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**ORIGINAL ARTICLE**

# Islam and democracy

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**Abstract**

The Muslim countries have a lower democracy level on average than the other countries. Yet, this cross-country comparison is not sufficient to blame Islam for the democracy deficit. This issue is related to the numerous fixed characteristics that differ across the countries and that also have an effect on democracy. When the differences are not considered, the estimates mix the effect of the fixed characteristics with the effect that Islam has on democracy. We show this issue for a large set of countries covering the period 1950–2015. In cross-country comparisons, we find a negative link between the share of Muslims in the total population and common measures for democracy. Yet, when the fixed characteristics are considered, the negative link vanishes. Thus, the lower democracy level has to be due to a fixed characteristic; it cannot be associated to (time-varying) Muslim shares. Numerous empirical specifications support this finding. We also measure Islam by the average per-day length of fasting during the month of Ramadan exploring whether the intensity of practicing the core teachings of Islam has a negative effect on democracy. Again, the evidence rejects a negative effect of Islam on democracy. If anything, the effect is positive. The findings are important for social coexistence.

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## 1 | INTRODUCTION

Today, around half of the countries in the world are non-democratic. There are different explanations for this pattern, yet, all of them are disputed. Only when it comes to Islam, there is widespread agreement that the religion has a negative effect on democracy. In this study, we challenge this view. Our empirical analysis shows that the negative association between Islam and democracy exists only in cross-country comparisons. Once country fixed effects are included, the negative link vanishes.

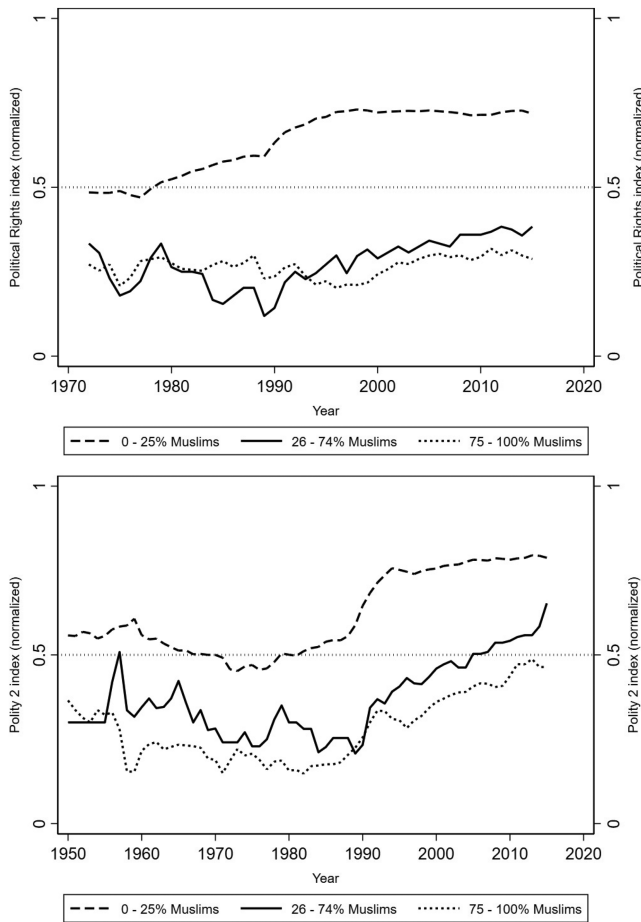
The relationship between Islam and democracy is discussed extensively in the literature (e.g. Lipset (1994), Midlarsky (1998), Barro (1999), Ross (2001), Karatnycky (2002), Fish (2002), Donno and Russett (2004), Pryor (2007), Borooah and Paldam (2007), Rowley and Smith (2009), Facchini (2010), and Potrafke (2012, 2013)).<sup>1</sup> The conclusion of these efforts is that Muslim countries are significantly less associated with democracy than other societies. According to Maseland and Van Hoorn (2011, p. 483) this notion "... is readily accepted." Yet, the cross-country link is not sufficient to blame Islam for the democracy deficit. The reason is related to the numerous fixed characteristics that differ across the countries. For example, Acemoglu et al. (2001, 2002) show that colonial history has had significant influence on the type of institutions implemented by the Europeans and that this feature is key for the political orientation of the countries today. Similarly, the geographical position of the country is an important determinant for democracy (e.g. Persson and Tabellini (2009) and Acemoglu et al. (2019)). These features are not caused by Islam. Thus, the empirical model has to consider them otherwise the estimates mix the effect of Islam with the effects that these fixed characteristics have on democracy.

Figure 1 illustrates our point. It displays the development of two of the most common measures for democracy. The measures are normalized between 0 and 1 whereby higher values indicate a higher level of democracy (details are discussed in the data section). It is clearly visible that across the countries, the democracy index decreases as the share of Muslims in the total population increases. The negative cross-country link exists in almost any year between 1950 and 2015 (sample period). However, the conclusion changes when the development of democracy is considered over time. From this perspective, it is clearly visible that democracy has different initial levels, yet, it develops very similar for all the countries irrespective of the Muslim share.

