


Leader gender, country culture, and the management of COVID-19

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Abstract

As early as two months into the COVID-19 pandemic, popular media started reporting that women leaders, compared to men leaders, were managing COVID-19 better. This paper empirically examines the impact of women leaders in managing pandemic health outcomes one year after the onset of the pandemic. Further, we consider leader effectiveness within the context of country culture. We find that women's leadership is indeed associated with better containment of the pandemic. We also find that certain country-level cultural traits play a significant role in pandemic outcomes. More hierarchical societies experience higher COVID-19 cases and death. Individualistic cultures and masculine cultures are associated with more deaths from the pandemic. Some cultural traits modulate women's ability to manage COVID-19. Our findings have implications for health policy and provide rationale for promoting gender equity in political leadership.

KEYWORDS

COVID-19, culture, women leaders

Key points

- Women's leadership is associated with better containment of the COVID-19 pandemic.
- Certain cultural traits have an impact on pandemic outcomes. Hierarchical societies have higher rates of COVID-19 cases and deaths. Individualistic cultures and masculine cultures are associated with more COVID-19 deaths but not cases.

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- The effect of women leaders on COVID-19 rates and deaths is modulated by cultural traits. More specifically, short-term orientation and indulgent cultures seem to boost women's effectiveness in tackling the pandemic.
- The mechanism of how culture influences the effectiveness of women leaders needs to be studied further.

INTRODUCTION

As early as late spring 2020, popular media reported better management of the COVID-19 pandemic in countries led by women as opposed to countries led by men. Headlines such as “What Do Countries with the Best Coronavirus Responses Have in Common? Women Leaders” from *Forbes* (Wittenberg-Cox, 2020), and “Why are Women-Led Nations Doing Better with Covid-19” from the *New York Times* (Taub, 2020) had the general population and researchers deliberating the validity of such claims.

Researchers have taken up the challenge of empirically investigating the reported association between women leaders and COVID-19 health outcomes. Within-country analysis by Sergent and Stajkovic (2020) found that, as of May 2020, US states with women governors had fewer COVID-19 deaths per capita than those governed by men. On an international level, researchers have found that countries with women leaders showed reduced COVID-19-related deaths per capita and that women were more effective in introducing the mitigating policy, such as country-level shutdowns, mask mandates, and contact tracing against COVID-19 (Abramson et al., 2021; Coscieme et al., 2020; Garikipati & Kambhampati, 2021; Park, 2021).

However, the overall country culture also seems to affect COVID-19 rates (Ibanez & Sisodia, 2020; Mayer et al., 2020). Furthermore, researchers such as Windsor et al. (2020) have concluded “women are able to attain national leadership positions in countries where core cultural values reward traits often found in women leaders, such as a long-term orientation, a collectivist (rather than individualist) focus, and fewer power disparities in society” (p. 2). Thus, it is important to consider and separate out country culture when examining the specific, unique impact of women's leadership on pandemic outcomes. Very few studies have evaluated the impact of both leader gender and country-level cultural variables on pandemic outcomes. So far, to our knowledge, Windsor et al. (2020) and Garikipati and Kambhampati (2021) are the only researchers to include both leader gender and some measure of culture or social norms when assessing COVID-19 outcomes. The results of each highlight the need to investigate this relationship further. Windsor et al. (2020) found that including cultural level variables in their model reduced the association between women's leadership and lower COVID-19 death rate to a non-statistically significant trend. From this, they concluded that country-level cultural values were confounding the effect of women-led countries having better COVID-19 outcomes. However, Garikipati and Kambhampati (2021) found support for the popular media claims while accounting for a proxy for gender-related cultural differences. They used nearest-neighbor matching to control for country-level differences on the Gender Inequality Index, a proxy for gender inequality in the context of health, educational attainment, political participation, and labor market participation. Results showed that women-led countries had lower death rates from COVID-19.

This paper contributes to the literature examining leaders' effectiveness, through the lens of gender, in health policy and on community-level health outcomes



(e.g., Chattopadhyaya & Duflo, 2004; Cole et al., 2017; Eagly & Karau, 2002; Eagly et al., 1995; Macmillan et al., 2018; Paustian-Underdahl et al., 2014; Swers, 1998). More specifically, we examine whether having an elected female political leader during the pandemic is associated with a lower number of COVID-19 cases and death per capita after controlling for country-level cultural values. Our paper contributes to the scarce existing literature on leader gender, country culture, and pandemic outcomes. To our knowledge, only two previous studies, by Windsor et al. (2020) and Garikipati and Kambhampati (2021), have investigated similar dynamics. Our research adds to the conversation in the following ways.

First, we look at a longer time horizon than Windsor et al. (2020) and Garikipati and Kambhampati (2021), who carried out their analyses in mid-2020. Unlike Windsor et al. (2020) who focus on pandemic outcomes 30, 60, 90, and 120 days after the onset of the pandemic, we focus on the cumulative cases a full year after the start of the pandemic. Thus, we are less interested in the efficacy of the emergency response immediately after the onset of the pandemic and more focused on the longer-term management of the health crisis. We expect that a 1-year overview of the pandemic would reveal different patterns of leadership than previous research. Our findings suggest that female leadership is associated with lower COVID-19 deaths in the longer run while Windsor et al. (2020) find no statistically significant effect in the immediate aftermath of the onset of the pandemic.

Second, similar to Windsor et al. (2020), we control for a broader number of cultural dimensions, using Hofstede's six domain cultural model, that are likely to confound the impact of female leadership on health outcomes. This is unlike Garikipati and Kambhampati (2021) who proxy for culture with the Gender Inequality Index. Our results with respect to women's leadership and pandemic outcomes include robust cultural variables.

WOMEN IN LEADERSHIP: COUNTRY-LEVEL CONCEPTUAL FRAMEWORK

Until the late 20th century and early 21st century, globally there have been few women in political power at the national level. It was therefore challenging to decipher empirically the effect of women's leadership, as compared to men's leadership, on political policies and outcomes (Perkins et al., 2013). Now that 75 countries have had women as leaders (O'Neill, 2021), 46 of whom have been elected into their position, it is becoming possible to test the effectiveness of women as leaders. The COVID-19 pandemic set the stage for a comparison of effectiveness between women and men leaders. During the pandemic, 16 women have held the position of head of state; of the 16 women, 13 were elected. Table 1 lists the names of the female leaders during the pandemic, their term start and/or end date and their position.

