examining the mean of the Per capita health expenditure-variable (Table 2) and a t-test (Figure E). Although this is very simple testing, it still gives implications on important differences between male- and female-led countries. Given this, female-led countries should have better capacities of performing large scale-testing. But then, female-led countries should be overrepresented in the data on both cases and deaths, which could result in that the impact of female leadership is overestimated.

By examining Table 2 and Figures A and B, one sees that female-led countries have significantly more cases but fewer deaths than male-led countries. In line with above explanation, the higher number of cases could be due to overrepresentation in the data. But given the same argumentation, why are the number of deaths not higher in female-led countries? There must be some aspect in female-led countries that have had a significant impact on deaths during the pandemic. While there is an impact found on deaths of the interactive health expenditure variable, it is neither big nor highly significant. Therefore, there must be something else that can explain why female-led countries experienced fewer deaths during the pandemic. But this has not successfully been captured by this thesis.

In section 3.4, I discuss two theoretical differences in terms of male and female leadership. These are characteristics related to transformational leadership and risk-avertness. Some would maybe argue that there could lie some explanatory power to the pandemic there. Perhaps it could be that the people of female-led countries have more faith in their leaders. Or perhaps that female leaders saw big risks in the health aspects of the pandemic and aimed more towards saving lives than other economic and social consequences.

I find myself left to be convinced by this type of argumentation. Firstly, I think it puts too much emphasis in the importance of an individual leader. Secondly, female leaders are found to have less strict policy responses to the pandemic. As is seen in Table 2 and Figure C, male-led countries had significantly stricter policy responses to the pandemic. So, if the risks of the pandemic were considered to be linked to health consequences, male leaders have been more risk-avert than female leaders.

Finally, I find this type of argumentation heavily gender stereotypical. Given traditional gender roles, women are expected to be more empathetic, caring, communicative and careful. When basing an analysis on these norms, I would argue that you enforce them rather than exploring their explanatory power.

My fourth and final major conclusion is that the pandemic and its outcomes are difficult to explain. This becomes clear as some control variables are estimated to have different effects throughout the results. Between the model specifications, there are differences found in magnitudes, type of effect and levels of significance for the same control. To me this implies that it is difficult to find general explanations on why some countries have fared the pandemic better than others. At least it is difficult to make such explanations that hold in every context, in every time and across the globe.

To finalize this discussion, I would like to say that it is interesting that the baseline results estimate a negative effect of female leadership, but also a negative effect of gender inequality. This indicate that countries with a female leader, which are in general more gender equal than countries without a female leader, have fared the pandemic better. But at the same time, less gender equal countries are found to also have fared fewer cases, but not deaths. All this can be seen as the impact of GII on deaths in Table 3.

This is in line with the findings of Windsor et al. (2020). These authors found that less gender equal countries fared better during the pandemic and argue that this could be due to gender quotas in democratic systems. But it could also be that more authoritarian states have better opportunities to limit their populations than democratic states, which could prevent the spread of Covid-19. Another explanation could also be that democratic states are more transparent than authoritarian regimes. Therefore, democratic states might report cases and deaths more truthfully than authoritarian regimes. All this could result in that democracies, and therefore also more gender equal countries, are found to have more cases and deaths.

7. Conclusion

This thesis has investigated if there a relationship between female leadership and Covid-19 outcomes. Previous research has found that female-led countries had fewer cases and deaths in initial and shorter periods of the pandemic, and the purpose of this thesis was to extend this line of research. This was done by asking the question; "*Have countries with female leaders to any extent performed differently than countries with male leaders during the Covid-19 pandemic?*". This was then investigated using a pooled OLS regression model on a dataset containing both panel- and cross-sectional data. The examined period is between January 2020 and March 2022.

The results indicate that the number of reported Covid-19 deaths is significantly lower in female-led countries. For reported cases of Covid-19, the picture is not as clear. Not only is the impact on cases less significant, but also insignificant in one of the robustness tests. A suggested explanation to this is fundamental differences between male- and female-led countries in terms of health care. This as an interactive variable between female leadership and per capita health expenditure is found a have a strong and highly significant effect on cases. What is interesting however is that the impact of the same variable is lower and not as significant on deaths. Therefore, there must be some other fundamental difference between male- and female-led countries that can explain the differences in deaths. But this research has not fully managed to identify what this could be.

The implication of the results is none the less that female-led countries did perform better than male-led countries during the pandemic, even after an extended period. Therefore, the answer to the research question is simply 'yes' – countries with female leaders have performed differently than countries with male leaders. But the results also imply that it likely is not female leadership itself that have affected countries pandemic performance. Instead, explanations likely lie in the social foundations and structures in the type of countries women tend to lead, for example in terms of health care. Therefore, to understand the outcomes of the pandemic better, future research should focus on identifying these foundational differences between male- and female-led countries.