The empirical analysis confirms the different views. In cross-country comparisons, the Muslim share is negatively associated with the measures for democracy. However, in within-country regressions, the negative link vanishes. We provide ample evidence showing the robustness of the pattern. For example, we find that the relationship is not driven by endogeneity. This is an important point because it clarifies that our estimates actually show the *causal* effect that runs from Islam to democracy. That effect is also not driven by the fact that most countries in the world have a minor Muslim share where Islam plays no important role for democracy. Our estimates are also robust to the criticism that the inclusion of country fixed effects removes a large fraction of the variation that is available across the countries. To this end, it is worth highlighting that some of our estimates are significant. Yet, they are positive. In addition, we perform a long-term specification where we consider the change in the measures for Islam and democracy over the sample period. As shown in Figure 2, there is meaningful variation in the long-term. Yet, there is no evidence for a negative effect.<sup>2</sup>

<sup>1</sup>Numerous variables have been suggested for the negative cross-country link including the Arab culture, Israeli-Palestine conflict, lack of gender equality, natural resources, and restriction of religious freedom. Fixed country characteristics are not considered.

<sup>2</sup>Figure 2 displays three plots. The plot at the top shows a positive relationship between the change in the Muslim share and the change in the Political Rights index. Yet, it also highlights two outliers, Qatar and the United Arab Emirates (UAE). In Qatar, the average Muslim share between 1972 and 1982 (beginning of the sample) was 96% and it went to an average of 47% between 2005 and 2015 (end of the sample). This corresponds to a change of -49 percentage points. In the UAE, the Muslim share went from an average of 90% to an average of 67% (= -23 percentage points) over the same periods. In the middle plot, the two outliers are excluded. The plot at the bottom is based on the Polity 2 index with averages over 1950-1960 (beginning of the sample) and averages over 2005-2015 (ending of the sample). Despite another period, it confirms the non-negative relationship. See Section 4.4 for more details.



**FIGURE 1** The figures show the development of democracy for countries grouped at different shares of Muslims in the total population. In the upper plot, democracy is measured by the Political Rights index normalized between 0 and 1 (higher values indicating more democracy) and in the lower plot, democracy is measured by the Polity 2 index normalized between 0 and 1. The data sources are named in Section 2.

In the analysis, we follow the literature by measuring Islam by the Muslim share. Although plausible, this measure might miss the point. When religions are concerned, the message of God is passed to the people. In this setting, it is plausible assuming that it is not the people but the messages (i.e. the teachings of the religion) that have an effect on outcomes. If so, measuring Islam by the Muslim share is meaningless. We address this issue by measuring Islam by the average per-day length of fasting during the month of Ramadan. Below, we explain the practice and outline our motivation for it. We also discuss the related literature working out that the measure includes the core teachings of Islam and that its variation affects Muslims' beliefs and actions. Since the length of Ramadan is an exogenous event, this measure too shows the *causal* effect that runs from (the teachings of) Islam to democracy. The application of the measure shows no evidence for a negative effect within the Muslim-majority countries.

In sum, the evidence rejects the idea that Islam has a negative effect on democracy. If anything, the religion supports democracy within the Muslim countries. We observe this pattern by some of the estimates turning out significantly positive. Although this might appear to be due to noise in the data or due to misspecifications in the