Health outcomes in communities with women leaders

Existing research (e.g., Cole et al., 2017; Eagly & Karau, 2002; Macmillan et al., 2018; Swers, 1998) has demonstrated and confirmed that women in politics have developed a niche in domestic health and social policy. Multiple factors, influenced by social roles, could explain the fact that women in political leadership focus on and effectively improve community-level health outcomes. First, women are traditionally and disproportionately responsible for child rearing, caring for elderly family members, and all other domestic duties (Bowles & McGinn, 2008; Eagly & Carli, 2007). Care for the health of family members has made women more aware of shortcomings of the health system and potentially likely to seek

TABLE 1 Female leaders since the pandemic started

Name	Date term started	End of term date	Official position
Serbia (Ana Brnabic)	2017	Ongoing	Prime minister
Estonia (Kersti Kaljulaid)	2019	Ongoing	Prime minister
Myanmar (Aung San Suu Kyi)	2015	February 2021	State counsellor (prime minister)
Germany (Angela Merkel)	2005	Ongoing	Chancellor
Bangladesh (Sheik Hasina)	2009	Ongoing	Prime minister
Denmark (Mette Fredricksen)	2019	Ongoing	Prime minister
Taiwan (Tsai Ingwen)	2016	Ongoing	President
Norway (Erna Solberg)	2013	Ongoing	Prime minister
Belgium (Sophie Wilmes)	2019	October 2020	Prime minister
New Zealand (Jacinda Ardern)	2017	Ongoing	Prime minister
Finland (Sanna Marin)	2019	Ongoing	Prime minister
Iceland(Katrin Jacobsdottir)	2017	Ongoing	Prime minister
Lithuania (Ingrida Simonyte)	December 2020	Ongoing	Prime minister
Tanzania (Samia Hassan)	March 2021	Ongoing	President
Trinidad and Tobago (Paula Mae Weeks)	2018	Ongoing	President
Bolivia (Jeanine Anez)	November 2018	November 2020	Prime minister

out political action to fix these healthcare issues (Bratton, 2005; Giles-Sims et al., 2012; Macmillan et al., 2018; Mavisakalyan, 2014; Swers, 1998). Second, because of these societal roles, women traditionally obtain leadership and influence by reaching prominence in fields that match cultural views of female gender roles such as nursing, hospice care, mental health, and education (Eagly, 1987; Eagly & Karau, 2002; Eagly et al., 2000; Okimoto & Brescoll, 2010; Wolfram et al., 2020). Previous meta-analyses and studies have shown that leadership emergence has often been based on gender and role congruence. In other words, men tend to emerge as leaders in stereotypically male occupations and women tend to emerge as leaders in stereotypically female occupations (Ayman & Korabik, 2010; Eagly & Carli, 2007; Eagly & Karau, 1991; Okimoto & Brescoll, 2010; Wolfram et al., 2020). This expertise and focus on “female” domestic occupations then follow women into their political careers.

Research studies have found that women can be more effective than men in leadership domains that are more congruent with cultural views of women (Eagly et al., 1995; Paustian-Underdahl et al., 2014). For example, Schwartz and Rubel (2005) found that women leaders are more likely to focus on, and highlight, the well-being of others than male leaders. Combining this particular leadership style with occupations such as education, social services, and health care allows women to be more effective leaders in those occupational settings (Eagly et al., 1995). Women's leadership is theorized to improve health outcomes in communities as shown by Chattopadhyay and Duflo (2004), who found that female executive village heads in India focused on health projects more than their male counterparts did. Female legislators have also been found to positively influence child and maternal outcomes in other less developed countries (Bhalotra & Clots-Figueras, 2014;

Obasanjo, 2019; Swiss et al., 2012; Westfall & Chantiles, 2016). In developed countries, female parliamentarians tend to be on social sector-related committees (Park & Liang, 2019; Swers, 1998) and thus have had success in promoting legislation and new laws in these areas.

Beyond the focus on female leaders' policy priorities, women's leadership style is another important factor in determining the effectiveness of health outcomes. Research has shown that women use a more participative and democratic leadership decision-making style (van Engen & Willemsen, 2004). Many theorize this is due to the prejudice and pushback women leaders face when behaving in a more autocratic style traditionally associated with masculine behavior (see Ayman & Korabik, 2010). Women leaders have also been found to use more transformational leadership, a style of leadership that strives to be inspiring, supportive, and respectful of their followers (Ayman et al., 2009; Bass & Avolio, 1993; Eagly et al., 2003). In the leadership literature overall, transformational leadership has been found to produce more long-lasting and effective results (e.g., see Ayman et al., 2009; Podsakoff et al., 1990; Rafferty & Griffin, 2004). Women also tend to use more transactional contingent reward behaviors, a leadership style that rewards followers with public recognition or material rewards for performing specific tasks (Ayman et al., 2009; Bass & Avolio, 1993; Eagly et al., 2003). The combination of these leadership styles might help women be better leaders than men in domains such as health and social policy where involvement and participation by a wide range of individuals are crucial for success. Consequently, we propose that, holding everything else constant, women leaders are more effective at managing the COVID-19 pandemic (a healthcare domain) than their male contemporaries.

Accounting for culture

To properly gauge the impact of women's leadership on health outcomes, and in particular on pandemic outcomes, we need to control for country-level cultural dynamics which have been shown to affect people's willingness to get vaccinated, follow government mandates on mask wearing and social distancing (Bartscher et al., 2021; Ng & Tan, 2021; Salvador et al., 2020). Culture can also influence the likelihood of women being voted into positions of national leadership (Windsor et al., 2020). In addition, cultural traits can impact the effectiveness of women leaders to bolster healthcare outcomes. For example, Ayman et al. (2009) found that in more hierarchical cultures, where male subordinates are more likely to belittle women's leadership, any benefit from participative, transformational, or contingent reward behaviors is lost.

Culture has been viewed as a multidimensional experience including shared visible characteristics and internal values that guide and define a community (e.g., Connerley & Pedersen, 2005; Hofstede, 2011). This includes demographic, geographic, ethnographic, power status, and moral values (Connerley & Pedersen, 2005). We focus specifically on Hofstede's six domains of culture: 1. power distance (PDI), 2. individualism versus collectivism (IDV), 3. masculinity versus femininity (MAS), 4. uncertainty avoidance (UAI), 5. long-term orientation versus short-term normative orientation (LTOWVS), and 6. indulgence versus restraint (IVR; Hofstede, 1980, 2001; Hofstede et al., 2010). Important to note is Hofstede's distinction between country-level analysis versus individual-level analysis. Specifically, these six domains are strategically meant to discern differences between countries rather than individual people. While the scope of this research is establishing the overall relationship between women's leadership, culture, and COVID-19 outcomes, it is important to consider potential underlying psychological mechanisms for the relationship. The following is a short description of each cultural domain with discussions of potential links to leader gender and the healthcare domain.



Power distance is concerned with acceptance and reliance on hierarchal power structures from all members of society (i.e., those less powerful also expect an unequal distribution of power). Overall, power distance is a description of how a society deals with inequalities among individuals. High power distance is seen in countries where people accept stringent hierarchical order without justification. Countries with low power distance attempt to flatten power distributions among individuals and any inequalities demand justification (Hofstede, 1980, 2001; Hofstede et al., 2010). Power distance could contribute to competing effects on follower behavior. On the one hand, we stipulate that cultures that rely on hierarchal structures (i.e., higher power distance) will be more likely to follow pandemic-related restrictions due to cultural norms in following authority. However, this positive mechanism may be suppressed by bias against women leaders. Women leaders face more difficulty when a culture relies on hierarchal structures (Ayman et al., 2009). This is due to perceived incongruence between the autocratic, masculine leadership style required to gain power and influence in hierarchal structures and cultural perceptions of women as less assertive. Therefore, women in high power distance cultures receive more resistance in gaining and enacting political influence. Other research on perceived effectiveness and style of women leaders supports the theory that low power distance is more conducive for women leaders (e.g., Gannouni & Ramboarison-Lalao, 2019; Paustian-Underdahl et al., 2014). Thus, we posit the effectiveness of women leaders will be higher in countries with low power distance.