But the inconsistent estimations of the other control variables come with another important implication. That is that explanations to the pandemic are dependent on both context and time.

Therefore, it might be difficult to find general explanations to the pandemic and its outcomes that apply for all countries and over time.

To further explore potential explanatory channels, it could be relevance to examine smaller groups of countries. By examining fewer countries, it might be easier to identify potential explanatory channels, and then test to which extent these apply globally. But the research field likely benefits from research on both global and more local scales. For example, I was able to find that health care expenditures are an important explanatory aspect on Covid-19 outcomes. This could be an important input when examining smaller groups of countries, which could then lead to new learnings and further results. Therefore, research on both a global and a more local scale have the possibility of complementing each other, meaning that both are needed for moving the field forward.

Given the circumstances, I believe this thesis used one of the best methods available. But with more distance in terms of time, the model should be extended to capture broader effects and impacts on the pandemic. Further, when other explanatory channels are identified, these should be added as well.

To summarize, this thesis has contributed to understanding of why different countries fared differently during the pandemic. But it has also highlighted that many holes are left to be investigated regarding why female-led countries in general fared better. Given this, I hope this thesis has enlightened the potential that lies in investigating this field of research, and that other scholars are inspired to continue.

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Appendix A – The Female Leaders of the Sample

Table A - List of Female Leaders

Country	Continent	Name of leader	In office
Barbados	N. America	Mia Mottley	Entire examined period
Denmark	Europe	Mette Fredriksen	Entire examined period
Finland	Europe	Sanna Marin	Entire examined period
Hong Kong	Asia	Carrie Lam	Entire examined period
Iceland	Europe	Katrín Jakobsdóttir	Entire examined period
New Zealand	Oceania	Jacinda Ardern	Entire examined period
Serbia	Europe	Ana Brnabic	Entire examined period
Estonia	Europe	Kaja Kallas	Since January 2021
Honduras	N. America	Xiomara Castro	Since January 2022
Moldova	Europe	Natalia Gavrilita	Since August 2021
Samoa	Oceania	Fiame Naomi Mata'afa	Since May 2021
Sweden	Europe	Magdalena Andersson	Since November 2021
Tanzania	Africa	Samia Suluhu Hassan	Since March 2021
Belgium	Europe	Sophie Wilmes	Until October 2021
Bolivia	S. America	Jeanine Añez	Until November 2020
Germany	Europe	Angela Merkel	Until December 2021
Myanmar	Asia	Aung San Suu Kyi	Until February 2021
Norway	Europe	Erna Solberg	Until October 2021
Switzerland	Europe	Simonetta Sommaruga	Until December 2020

In total: 19

Appendix B – The Countries of the Sample

Table B - List of Countries included in Sample

Afghanistan	Chad	Greece	Lithuania	Papua New Guinea	Syria
Albania	Chile	Grenada	Luxembourg	Paraguay	Tajikistan
Algeria	China	Guatemala	Madagascar	Peru	Tanzania
Andorra	Colombia	Guinea	Malawi	Philippines	Thailand
Angola	Comoros	Guinea-Bissau	Malaysia	Poland	Timor
Antigua and Barbuda	Congo	Guyana	Maldives	Portugal	Togo
Argentina	Costa Rica	Haiti	Mali	Qatar	Tonga
Armenia	Cote d'Ivoire	Honduras	Malta	Romania	Trinidad and Tobago
Australia	Croatia	Hong Kong	Marshall Islands	Russia	Tunisia
Austria	Cuba	Hungary	Mauritania	Rwanda	Turkey
Azerbaijan	Cyprus	Iceland	Mauritius	Saint Kitts and Nevis	Turkmenistan
Bahamas	Czechia	India	Mexico	Saint Lucia	Uganda
Bahrain	Dem. Republic of Congo	Indonesia	Micronesia	Saint Vincent and the Grenadines	Ukraine
Bangladesh	Denmark	Iran	Moldova	Samoa	United Arab Emirates
Barbados	Djibouti	Iraq	Mongolia	Sao Tome and Principe	United Kingdom
Belarus	Dominica	Ireland	Montenegro	Saudi Arabia	United States
Belgium	Dominican Republic	Israel	Morocco	Senegal	Uruguay
Belize	Ecuador	Italy	Mozambique	Serbia	Uzbekistan
Benin	Egypt	Jamaica	Myanmar	Seychelles	Vanuatu
Bhutan	El Salvador	Japan	Namibia	Sierra Leone	Venezuela
Bolivia	Equatorial Guinea	Jordan	Nepal	Singapore	Vietnam
Bosnia and Herzegovina	Eritrea	Kazakhstan	Netherlands	Slovakia	Yemen
Botswana	Estonia	Kenya	New Zealand	Slovenia	Zambia
Brazil	Eswatini	Kiribati	Nicaragua	Solomon Islands	Zimbabwe
Brunei	Ethiopia	Kuwait	Niger	South Africa	
Bulgaria	Fiji	Kyrgyzstan	Nigeria	South Korea	
Burkina Faso	Finland	Laos	North Macedonia	South Sudan	
Burundi	France	Latvia	Norway	Spain	
Cambodia	Gabon	Lebanon	Oman	Sri Lanka	
Cameroon	Gambia	Lesotho	Pakistan	Sudan	
Canada	Georgia	Liberia	Palau	Suriname	
Cape Verde	Germany	Libya	Palestine	Sweden	
Central African Republic	Ghana	Liechtenstein	Panama	Switzerland	