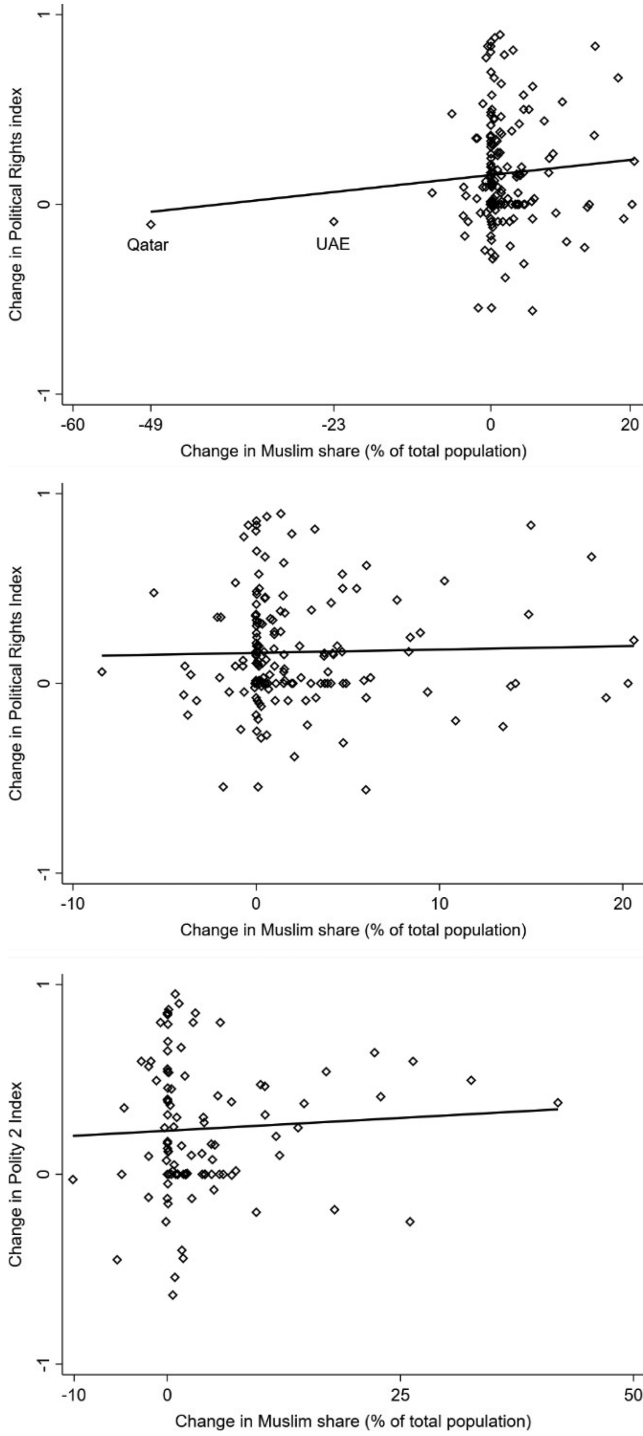


FIGURE 2 Legend on next page.

**FIGURE 2** The plots display the changes in averages for the measures for Islam and democracy over the sample period. Islam is measured by the %-share of Muslims in the total population. Democracy is measured by two figures including the Political Rights index and Polity 2 index each normalized between 0 and 1 (higher values indicating more democracy). The averages are calculated over the first and last 11 years in each sample. Due to data limitations, the averages in the top and middle plots are taken over the period 1972–1982 (for the beginning) and 2005–2015 (for the ending). In the plot at the bottom, the averages are taken over the periods 1950–1960 and 2005–2015. In the top plot, Qatar and the United Arab Emirates (UAE) identify as outliers. The middle plot repeats the analysis of the top plot excluding the two countries. See also Footnote 2 and Section 2 for more information.

empirical model, it is worth highlighting that a positive effect is in line with the (non-macro) literature.<sup>3</sup> For example, Islamic decision-making is based on the concepts of consultation (*shura*), legal consensus (*ijma*), and independent reasoning (*ijtihad*). These principles advise Muslims to counsel each other in affairs concerning political, economic, as well as social life seeking the agreement of the community (*ummah*). The elements ensure that neither power becomes concentrated in the hands of a few (e.g. Voll and Esposito (1994)) nor will majority-voting be rejected (e.g. Farooq & Aktaruzzaman, 2018). This setting resembles that of an ideal democracy (e.g. Esposito et al., 1996).

There is also a significant micro-literature showing that Muslims have similar or even higher demands for democracy than non-Muslims (e.g. Rose (2002), Tessler (2002a, 2002b), Hofmann (2004), Tessler and Gao (2005), Jamal and Tessler (2008), Rowley and Smith (2009), Shafiq (2010), Farooq and Aktaruzzaman (2018), and Tessler et al. (2012)). Our results confirm this pattern by showing estimates that are either insignificant (similar demand) or significantly positive (higher demand). This is particularly true in countries where Muslims represent a majority.

Yet, most of our estimates are insignificant. This pattern is often criticized for being less informative. As discussed by Abadie (2020), this is not true in general. In cases with a strong prior for an outcome, insignificant estimates carry more information because they induce a larger change in beliefs. This applies particularly to the relationship between Islam and democracy where a negative association is prevalent. Moreover, we explain Islam's democracy paradox (asking why the Muslim countries have so little democracy even though the Muslims like democracy so much, e.g. Rowley and Smith (2009)). As we show, this is related to the fixed characteristics of the countries that are either unchangeable (e.g. geography) or change only over the very long period (e.g. national identity). In the conclusion, we return to this discussion. The analysis also contributes to the literature that challenges common wisdom based on insignificant estimates. In general, Acemoglu et al. (2008) reject the idea that higher income leads to more democracy. With regards to Islam, Jetter and Stadelmann (2019) find no support that Muslims are associated with more terror per-capita.<sup>4</sup> We discuss the implications of our findings in the conclusion.

<sup>3</sup>There are few macro-studies that show a positive effect of Islam on components of democracy. For example, Clingingsmith et al. (2009) show that the performing of the Hajj pilgrimage to Mecca (one of the five pillars of Islam) increases both belief in religious freedom and sympathy for female education and female employment. Similar results are reported by Meyersson (2014) showing that Islamic rule increased female education in Turkey.