In Hofstede's second domain, individualism versus collectivism, higher scores indicate highly individualistic societies, which value more loose social connections. In these cultures, individuals are responsible only for themselves and immediate family. In contrast, lower scores delineate collectivism, in which there is a preference for higher interconnectedness between individuals. This entails expectations for loyalty and care from in-group members outside the immediate family unit (Hofstede, 1980, 2001; Hofstede et al., 2010). In this case, collective cultures should be associated with better COVID-19 outcomes and will interact positively with women's leadership. Collective behaviors include more supporting behaviors throughout a population and women tend to be more community-oriented in their leadership style (i.e., participative decision-making). Thus, we hypothesize that more collectivistic cultures are going to have better outcomes when facing a pandemic.

The masculinity–femininity domain focuses on the relative status placed on masculinity: assertiveness, achievement, competitiveness, material rewards for success, and heroism as opposed to femininity: caring for quality of life, modesty, preference for cooperation, position security, and consensus seeking (Hofstede, 1980, 2001; Hofstede et al., 2010). Higher scores imply more masculinity. We hypothesize that cultures that score lower on the masculinity scale would be more effective at managing the pandemic because of the cultural focus on caring and cooperation. Furthermore, we again expect an interaction effect between female leadership and this cultural dimension. More specifically, we stipulate that women leaders will be more effective in highly feminine cultures and less effective in masculine cultures.

The fourth domain is uncertainty avoidance. Countries high in uncertainty avoidance attempt to control uncertainty and ambiguity with the use of inflexible social norms and an intolerance of unconventional behaviors. Low uncertainty avoidance describes cultures with a more relaxed view of the future; “come what may.” In these countries, persistence in overcoming obstacles is more important than cultural conventions (Hofstede, 1980, 2001; Hofstede et al., 2010). Like power distance, we stipulate the effects of uncertainty avoidance and female leadership will be at odds. Countries with higher uncertainty avoidance will be more likely to follow safety precautions to avoid risks and ambiguity. However, women leaders might hold less influence in high uncertainty avoidance cultures due to female leadership being counter to cultural conventions.

The fifth domain, long-term orientation versus short-term normative orientation evaluates a society's balance between traditionalism and the need for pragmatic modern change. Long-term orientation (high scores on this domain) indicates a society that is focused more on preparing for the future rather than the present or the past (Hofstede, 1980, 2001, 2010). Short-term normative orientation (low scores) denotes a preference to maintain the established status quo and is more resistant to societal change (Hofstede, 1980, 2001; Hofstede et al., 2010). Conceptually, we can see two possible directions, in which long-term versus short-term orientation can affect pandemic outcomes regardless of leader gender. On the one hand, cultures with long-term orientation might have better outcomes during the pandemic due to recognition and acceptance of change. On the other hand, short-term orientation might lead to better outcomes during a pandemic because pandemic health outcomes have immediate and serious health consequences and short-term orientation is linked with the mindset that “most important events in life occurred in the past or take place now” (Hofstede, 2011, p. 15). We do not expect an interaction between leader gender and long-term orientation although it is likely that countries with long-term orientation are more open to electing a woman leader.

The last domain is indulgence versus restraint. Indulgent cultures accommodate hedonism and focus more on finding enjoyment in life. Restraint cultures suppress gratification of natural drives and are guided by stringent social norms (Hofstede, 1980, 2001; Hofstede et al., 2010). A culture of restraint will be far more likely to follow the safety precautions in place despite inconvenience. Conceptually, we do not expect an interaction between leader gender and culture on this domain.

MODEL AND DATA

To explore the impact of women leaders on pandemic outcomes, we estimate the following model:

$$PO_i = \alpha + \beta_1 WL_i + \beta_2 NY_i + \beta_2 PDI_i + \beta_2 IDV_i + \beta_2 MAS_i + \beta_2 UAI_i + \beta_2 LTOWVS_i + \beta_2 IVR_i + X_i' \gamma + \epsilon_i,$$

where our dependent variable, PO , is pandemic outcome; WL is women leadership; NY is number of years of female leadership in the country; PDI , IDV , MAS , UAI , $LTOWVS$, and IVR are Hofstede's cultural variables; X is a number of country-level controls; and e is the error term.

Dependent variable: Pandemic outcome

Our discussion focuses on two key dependent variables—cumulative total COVID-19 cases per 100,000 population and cumulative total COVID-19 deaths per 100,000 population. The data come from the World Health Organization as of May 15, 2021. The number of COVID-19 cases better captures the effectiveness of overall public health measures initiated specifically for managing COVID-19 and the adherence to these measures while the number of COVID-19 deaths is a better proxy for the quality of the healthcare system and effectiveness of existing health policy. Some of the earlier literature on COVID-19 utilizes measures of the spread of the disease for a particular period of time after the onset of the disease. This approach makes sense for research focusing on the first 3–6 months of the pandemic. However, we are examining a much longer time period and thus resort to the cumulative number of cases.

Leader gender

We utilize two key explanatory variables, *WL* and *NY*, to proxy for the presence of women leaders. The first, *WL*, is a dummy variable equal to one if the person in highest position of executive power since the start of the pandemic was ever a woman. As discussed above, our research focuses on women who won elections to become the political leaders of their countries. We do not include ceremonial or appointed leaders. Our reasoning for this is that appointed women tend to be appointed for short periods of time, primarily as symbolic leaders and thus do not represent the ability of society to abide with the leadership of a woman. Of the 16 countries identified in Table 1, 13 were elected and 11 countries are included in our data set; the rest had missing data and were, consequently, dropped from the regression analysis. These countries had an elected woman leader at some point during the first year of the pandemic.

Our second leader gender variable, *NY*, is the number of years of women's leadership in a country since 1960. To calculate this number, we used Statista data on the number of women in the highest position of executive power from 1960 to 2021. We researched each of the women listed in the database to understand the mechanism of acquiring the executive leadership position (elected, appointed, etc.) and the specifics of the political system in the country. We used 1960 as our starting date since it marked the beginning of the era of mass independence for countries in the global south. The number of years of women leaders is a proxy for the historical level of comfort of countries with women leaders as well as the accumulated effect of policies designed by women leaders over the decades. In our sample, the country with the most extensive experience with women's leadership in national politics is Ireland (21 years), followed by England and Bangladesh (19 years), India and New Zealand (18 years), Philippines (17 years), and Germany and Norway (15 years). Of these countries, four had a female leader during the pandemic. The other seven female leaders during the pandemic were from countries with less extensive experience with female leadership.