Total: 189

Appendix C – The Coding Manual of the Leadership-dataset.

In the REIGN-dataset, the gender of a executive leader is coded 0 for "female" and 1 for "male" (Bell et al., 2021). As this thesis aims to examine the potential impact of female leadership, a female leadership-dummy is generated. This dummy takes the value 0 if a leader is not female (i.e., the political leader is male) and the value 1 if a leader is female. In other words, the female leadership-dummy takes the opposite value of the *gender*-variable of the REIGN-dataset.

To construct the final dataset as smoothly as possible, country names and ISO-codes were copied from the monthly transformed OWiD-dataset. The leadership data was then manually filled with the names and gender of every country's executive political leader. As the REIGN dataset was last updated in August 2021, it does not cover the entire examined period. To complement the missing information, and to check the validity of the REIGN dataset, several lists of political leaders was consulted (Wikipedia, 2022a; Wikipedia, 2022b; Wikipedia, 2022c).

During the examined period, some countries experienced a change in their executive leader. As shifts in political leaders can happen any time during a month, and the data is constructed on monthly observations, the leadership dataset needs to take this into account. Therefore, the following strategy was adopted; when there was a shift in political leadership, the new leader was coded as the executive leader from the month they stepped into office. This while the preceded leader was coded to be the leader up until the month before they left office.

The reasoning behind this coding was simply to have a cohesive way of constructing the data that avoided having more than one leader in office during a month. If an executive leader changed for one month, and that change also involved a change in the gender of the executive leader, the potential effect of female leadership would have been difficult to capture if both leaders was coded to lead the same month.

Here follows two examples on how the leadership data is coded. Since 19th of April 2021, Miguel Díaz-Canel has been the chairman of the communist party of Cuba, preceded by Raúl Castro (Acosta & Marsh, 2021). And the former president of Tanzania John Magufuli, that died in March 2021 was preceded by Samia Suluhu Hassan (BBC, 2022). Given the coding strategy used for this dataset, the data looks like the following: Castro is coded to be the leader of Cuba up until March 2021, while Díaz-Canel is coded as the leader of Cuba from April 2021. This while Magufuli is coded to lead Tanzania up until February 2021, while Suluhu Hassan is coded to lead Tanzania from March 2021.

In the rare cases that there was more than one shift in leadership for one month, the leader who is in office after that month passed was coded to be the only leader that month. For example, Claude Joseph held the position as president of Haiti for 13 days in July 2021 (Sky News, 2021). As Joseph did not hold this position past the month of July, he is not included in the leadership dataset. Instead, Ariel Henry is coded to be the only executive leader of Haiti in July 2021. Similar situations were found for Burundi and Peru (Bell et al. 2021).

But given that this thesis focuses on the gender of executive leaders, and not the executive leaders as individuals, the above strategy is not thought to affect the results. Especially because the three excluded leaders were all male, as well as the leaders preceding and succeeding them (Bell et al. 2021).

There is only one country in the dataset that is coded to be led by a group, and that country is Yemen (Bell et al. 2021). Yemen is coded to have a male leader, as most of the leaders within the Houthi movement are male (Wikipedia, 2022d).

Appendix D – T-tests of the Elements of the Baseline model.

Figure A - T-test on cases per million between male- and female-led countries.