<sup>4</sup>There are also studies conducted for individual cities/countries. For example, Cesarini et al. (2016) show that wealth is irrelevant for health outcomes in Sweden. Meghir et al. (2018) show that education does not improve the mortality rate in Sweden. The prior that going to an elite school leads to higher test scores is also not supported by the data (see Abdulkadiroglu et al. (2014) for schools in Boston and New York, and Lucas and Mbiti (2014) for schools in Kenya). De Ree et al. (2018) show that increasing teacher salary has no impact on test scores in Indonesia. There is also no support that migrant agricultural laborers drive down wages for U.S. workers (see e.g. Card (1990) and Clemens et al. (2018)).

## 2 | DATA AND DESCRIPTIVE STATISTICS

The analysis utilizes data from several sources. For democracy, we employ the Political Rights index from Freedom House and the Polity 2 index from the Polity IV Project (Marshall et al., 2017). The measures are widely used in the literature since they evaluate democracy from different perspectives. The Political Rights index measures democracy from the perspective of the citizens. It is based on a catalogue of 25 questions concerning the electoral process, political pluralism and participation, functioning of government, freedom of expression and beliefs, associational and organizational rights, rule of law, as well as personal autonomy and individual rights. The Polity 2 index is a revised 21-scale measure that gauges democracy based on competitiveness of executive recruitment, openness of executive recruitment, constraints on the chief executive, regulation of participation, and competitiveness of participation. Both measures are available on an annual basis. However, their coverage across countries and years varies. For example, the Political Rights index is available for a larger set of countries, yet, data is given only from the year 1972 onwards. The Polity 2 index includes information for fewer countries, yet, data begins in the year 1800. Another difference between the two indices is that they vary in range. To have comparable estimates, we follow the literature (e.g. Acemoglu et al. (2008) and Kotschy and Sunde (2017)) by normalizing each index to range between 0 (full autocracy) and 1 (full democracy).

The second data source concerns the measure for Islam. Our main proxy is the share of Muslims in the total population. We obtain this information from the World Religion Project maintained by Maoz and Henderson (2013). The database offers historical records for almost all countries in the world between 1945 and 2010. The advantage of the dataset is its large coverage across both countries and years. However, its disadvantage is that it is not balanced (i.e. the Muslim share is not given for all countries at any time). Moreover, the estimates are provided on a five-year basis (i.e. for 1945, 1950, ..., 2010). We interpolate the data to get a panel with annual observation covering the sample period 1950–2015.

In some specifications, we focus on countries where Muslims represent a vast majority in the total population. We evaluate this feature by a threshold of  $\geq 75\%$  Muslims in the total population. Countries that meet this criterion are referred to as *Muslim-majority* countries.

Our alternative measure for Islam is the average per-day length of fasting during the month of Ramadan. We make a few simplification assumptions for the construction of this measure: (i) we assume Ramadan lasts exactly 30 days in each year (in reality it can last 29 or 30 days depending on the seeing of the new moon), (ii) we assume that on the days of Ramadan, fasting begins with the astronomical sunrise and ends with the astronomical sunset (in reality the Quran specifies that fasting begins at dawn, i.e. first light), (iii) we assume that the capital is representative for the entire country. Based on these assumptions, we proxy Ramadan Fasting as the average per-day length of daylight in the capital of a country over a 30-day period beginning with the first day of Ramadan. We construct this measure based on information from the Islamic Philosophy Online webpage ([www.muslimphilosophy.com](http://www.muslimphilosophy.com)) where we convert the dates from the Islamic calendar to the Gregorian calendar. For each day of Ramadan, we observe the corresponding sunrise and sunset times using information provided by the Astronomical Applications Department of the U.S. Naval Observatory ([www.aa.usno.navy.mil](http://www.aa.usno.navy.mil)). The webpage requires geographic coordinates to determine sunrise and sunset times. Data for the geographic coordinates of the capitals (i.e. longitude and latitude) is provided by the French institute for research into international economics ([www.cepii.fr](http://www.cepii.fr)). These sources enable the construction of our Ramadan measure for a given country and year. We re-scale the Ramadan measure to decimal values, i.e. a value of 10.5 in our dataset means 10 hours and 30 minutes.