Culture

To measure dimensions of culture at the country level, we use Hofstede's cultural variables described in detail in our Accounting for culture section. We use the 2015 updated Hofstede cultural dimensions data, available for research use on Geert Hofstede's website (<https://geerthofstede.com/research-and-vsm/dimension-data-matrix/>). The original data were collected in the 1970s through a survey of IBM employees across countries. Over the decades, the cultural dimensions expanded and Hofstede collaborated with other researchers to update and expand the data. A number of studies have replicated and validated the Hofstede dimensions over time. "Between 1990 and 2002 six major replications (14 or more countries) used populations of country elites, employees and managers of other corporations and organizations, airline pilots, consumers and civil servants" (Hofstede, 2011, p. 8). Unfortunately, while Hofstede's data is more complete than other cultural databases, it does not cover a significant number of countries in the world. Further, in a number of cases, it only provides regional-level data (e.g. East Africa, West Africa) rather than individual country-level data for four of the cultural indices. Thus, the inclusion of cultural dimensions in our regressions naturally decreases our sample size. Correlation coefficients between the six dimensions of culture do not reveal any significant patterns of complementarities between the different dimensions. All correlation coefficients are between -0.46 and 0.39 .

Control variables: Country demographics

Because we are dealing with countries with vastly different demographics, a larger picture of country demographic effects on COVID-19 outcomes is required. Specifically, we identified the five following demographic variables as important controls for our analysis: (a) life expectancy at birth, (b) log GDP per capita, (c) log population density, (d) percent of the population above age 65, and (e) regional dummy variables. We follow the World Bank regional classification to include the following world regions—Eastern Mediterranean, Europe, Western Pacific, South East Asia, Africa, and Americas (our control group).

First, life expectancy at birth and log GDP per capita are both proxies for standard of living and higher quality of health care available to citizens. We expect that they are associated with lower death rates during the pandemic. We expect GDP per capita to have a positive relationship with COVID-19 cases. More specifically, high GDP is related to higher levels of global connections and citizens involved in global travel. As most countries originally acquired cases through global travel (see Petersen et al., 2020), we stipulate that countries with fewer global connections and with fewer residents involved in global travel will have fewer cases. For countries with higher population density, we expect the transmission mechanism of the COVID-19 virus, airborne and close contact, to produce higher numbers of cases and deaths. Finally, since the virus has higher rates of complications for people over age 65, we also expect to see higher death rates from COVID-19 in countries with a higher percent of the population above age 65.

The correlation coefficient between life expectancy and GDP per capita is very high (0.87). Countries with higher GDP per capita and higher life expectancy also have a higher percentage of their populations above age 65 (correlation coefficients are, respectively, 0.60 and 0.64). There is a negative correlation between log GDP per capita and power distance (−0.63) and a positive correlation between log GDP per capita and individualism (0.67). Table 2 provides a list of the countries included in our analysis. Table 3 shows summary statistics for the variables included in our empirical analysis. Table 4 shows the correlation coefficients between the explanatory variables.

TABLE 2 Countries included in our regressions

United Arab Emirates	Colombia	Indonesia	Malta	Singapore
Argentina	Czechia	India	Malaysia	El Salvador
Australia	Germany	Ireland	Netherlands	Serbia
Austria	Denmark	Iran	Norway	Slovakia
Belgium	Spain	Italy	New Zealand	Sweden
Bangladesh	Estonia	Japan	Pakistan	Thailand
Bulgaria	Finland	Republic of Korea	Peru	Trinidad and Tobago
Brazil	France	Lithuania	Philippines	Turkey
Canada	The United Kingdom	Luxembourg	Poland	Uruguay
Switzerland	Greece	Latvia	Portugal	United States of America
Chile	Croatia	Morocco	Romania	Viet Nam
China	Hungary	Mexico	Russian Federation	

TABLE 3 Summary statistics

Variable	Obs.	Mean	SD	Min	Max
Log COVID-19 cases	59	7.866373	1.703235	1.576915	9.644802
Log COVID-19 deaths	59	3.930742	1.56334	.0392207	5.697966
Log GDP per capita	59	9.659524	1.095241	7.129658	11.5266
Log population	59	16.88997	1.725109	13.00595	21.03897
Female leadership during the pandemic	59	0.1864407	0.392805	0	1
Number of years of female leadership	59	3.79661	6.124512	0	21
Power distance	59	58.18644	20.79496	11	100
Individualism	59	47.49153	23.11096	13	91
Masculinity	59	48.69492	20.02262	5	100
Uncertainty avoidance	59	66.64407	22.35201	8	100
Long-term orientation	59	49.45763	22.19609	13	100
Indulgence	59	46.16949	20.83859	0	97
Life expectancy	59	77.76068	4.093064	66.58	83.79
Log population density	59	305.8929	1023.592	3.1	7806.77
Percent of population age 65 or above	59	14.97793	6.054669	1.156549	28.00205

Note: Summary statistics based on sample in the empirical specification in Table 5, Column 2.

TABLE 4 Correlation coefficients

	Power distance	Individualism	Masculinity	Uncertainty avoidance	Long-term orientation	Indulgence
Power distance	1.00					
Individualism	-0.65	1.00				
Masculinity	0.14	0.06	1.00			
Uncertainty avoidance	0.22	-0.20	0.04	1.00		
Long-term orientation	0.04	0.09	0.04	0.02	1.00	
Indulgence	-0.40	0.27	0.06	-0.18	-0.46	1.00
	Life expectancy	GDP per capita (log)	Population density	Population above 65		
Life expectancy	1.00					
GDP per capita (log)	0.87	1.00				
Population density	0.15	0.11	1.00			
Population above 65	0.64	0.60	-0.07	1.00		

CULTURE, LEADER GENDER, AND PANDEMIC OUTCOMES: EMPIRICAL RESULTS

We estimate the model specified in the Model and data section using ordinary least squares. We base statistical inference on heteroskedasticity-robust standard errors.

Tables 5 and 6 present the results with log COVID-19 deaths per 100,000 residents and log COVID-19 cases per 100,000 residents as the dependent variables, respectively. Column (1) of each table presents the baseline regression results that do not include cultural dimensions as explanatory variables. Column (2) presents results that include cultural dimensions but do not include the leader gender variables. Column (3) presents results with both leader gender and country culture. The results for these specifications are discussed in the Leader gender, Culture, and Demographic indicators sections.

Tables 7 and 8 add an interaction effect between women's leadership and individual cultural components. Section Women leaders' effectiveness: moderating cultural factors discusses the results from these regressions and more specifically the moderating effects of culture on the effectiveness of women's leadership. All specifications include the country demographic variables discussed in the previous section.

The Robustness checks section outlines our robustness checks.

Leader gender

In confirmation of the hypothesis that women leaders have been more successful at managing COVID-19, we see a negative and statistically significant effect of having a female leader on both COVID-19 deaths (-0.8909) and COVID-19 cases (-0.7101) in Column (1) of Tables 5 and 6. This translates into 41% fewer COVID-19 deaths and 49% fewer COVID-19 cases in countries with a woman leader. The historical number of years of female leadership in the country does not have a statistically significant effect on pandemic outcomes.