Two-sample t test with equal variances

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
Male lea	4,365	32706.39	897.8884	59321.82	30946.07	34466.7
Female l	318	40431.28	4394.146	78358.85	31785.91	49076.66
Combined	4,683	33230.95	888.8188	60824.05	31488.44	34973.45
diff		-7724.897	3531.476		-14648.25	-801.5418

```
    diff = mean(Male lea) - mean(Female l)                        t =  -2.1874
H0: diff = 0                                     Degrees of freedom =     4681

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0144         Pr(|T| > |t|) = 0.0288          Pr(T > t) = 0.9856
```

Figure B - T-test on deaths per million between male- and female-led countries.

Two-sample t test with equal variances

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
Male lea	4,025	542.4714	13.40026	850.1511	516.1995	568.7433
Female l	295	389.2165	33.37656	573.2612	323.5293	454.9038
Combined	4,320	532.0061	12.7044	835.0182	507.099	556.9132
diff		153.2549	50.31855		54.60471	251.9051

```
    diff = mean(Male lea) - mean(Female l)                        t =   3.0457
H0: diff = 0                                     Degrees of freedom =     4318

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9988         Pr(|T| > |t|) = 0.0023          Pr(T > t) = 0.0012
```

Figure C - T-test on Stringency Index between male- and female-led countries.

Two-sample t test with equal variances

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
Male lea	3,850	55.64291	.3338839	20.71695	54.9883	56.29751
Female l	296	50.3974	1.21809	20.95681	48.00015	52.79465
Combined	4,146	55.26841	.322655	20.77557	54.63583	55.90098
diff		5.245508	1.250616		2.79363	7.697386

```
    diff = mean(Male lea) - mean(Female l)                        t =   4.1943
H0: diff = 0                                     Degrees of freedom =     4144

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Figure D - T-test on GDP per capita between male- and female-led countries.

Two-sample t test with equal variances

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
Male lea	4,296	17430.95	291.0429	19076.08	16860.36	18001.54
Female l	319	34540.54	1065.468	19029.86	32444.29	36636.8
Combined	4,615	18613.61	287.906	19558.55	18049.17	19178.04
diff		-17109.59	1106.815		-19279.48	-14939.7

```
    diff = mean(Male lea) - mean(Female l)                        t = -15.4584
H0: diff = 0                                     Degrees of freedom =     4613

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

Figure E - T-test on Per capita health expenditure between male- and female-led countries.

Two-sample t test with equal variances

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
Male lea	4,246	984.9576	25.48184	1660.43	934.9999	1034.915
Female l	292	3721.7	166.1055	2838.412	3394.78	4048.621
Combined	4,538	1161.055	27.95889	1883.442	1106.242	1215.868
diff		-2736.743	106.4688		-2945.474	-2528.012

```
    diff = mean(Male lea) - mean(Female l)                        t = -25.7046
H0: diff = 0                                     Degrees of freedom =     4536

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

Figure F - T-test on Population Density between male- and female-led countries.

Two-sample t test with equal variances

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
Male lea	4,347	208.6607	10.01018	659.9889	189.0357	228.2858
Female l	319	717.5115	108.2546	1933.49	504.5258	930.4973
Combined	4,666	243.4493	12.04658	822.879	219.8323	267.0663
diff		-508.8508	47.153		-601.293	-416.4087

```
    diff = mean(Male lea) - mean(Female l)                    t = -10.7915
H0: diff = 0                                 Degrees of freedom =     4664

    Ha: diff < 0               Ha: diff != 0               Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000      Pr(T > t) = 1.0000
```

Figure G - T-test on Aged 65 or older between male- and female-led countries.

Two-sample t test with equal variances

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
Male lea	4,245	8.198526	.0917548	5.978159	8.018639	8.378414
Female l	319	15.72528	.2824176	5.04414	15.16963	16.28092
Combined	4,564	8.724607	.0920799	6.220676	8.544086	8.905128
diff		-7.52675	.3435591		-8.200292	-6.853207

```
    diff = mean(Male lea) - mean(Female l)                    t = -21.9082
H0: diff = 0                                 Degrees of freedom =     4562

    Ha: diff < 0               Ha: diff != 0               Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000      Pr(T > t) = 1.0000
```

Figure H - T-test on Gender Inequality Index 2019 between male- and female-led countries.

Two-sample t test with equal variances

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
Male lea	3,827	.3554978	.0030088	.1861357	.3495987	.3613969
Female l	292	.1517603	.0087159	.1489372	.1346061	.1689144
Combined	4,119	.3410546	.0029765	.1910287	.3352191	.3468901
diff		.2037375	.0111561		.1818656	.2256095

```
    diff = mean(Male lea) - mean(Female l)                    t =  18.2625
H0: diff = 0                                 Degrees of freedom =     4117

    Ha: diff < 0               Ha: diff != 0               Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000      Pr(T > t) = 0.0000
```