Finally, we consider two control variables concerning economic growth and development. We measure the former by GDP per-capita. In detail, we obtain data for total GDP at chained PPP (in 2011 US-\$) dividing it by the total population size, both available in the Penn World Tables (Feenstra et al., 2015). This database covers the entire sample period. For development, we consider life expectancy at birth (in years). Data is

**TABLE 1** Islam and democracy: summary statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
<b>Panel A: Baseline sample</b>					
Polity 2 index (normalized)	8,604	0.54	0.37	0	1
Political Rights index (normalized)	7,587	0.54	0.37	0	1
Muslim share (%-share of total population)	9,718	0.24	0.36	0	1
GDP per-capita (at chained PPP, in 2011 US-\$)	8,440	10,859	16,027	223	251,882
Life expectancy (at birth, in years)	8,733	63.55	11.48	18.91	85.42
<b>Panel B: Countries with less than 75% Muslims in the total population</b>					
Polity 2 index (normalized)	6,936	0.60	0.36	0	1
Political Rights index (normalized)	6,212	0.61	0.37	0	1
GDP per-capita (at chained PPP, in 2011 US-\$)	6,954	10,815	13,477	223	153,458
Life expectancy (at birth, in years)	7,084	64.28	11.56	18.91	85.42
<b>Panel C: Countries with at least 75% Muslims in the total population</b>					
Polity 2 index (normalized)	1,668	0.29	0.29	0	0.95
Political Rights index (normalized)	1,375	0.27	0.24	0	1
GDP per-capita (at chained PPP, in 2011 US-\$)	1,486	11,066	24,684	482	251,882
Life expectancy (at birth, in years)	1,649	60.38	10.59	28.12	77.05
Ramadan Fasting length (normalized hours per day)	1,748	12.13	1.25	9.12	15.09

*Notes:* The table shows summary statistics for the main variables. The Polity 2 index is from the Polity IV project (Marshall et al. (2017)) and the Political Rights index is from Freedom House. Both indices are normalized between 0 (absolute autocracy) and 1 (absolute democracy). Data on the share of Muslims in the total population is from the World Religion Project (WRP) maintained by Maoz and Henderson (2013). Data on GDP per-capita (determined by GDP divided by total population size) is from the Penn World Tables (Feenstra et al. (2015)). Data on life expectancy is from the World Development Index (WDI) database maintained by the World Bank. Ramadan fasting refers to the average time from sunrise to sunset times for a 30-day period beginning with the month of Ramadan in a given year and for a given capital. Panel A shows statistics for the baseline sample. Panels B and C show separate statistics for countries with different Muslim shares in the total population. More information is given in Section 2.

gathered from the World Indicators Database (WDI) maintained by the World Bank. Albeit, the data begins in 1960.

In sum, our baseline sample contains annual information for a maximum of 189 countries covering the period 1950–2015. However, the sample is not balanced meaning that we do not have data for all the countries in all the years. Thus, depending on the model specifications, the sample size varies. Table 1 displays the summary statistics for our sample.

At the top of the table, Panel A shows information for the entire baseline sample. In the two panels beneath, we divide the baseline sample according to the 75%-threshold showing separated data for the Muslim-majority countries. This provides further insights. Overall, the world has an average democracy index of 0.54. This is shown by both measures for democracy. However, there is a significant difference with respect to the Muslim share. In the Muslim-majority countries, the democracy index is only about half that large than in the other countries. This pattern is confirmed by both measures for democracy. With respect to economic growth though, the countries in the two groups are on average almost equally rich (shown by average GDP per-capita of 10,815 vs 11,066). In terms of human development in turn, the Muslim-majority countries lag behind since life expectancy at birth is on average slightly lower for them (60.38 vs 64.28). When Ramadan fasting is concerned, the average per-day length of fasting in the Muslim-majority countries is 12.13 normalized hours.



### 3 | EMPIRICAL MODEL

We estimate the effect of Islam on democracy based on the following model:

$$d_{ct} = \alpha d_{ct-1} + \gamma I_{ct-1} + \beta X_{ct-1} + \mu_c + \tau_t + u_{ct} \quad (1)$$

Here,  $d$  represents the level of democracy in country  $c$  in year  $t$ . The variables on the right side explain that level. They include the lag of democracy ( $d_{ct-1}$ ), a lagged measure for Islam ( $I_{ct-1}$ ), a lagged vector ( $X_{ct-1}$ ) for control variables, full sets of country and year fixed effects ( $\mu_c$  and  $\tau_t$ ), and the error term ( $u_{ct}$ ). Throughout the analysis, we report standard errors robust against arbitrary heteroskedasticity and serial correlation at the county-level.

Democracy is a persistent process also showing mean-reverting dynamics. The literature recommends to consider these issues by including the lag of democracy on the right side of the equation (e.g. Acemoglu et al. (2008) and Kotschy and Sunde (2017)). Although justified, the dynamic model takes out a large fraction of the variation in democracy. This leaves little variation to be explained by the other variables of the model. We tackle this issue by employing a static version of the empirical model (where  $\alpha = 0$ ) as well as a dynamic version (where  $\alpha \neq 0$ ).

Another estimation issue concerns the time structure of the panel. In detail, it is unlikely that changes in the measures for Islam have immediate effects on democracy. Since the timing is unclear, we consider three different data frequencies: one-year (where data is observed every year), five-year, and ten-year. Depending on the frequency, the first lag ( $t - 1$ ) refers either to the value one year ago, five years ago, or ten years ago.