Controlling for cultural variables in our regressions slightly reduces the impact of female leadership on COVID-19 deaths (Column 3 of Table 5) and makes the impact insignificant for the COVID-19 cases regressions (Column 3 of Table 6). The COVID-19 cases regression is in line with the findings of Windsor et al. (2020). However, the COVID-19 death results indicate that there is more to the relationship than culture can account for. This supports the overall assertion that women leaders have better results in reducing the number of COVID-19 deaths in their countries.

Our conceptual framework outlines a number of possible mechanisms for this result. First, due to having more domestic responsibility for the health care of children and elderly, women may more readily identify gaps in the existing healthcare systems. Second, due to a greater focus on social policies, women leaders may have more intimate knowledge of the healthcare system. Finally, due to their tendency toward participative decision-making, women leaders will be more likely to consult and utilize knowledge of experts from different domains when faced with a pandemic of an unfamiliar virus.

Culture

In terms of Hofstede's six cultural variables, individualistic and masculine cultures were in line with our expectations, while power distance had some unexpected results. The results in Column (2) of Table 5 indicate that three cultural variables are significantly associated with COVID-19 deaths—power distance, individualism, and masculinity. The number of COVID-19 cases is only affected by power distance (see Column 2 of Table 6). The other

TABLE 5 Dependent variable: Log COVID-19 deaths per 100,000 residents

Variables	(1)	(2)	(3)
Female Leader Dummy	-0.8909** (0.3435)		-0.6903** (0.2583)
Years of female leadership	0.0153 (0.0200)		0.0158 (0.0191)
Power distance		0.0154** (0.0062)	0.0137** (0.0066)
Individualism		0.0158** (0.0073)	0.0148** (0.0067)
Masculinity		0.0106** (0.0051)	0.0083* (0.0047)
Uncertainty Avoidance		0.0055 (0.0069)	0.0049 (0.0069)
Long-term Orientation		0.0034 (0.0068)	0.0056 (0.0066)
Indulgence		0.0015 (0.0080)	0.0031 (0.0080)
Life Expectancy at Birth	-0.0123 (0.0602)	0.0314 (0.0694)	0.0132 (0.0666)
Log GDP per capita	-0.0961 (0.1926)	-0.2308 (0.2705)	-0.2140 (0.2688)
Population Density	-0.0001 (0.0001)	-0.0000 (0.0001)	-0.0001 (0.0001)
Percent population above age 65	0.0373 (0.0330)	0.0084 (0.0393)	0.0221 (0.0356)
Log Total Population	0.0691 (0.0741)	0.0356 (0.0738)	-0.0109 (0.0794)
Eastern Mediterranean	-1.3938** (0.6059)	-1.4503* (0.7253)	-1.3374* (0.7674)
Europe	0.1505 (0.3329)	-0.0645 (0.4115)	-0.0967 (0.4076)
Western Pacific	-3.3860*** (0.4000)	-3.5541*** (0.4958)	-3.5253*** (0.4631)
South East Asia	-2.6721*** (0.7660)	-2.6825*** (0.7079)	-2.5917*** (0.7884)

TABLE 5 (Continued)

Variables	(1)	(2)	(3)
Observations	59	59	59
R^2	0.8164	0.8404	0.8596

Note: The dependent variable in these regression specifications is Log COVID-19 deaths per 100,000 population. All columns control for country demographics. Column (1) shows results with gender leader but without culture. Column (2) shows results with culture but without gender leader. Column (3) shows results with both culture and gender leader. We use country-level data. Robust standard errors in parentheses.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

three cultural dimensions showed no relationship with COVID-19 outcomes. When we control for women's leadership in Column 3 of both Tables 5 and 6, we find the same qualitative pattern of the association between culture and pandemic outcomes.

The positive and statistically significant association between individualism and COVID-19 deaths (0.0158) and masculinity and COVID-19 deaths (0.0106) matches our expectations. Individualistic societies give precedence to individual rights (Hofstede, 1980, 2001; Hofstede et al., 2010). As a result, society members are less likely to follow pandemic protocols when they interfere with perceived individual freedoms and are therefore more likely to both contract the disease but also expose others who are more vulnerable to complications from the disease. Masculine societies give precedence to competitiveness and have less preference for cooperation, while feminine societies are the opposite (Hofstede, 1980, 2001; Hofstede et al., 2010). It makes intuitive sense that a masculine society will have higher COVID-19 deaths than a feminine society especially considering the amount of caring toward the weak and vulnerable.

Power distance, or an adherence and reliance on hierarchal power within society (Hofstede, 1980, 2001; Hofstede et al., 2010), was associated with both higher number of COVID-19 deaths (0.0154) and COVID-19 cases (0.0222) in our data. While our original hypothesis proposed more hierarchical societies would give higher precedence to following COVID-19 mandates (i.e., higher mask use, better social distancing) and thus lower rates of COVID-19 deaths and cases, our findings suggest the opposite. We provide two plausible explanations for the positive coefficient on power distance. First, the pandemic presented a lot of uncertainty, which combined with a sense of urgency made it challenging for political leaders to know what to do about COVID-19. Thus, individuals in higher power distance cultures would have been more negatively affected if the leader chose an approach to the pandemic that did not follow the medical community's recommendations or if they received conflicting, ambiguous, mandates from multiple individuals in positions of authority (i.e., work place leadership, local government, country leaders). Second, Hofstede (2011) has suggested that for large power distance, "that income distribution in society is uneven" (p. 9) and consequently is associated with a wider range of living conditions. This would suggest people who are not in the top circles are living in conditions that might facilitate the spread of COVID-19.

Women leaders' effectiveness: Moderating cultural factors

As discussed earlier in the paper, cultural variables complicate the relationship between women's leadership and effective COVID-19 management. To assess this, we add an interaction effect between culture and female leadership. We anticipated that power distance and masculinity versus femininity would play a role. However, we do not find a

TABLE 6 Log COVID-19 Cases per 100,000 population

Variables	(1)	(2)	(3)
Female Leader Dummy	-0.7101*		-0.5115
	(0.3804)		(0.3353)
Years of female leadership	0.0120		0.0221
	(0.0308)		(0.0287)
Power distance		0.0222*	0.0221*
		(0.0111)	(0.0118)
Individualism		0.0153	0.0141
		(0.0103)	(0.0095)
Masculinity		0.0018	-0.0004
		(0.0064)	(0.0066)
Uncertainty avoidance		0.0094	0.0092
		(0.0109)	(0.0110)
Long-term orientation		-0.0047	-0.0019
		(0.0088)	(0.0081)
Indulgence		-0.0037	-0.0020
		(0.0117)	(0.0118)
Life expectancy at birth	-0.0578	-0.0384	-0.0480
	(0.0817)	(0.0998)	(0.0959)
Log GDP per capita	0.3512	0.4788	0.4888
	(0.3214)	(0.4066)	(0.4072)
Population density	0.0002**	0.0003*	0.0003*
	(0.0001)	(0.0002)	(0.0001)
Percent population above age 65	0.0161	-0.0016	0.0121
	(0.0517)	(0.0467)	(0.0476)
Log total population	-0.0398	-0.0390	-0.0760
	(0.1089)	(0.1050)	(0.1117)
Eastern Mediterranean	-0.6102	-0.6909	-0.5434
	(0.6997)	(0.7696)	(0.8376)
Europe	0.3293	0.1595	0.0860
	(0.4764)	(0.4687)	(0.4820)
Western Pacific	-3.4659***	-3.3827***	-3.4098***
	(0.8056)	(0.7709)	(0.7578)
South East Asia	-1.6948**	-1.4681	-1.4759
	(0.7855)	(0.8940)	(0.9118)