Our main interest lies on the effect of Islam on democracy. We model that variable by  $I_{ct-1}$ . Thus,  $\gamma$  is the main estimate of interest. When  $\gamma$  is significant and positive (negative), it follows that Islam has a positive (negative) effect on democracy. However, when  $\gamma$  is insignificant, the estimate suggests that Islam is irrelevant for democracy.

As discussed above, the type of analysis (cross-country or within-country) is important to estimate the true effect of Islam on democracy. The empirical model considers this issue by the country fixed effects,  $\mu_c$ . In cross-country regressions, the (country and year) fixed effects are excluded from the model. In within-country regressions though, they are all included in the model. Comparison of the results provides deep insight for the features that keep the Muslim countries less democratic.

## 4 | MUSLIM SHARE AND DEMOCRACY

We begin the analysis by measuring Islam by the share of Muslims in the total population. The choice for this measure follows from the claim that the larger the Muslim share the more are Islamic views expressed in political outcomes.

### 4.1 | Main Findings

Tables 2 and 3 represent our main findings. They show that the negative link between the Muslim share and common measures for democracy exist only in cross-country comparisons. Once country fixed effects are included in the model, the negative link vanishes.

In Table 2, democracy is measured by the Political Rights index. As mentioned in Section 3, we employ both a static version as well as a dynamic version of the empirical model (named in the Panel-head). Moreover, we present estimates for both types of analysis including cross-country comparisons and within-country regressions. This is specified in the top row following Panel A. The second-top row names the frequency at which the data is observed. The specifications in columns (1) to (3) show that there is a stark negative cross-country link between the Muslim share and democracy. The columns also clarify that the pattern is independent of the data frequency. To specify one

TABLE 2 Islam and democracy: cross-country and within-country

Dependent variable: Political Rights index (normalized)						
Panel A: static model						
Type of Analysis	Cross-country			Within-country		
Data frequency	One-year	Five-year	Ten-year	One-year	Five-year	Ten-year
	(1)	(2)	(3)	(4)	(5)	(6)
Muslim share <sub>t-1</sub>	-0.470*** (0.00886)	-0.483*** (0.0195)	-0.487*** (0.0293)	0.224 (0.242)	0.297 (0.216)	0.280 (0.228)
Country fixed effects	No	No	No	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	Yes
Observations	7,587	1,561	690	7,587	1,561	690
R-squared	0.202	0.212	0.212	0.120	0.126	0.102
Countries in sample	189	189	189	189	189	189
Panel B: dynamic model						
	(1)	(2)	(3)	(4)	(5)	(6)
Democracy <sub>t-1</sub>	0.961*** (0.00313)	0.842*** (0.0151)	0.742*** (0.0291)	0.855*** (0.0110)	0.424*** (0.0368)	0.0672 (0.0430)
Muslim share <sub>t-1</sub>	-0.0227*** (0.00382)	-0.0871*** (0.0172)	-0.160*** (0.0342)	0.0477 (0.0342)	0.176 (0.135)	0.299 (0.262)
Country fixed effects	No	No	No	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	Yes
Observations	7,392	1,367	501	7,392	1,367	501
R-squared	0.944	0.789	0.688	0.780	0.279	0.092
Countries in sample	189	189	189	189	189	189

Notes: The table shows OLS estimates for the correlation between the Muslim share and the normalized Political Rights index of democracy. Panel A shows estimates based on a static model where  $\alpha = 0$  in Equation 1 and Panel B shows estimates based on a dynamic model where the first lag of democracy is included on the right side of Equation 1. The top row informs about the type of analysis including cross-country comparisons and within-country regressions. The second-top row specifies the frequency at which data is observed.

Consequently, the subscript  $t - 1$  refers either to the value one year ago, five years ago, or ten years ago. Standard errors (reported in parentheses) are robust against heteroskedasticity and serial correlation at country-level. Significance levels are:

\*\*\*p < 0.01,

\*\* p < 0.05,

\* p < 0.1.

TABLE 3 Islam and democracy: cross-country and within-country

		Dependent variable: Polity 2 index (normalized)					
		Panel A: static model			Panel B: dynamic model		
Type of Analysis		Cross-country			Within-country		
Data frequency		One-year (1)	Five-year (2)	Ten-year (3)	One-year (4)	Five-year (5)	Ten-year (6)
Muslim share <sub>t-1</sub>		-0.396*** (0.00926)	-0.398*** (0.0206)	-0.415*** (0.0297)	0.253 (0.208)	0.313* (0.188)	0.285 (0.187)
Country fixed effects		No	No	No	Yes	Yes	Yes
Year fixed effects		No	No	No	Yes	Yes	Yes
Observations		8,604	1,756	817	8,604	1,756	817
R-squared		0.149	0.151	0.162	0.270	0.280	0.259
Countries in sample		162	161	161	162	161	161
		Panel A: static model			Panel B: dynamic model		
		(1)	(2)	(3)	(4)	(5)	(6)
Democracy <sub>t-1</sub>		0.970*** (0.00267)	0.865*** (0.0126)	0.749*** (0.0245)	0.903*** (0.00876)	0.587*** (0.0345)	0.287*** (0.0590)
Muslim share <sub>t-1</sub>		-0.0125*** (0.00333)	-0.0547*** (0.0149)	-0.106*** (0.0293)	0.0521** (0.0256)	0.258** (0.104)	0.380** (0.189)
Country fixed effects		No	No	No	Yes	Yes	Yes
Year fixed effects		No	No	No	Yes	Yes	Yes
Observations		8,503	1,661	724	8,503	1,661	724
R-squared		0.951	0.791	0.639	0.872	0.552	0.352
Countries in sample		162	161	160	162	161	160

Notes: The table shows OLS estimates for the correlation between the Muslim share and the normalized Polity 2 index of democracy. Panel A shows estimates based on a static model where  $\alpha=0$  in Equation 1 and Panel B shows estimates based on a dynamic model where the first lag of democracy is included on the right side of Equation 1. The top row informs about the type of analysis including cross-country comparisons and within-country regressions. The second-top row specifies the frequency at which data is observed. Consequently, the subscript  $t-1$  refers either to the value one year ago, five years ago, or ten years ago. Standard errors (reported in parentheses) are robust against heteroskedasticity and serial correlation at country-level. Significance levels are:

\*\*\* $p < 0.01$ ,\*\* $p < 0.05$ ,\* $p < 0.1$ .

case, the specification in column (2) displays a coefficient of  $-0.483$  (with robust standard error  $0.0195$ ). The high precision makes the estimate significant at the 99% level. The coefficient suggests that a country with only Muslims in the total population has a democracy index that is 48.3% lower than a country with absolutely no Muslims in the total population. Consequently, Muslims represent a significant barrier to democracy.<sup>5</sup>

The picture changes entirely in columns (4) to (6) when fixed effects are included. The estimates turn out insignificant suggesting that the Muslim share does not matter for the development of democracy when the fixed characteristics of the countries are considered. This pattern holds true irrespective of the data frequency. Since the Muslim share is lagged by one period, the specification in column (6) clarifies that there is also no effect after a period of ten years.

Panel B of the table shows the estimates for the same exercises based on a dynamic model. Across almost all specifications, it turns out that lagged democracy is a significant explanatory variable for its current level. The only exception is in column (6) where the coefficient for the lag turns out insignificant suggesting that within the same country, on average, democracy is not self-explaining after a period of 10 years.<sup>6</sup> In terms of magnitude, the significant coefficients for lagged democracy explain a large fraction of the variation. This leaves less variation to be explained by the Muslim share. Accordingly, the estimates for the Muslim share are much smaller in Panel B. For comparison purposes, we highlight column (2) once again. The coefficient for the Muslim share is  $-0.0871$  ( $0.0172$ ). This is about one-fifth of the corresponding coefficient in Panel A. In any case though, all coefficients in columns (1) to (3) are significant and negative still suggesting that an increase in the Muslim share leads to less democracy. Once again, the picture changes in columns (4) to (6) when fixed effects are included. Independent of the data frequency, all coefficients for the Muslim share are insignificant.

In Table 3, we employ the Polity 2 index as the measure for democracy repeating the same specifications as shown in Table 2. Overall, we observe the same picture as before namely that the negative link between the Muslim share and democracy exists only in cross-country comparisons (Footnote 5 applies here as well). Once fixed effects are included, the negative link vanishes. Yet, there is another interesting pattern. With this measure for democracy, most of the coefficients for the Muslim share turn out significant and positive suggesting that contrary to the cross-country evidence, Muslims actually support democracy. For example, the estimate in column (2) of Panel A suggests that a 10 percentage points increase in the Muslim share increases the level of democracy by 3.13%. When the effect of past democracy is deducted, the estimate in Panel B shows an effect of 2.58%. This estimate refers only to the short-run effect though. The long-run effect is larger since democracy reinforces itself over time (the coefficient of lagged democracy is positive,  $0.587$ ). When this reinforcement effect is considered, a 10 percentage points increase in the Muslim share leads to democratic improvements by 6.25% ( $= 0.0258 / [1 - 0.587]$ ) in the long-run.

It might appear that the positive effect in Table 3 is due to a different sample. As mentioned in Section 2, the measures for democracy differ in both number of countries and years for which data is available. However, this is not the case. In Appendix Table A.2, we repeat the within-country specifications using only information that is available with both measures for democracy (called same-sample analysis). With the Polity 2 index, the positive effect of the Muslim share on democracy remains. With the Political Rights index, some of the coefficients for the effect of the Muslim share also turn out (marginally) significant and positive. There are two explanations for this pattern: Either the effect of the Muslim share on democracy is heterogeneous at the country-level or the different results are due to conceptual differences concerning the way how democracy is measured by the two indices. Below, we explore this issue in more detail.