TABLE 6 (Continued)

Variables	(1)	(2)	(3)
Observations	59	59	59
R^2	0.7190	0.7564	0.7655

Note: The dependent variable in these regression specifications is Log COVID-19 cases per 100,000 population. All columns control for country demographics. Column (1) shows results with gender leader but without culture. Column (2) shows results with culture but without gender leader. Column (3) shows results with both culture and gender leader. Robust standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

TABLE 7 Dependent variable: Log COVID-19 Deaths per 100,000 residents

Variables	(1)	(2)
Woman leader	-2.2671*** (0.6302)	0.3943 (0.3955)
Power distance	0.0124** (0.0055)	0.0132** (0.0061)
Individualism	0.0085 (0.0069)	0.0119* (0.0067)
Masculinity	0.0084** (0.0038)	0.0081** (0.0040)
Uncertainty avoidance	0.0024 (0.0062)	0.0050 (0.0066)
Long-term orientation	-0.0024 (0.0075)	0.0028 (0.0069)
Indulgence	0.0057 (0.0072)	0.0096 (0.0085)
Ltows × Woman leader	0.0286*** (0.0097)	
Ivr × Woman leader		-0.0240** (0.0090)
Controls	YES	YES
Observations	59	59
R^2	0.8813	0.8738

Note: The dependent variable in these regression specifications is Log COVID-19 Deaths per 100,000 population. All columns control for country demographics. The specification in these regressions follows Table 5, Column (3) but adds one interaction effect between women’s leadership and a cultural dimension at a time. We only report the regression specifications that have significant interaction effects. Robust standard errors in parentheses.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

TABLE 8 Dependent variable: Log COVID-19 Cases per 100,000 residents

Variables	(1)	(2)
Woman leader	-2.3030** (0.8709)	1.2601* (0.6393)
Power distance	0.0206* (0.0106)	0.0212** (0.0100)
Individualism	0.0069 (0.0097)	0.0094 (0.0090)
Masculinity	-0.0002 (0.0058)	-0.0006 (0.0054)
Uncertainty avoidance	0.0064 (0.0105)	0.0093 (0.0104)
Long-term orientation	-0.0110 (0.0107)	-0.0065 (0.0088)
Indulgence	0.0010 (0.0118)	0.0087 (0.0142)
Ltowvs × Woman leader	0.0325** (0.0140)	
Ivr × Woman leader		-0.0393*** (0.0140)
Controls	Yes	Yes
Observations	59	59
R^2	0.7892	0.7976

Note: The dependent variable in these regression specifications is Log COVID-19 cases per 100,000 population. All columns control for country demographics. The specification in these regressions follows Table 6, Column (3) but adds one interaction effect between women's leadership and a cultural dimension at a time. We only report the regression specifications that have significant interaction effects. Robust standard errors in parentheses.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

statistically significant effect of either of those cultural traits on the effectiveness of women leaders. Instead, two other cultural variables seem to have a moderating effect on women's leadership effectiveness—long-term vs short-term orientation and indulgence versus restraint. We did not have any expectation for a moderating effect of either of these cultural traits on women's effectiveness as leaders.

The results are presented in Tables 7 and 8. The regressions in Tables 7 and 8 include all of the variables in Tables 5 and 6 and add interaction effects. Each regression specification in Tables 7 and 8 adds one interaction effect at a time. We only report results for regressions where we find a significant interaction effect. We emphasize that the interaction effects should be interpreted with caution given the relatively small number of countries (11) with female leaders in our data set. We provide two figures, Figure 1 and Figure 2, of the support of the distribution of the cultural variables highlighted below for countries with male and female leaders. The figures demonstrate

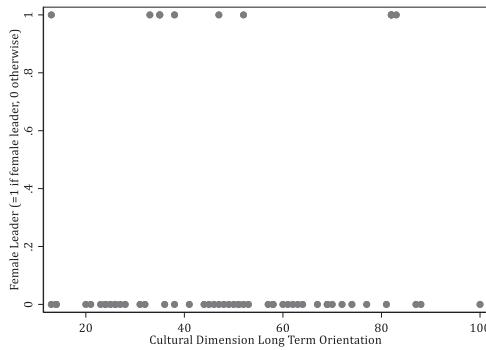


FIGURE 1 Female leader and long-term orientation

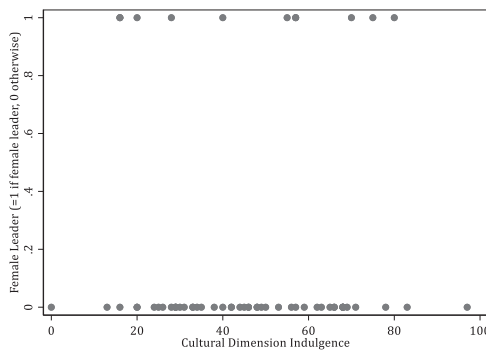


FIGURE 2 Female leader and indulgence

that there are countries with female leaders across the spectrum of the cultural dimensions of interest.

We find that women leaders are more successful at managing pandemic outcomes in countries with short-term orientation, but we do not find evidence that women leaders, as compared to men leaders, are more effective in countries with long-term orientation (Tables 7 and 8, Column 1). Figure 3a shows the estimated effect of the leader's gender on COVID-19 deaths at different values of the long-term orientation cultural dimension. Figure 3b shows the estimated effect on COVID-19 cases. Both figures display the coefficients and horizontal spikes for the 95% confidence intervals. A possible explanation for this result is that in short-term orientation cultures, leaders who give and present information and policies that help save lives are more likely to be followed. Moreover, people in short-term orientation cultures are more likely to follow instructions about health issues having immediate impact on their health, as is the case with COVID-19. Thus, if women leaders have an advantage in tackling urgent issues and health policy, then they will be supported by citizens in short-term orientation societies. The role of women leadership in crisis situations has not been sufficiently studied but there is some evidence that women tend to be elected in post-conflict situations and in times of crisis (Hughes, 2009).

We also find that indulgence cultures seem to bolster women's effectiveness of managing the pandemic while in cultures that score low on indulgence women leaders do not seem to be more effective than men in managing the COVID-19 pandemic (Table 8, Column 2). Figure 4a shows the estimated effect of the leader's gender on COVID-19 deaths at different values of the indulgence cultural dimension. Figure 4b shows the estimated

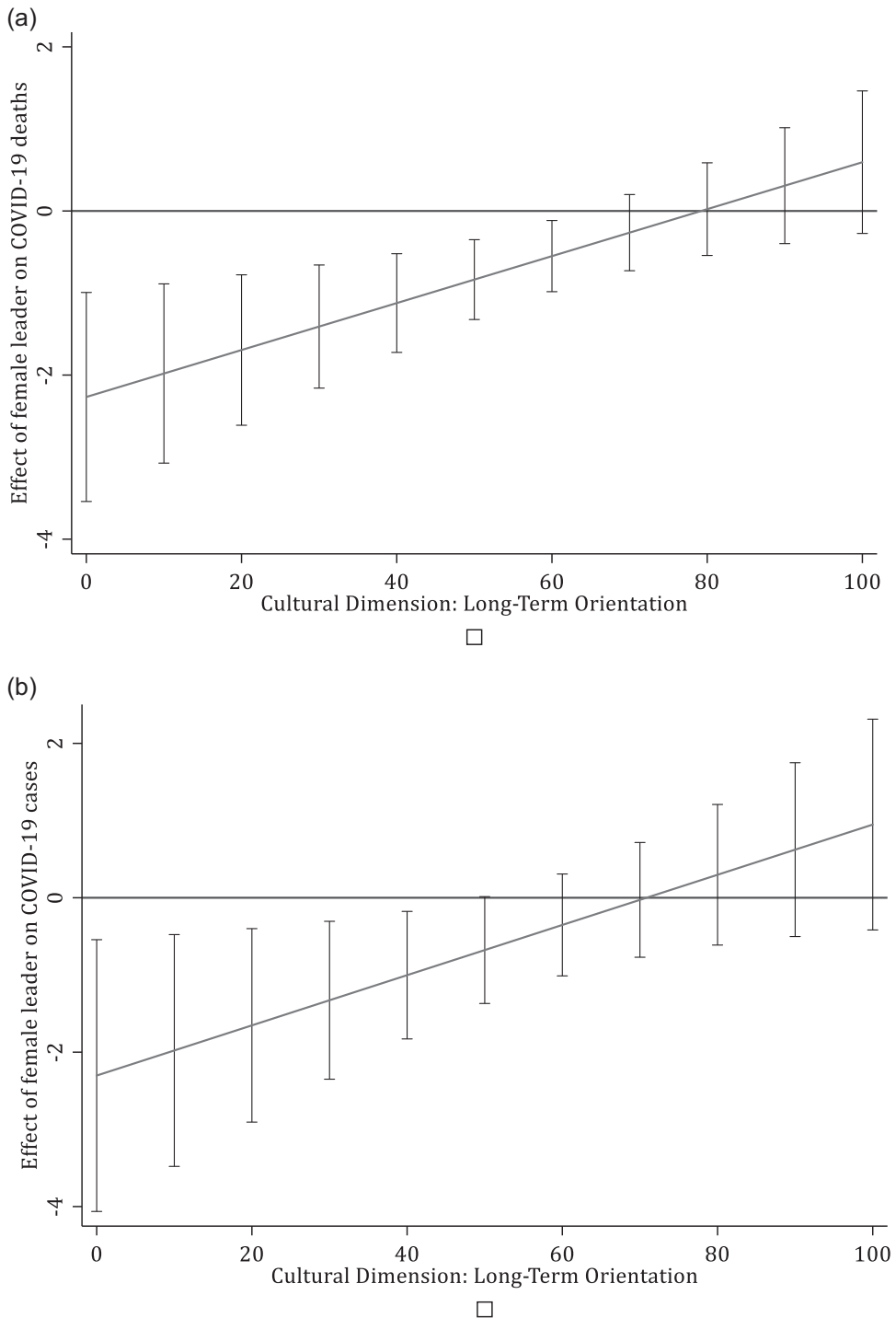


FIGURE 3 (a) The estimated effect of the leader's gender on COVID-19 deaths at different values of long-term orientation. (b) The estimated effect of the leader's gender on COVID-19 cases at different values of the long-term orientation.

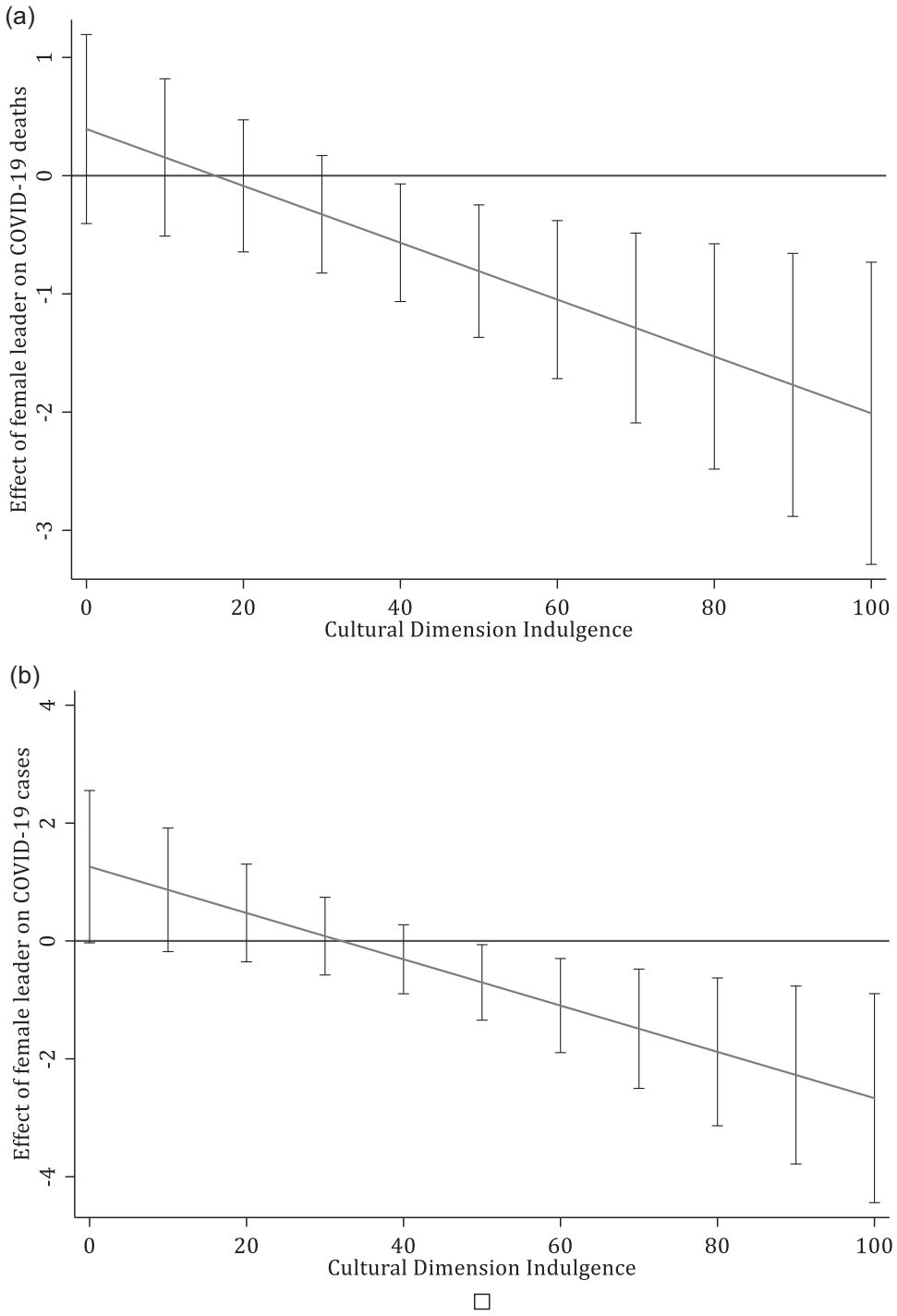


FIGURE 4 (a) The estimated effect of the leader's gender on COVID-19 deaths at different values of Indulgence. (b) The estimated effect of the leader's gender on COVID-19 cases at different values of Indulgence.

effect on COVID-19 cases. Both figures display the coefficients and horizontal spikes for the 95% confidence intervals. This could be due to high restraint cultures' adherence to stringent social norms, which might render female leadership less effective in using innovation and new ideas at tackling a health crisis.

Demographic indicators

The level of development, as measured by both GDP per capita and life expectancy at birth, does not have a significant impact on pandemic outcomes. GDP per capita and life expectancy are highly correlated; thus, it is plausible that multicollinearity is driving the insignificant results. Moreover, both variables might be correlated with the geography dummy variables. When we exclude the geography dummy variables, life expectancy becomes statistically significant and is associated with a lower number of cases and deaths. Our findings suggest that holding the level of economic development constant, higher life expectancy at birth, and therefore higher quality of the healthcare system, is associated with better pandemic outcomes. The lack of statistical significance of GDP per capita in all of our specifications seems to suggest two factors working in different directions. On the one hand, a higher level of economic development might affect the number of global visitors the country receives, the number of the country's citizens who travel abroad, and the number of flights entering and leaving the country. On the other hand, a higher level of economic development provides more public resources to tackle the pandemic.

Population density is associated with more COVID-19 cases (Table 6) but not with more COVID-19 deaths (Table 5). The result of pandemic cases aligns with our expectations because higher population density means higher proximity to others and easier transmission of a highly contagious virus.

Robustness checks

We performed a number of robustness checks. First, we re-ran the regression in Table 5, Column (1) but did not restrict the sample to the 59 countries for which we also have cultural variables. The number of countries in this regression was significantly higher ($n = 184$). The coefficient on female leader remained negative and statistically significant. We also ran the regressions in Table 5, Column (3) with and without life expectancy to ensure that the high correlation between life expectancy and GDP per capita did not affect our results. Similarly, we ran the regression in Table 5, Column (3) with and without GDP per capita to check if the regression results with respect to our cultural indices for individualism and power distance changed. The results remained qualitatively the same.

We re-ran the regressions in Table 5, Column (3) but applied the regional cultural variables for East Africa and West Africa for the first four cultural components (power distance, individualism, masculinity, and uncertainty avoidance) to individual countries in the respective regions. In one specification, we included the long-term orientation and indulgence variables; in another, we did not. In the first case, our sample increased to 65 countries. In the second case, our sample increased to 91 countries. In both specifications, our result with respect to the female leader was robust and remained negative and statistically significant. We do not put much weight on the cultural variables in these alternative specifications because the cultural variables were evaluated at a regional level rather than an individual country level. However, the effect of power distance was robust in all specifications.¹

CONCLUSION

This paper investigates the impact of women's leadership on health outcomes in the context of the COVID-19 pandemic. Our empirical findings suggest that, after controlling for culture and a number of other country-level demographic factors such as life expectancy, GDP per capita, population density, and population composition, women's leadership is indeed associated with a lower number of deaths from COVID-19. We also find that certain cultural traits have an impact on pandemic outcomes. Hierarchical societies have higher rates of COVID-19 cases and deaths. Higher scores in individualism and masculinity cultural variables are both associated with more COVID-19 deaths, but not number of cases, indicating that these cultural variables do not affect the spread of disease, but rather influence how people care for each other in these societies. Both more individualistic and more masculine cultures prioritize individual rights and competition and thus might jeopardize the health of vulnerable community members.

Finally, culture can help or hinder women's leadership. We find two unexpected cultural factors that moderate women's leadership—long versus short-term orientation and indulgence versus restraint. Counter to expectations, short-term orientation and indulgent cultures seem to boost women's effectiveness in tackling the pandemic. The mechanism by which short-term orientation and indulgent cultures boost women's leadership cannot be determined from our data and warrants further research. One plausible suggestion is a difference in rhetoric used by men and women leaders. Due to relationship-based skills and transformational style women leaders may be better able to express an awareness of, and empathy towards, immediate community needs (short-term orientation) and ability to express understanding of followers emotions toward the limiting nature of necessary COVID-19 restrictions (indulgence) (Sergent & Stajkovic, 2020). In other words, women leaders could be better suited to communicate intended interventions while simultaneously having a calming effect on follower emotions. This in turn might make them more effective in helping communities overcome natural tendencies of short-term and indulgent cultures. Men's more autocratic style of leadership communication may backfire and incur more resistance from followers in short-term orientation and indulgent cultures, making them less effective in promoting COVID-19 preventative measures.

Our results align with the findings of Garikipati and Kambhampati (2021) who found that women country leaders were more effective in managing COVID-19. Our findings also support Windsor et al. (2020)'s finding that culture modulates the effect of women's leadership; however, our analysis reveals that women's leadership is statistically significant even after controlling for culture. This difference might be driven by the fact that we focus on a full year of pandemic outcomes rather than the immediate outcomes after the onset of the pandemic, which is the outcome variable in Windsor et al. (2020).

There are several limitations to our research. First, our analysis only covers the first full year of the pandemic. Equal access to vaccines across countries has become the major hindrance to managing the COVID-19 cases and deaths in the second year of the pandemic. That might change the dynamic between leadership and pandemic outcomes. Further, the pandemic will move to an endemic state eventually and further research should investigate how women's leadership impacts health outcomes in that scenario where there is a need for continuous surveillance and effective outbreak management. Second, due to culture data availability, our research only focuses on a subset of countries; availability of data for those countries might be correlated with a feature of those countries that affects their ability to tackle the pandemic. Third, the number of countries with women leaders is still relatively small and thus our results should be interpreted with caution.

Women leaders in the 21st century are still encumbered by societal notions of who they are and what their place in leadership should be (Ayman & Korabik, 2010;



Eagly & Carli, 2007; Eagly & Karau, 1991). COVID-19 provided a worldwide opportunity to analyze the actual effectiveness of women leaders. Over time as women's national leadership becomes a global norm, it will be important to examine whether the current effect of women's leadership on health outcomes continues and translates into better outcomes in other domains.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS STATEMENT

No ethics committee approval was needed since the research uses publicly available data.

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ENDNOTE

¹ Results from robustness checks are available upon request.

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