The patterns shown in Tables 2 and 3 represent our main findings. Most importantly, they show that the negative link between the Muslim share and common measures for democracy exists only in cross-country comparisons. Within the countries though, there is no evidence for a negative effect of Islam on democracy. Although the pattern

<sup>5</sup>The estimates shown here pool all countries and all years together. In Appendix Table A.1, we repeat the analysis for individual years. They show the same stark negative cross-country link as shown here.

<sup>6</sup>In this case, the R-square value (reported in the second-last row of the table) is lower in the dynamic model than in the static model. In all other specifications (and those that follow), the dynamic model always performs better than the static model.

is robust, it cannot stand alone since there are numerous estimation issues that have the potential to have biased the estimates. In all that follows, we address some of the most common estimation issues showing that our main findings hold true. To keep the tables short, we continue the analysis with only the five-year data frequency. Only when we consider long-term changes, we deviate from this choice (discussed below in detail).

## 4.2 | Endogeneity Concerns

The main findings assume that the Muslim share is strictly exogenous to democracy. When this assumption fails, there is concern for endogeneity. Even though we have lagged the Muslim share by one period (one to ten years), it is still possible that the anticipation of political liberalization in the future has causal effects on peoples' declaration of faith. In this case, even future democracy has an effect on the Muslim share today. Despite this issue, numerous variables simultaneously affect the Muslim share and democracy. When the variables are omitted from the model, it is possible that the main findings mix the effects of the omitted variables with the effect that the Muslim share has on democracy. An ideal way of solving the endogeneity problem is to find an exogenous source of variation in the Muslim share. Since we are not aware of a plausible source, we explore if the two estimation issues apply in the first place.

We begin with reverse causality, i.e. the effect that democracy has on the Muslim share. Since democracy is subject to the same endogeneity problem as the Muslim share, we instrument it by *regional waves of democracy* as given by Acemoglu et al. (2019). The instrument is based on the idea that demand for democracy spreads across the countries (as seen by the *Arab Spring* in 2010/11). Under this assumption, the democracy indices in all other countries in the same geographical region affect domestic democracy. Since the events in the other countries are exogenous, the measure qualifies as a valid instrument for democracy.

We employ the instrument in a two-stage least-square (2SLS) instrumental-variable (IV) estimation method. This method estimates the effect of democracy on the Muslim share in two steps: First, democracy is regressed on the exogenous instrument (called first-stage regression). This produces predicted values for democracy that are exogenous. Second, the predicted values are used in a second equation where the effect of instrumented democracy on the Muslim share is estimated (called second-stage regression). The validity of the approach relies on a strong first-stage relationship (called relevance criterion) and on the instrument not having direct effects on the outcome variable (called exclusion restriction). The former condition can be tested by the so-called 1st-stage F-statistics. For a strong instrument, the rule-of-thumb is a value  $\geq 10$ . However, the latter condition cannot be tested empirically. It depends on reasoning and testing of theories that have the potential to establish a direct link of the instrument to the outcome variable. We rely on the literature that has shown the validity of the instrument.

Table 4 displays the IV estimates for the effect of instrumented democracy on the Muslim share. In the upper half (Panel A), we present the second-stage estimates. The corresponding first-stage estimates are shown beneath in Panel B. The top row names the measure for democracy and the second-top row specifies the empirical model. In all specifications, democracy is instrumented by the first lag of the instrument relative to democracy itself. We highlight this point because we estimate the effect of simultaneous democracy on the Muslim share as well as the effect of lagged democracy on the Muslim share. In the latter case, the instrument is lagged by two periods (shown in the table by  $t - 2$ ) since democracy itself is lagged by one period ( $t - 1$  in the table). Throughout all specifications, democracy is shown to have no significant effect on the Muslim share. This holds true with both measures for democracy and it is also robust to the empirical model (static or dynamic). All estimates are based on a strong instrument. This is shown by the first-stage estimates that are highly significant and by the 1st-stage F-statistics that exceed 10 in all cases. The pattern renders it unlikely that the main findings are biased by reverse causality.

The second part of the endogeneity problem concerns omitted variables. We cannot consider all the variables that can play a role for the relationship between Islam and democracy. Some of the variables might be unknown. Even if they are known, appropriate data might not be available. However, since most of the omitted variables are

TABLE 4 Islam and democracy: reverse causality

Panel A: second-stage 2SLS estimates									
Dependent variable: share of Muslims (% of total population)									
Measure for democracy	Political Rights index (normalized)				Polity 2 index (normalized)				
	Static (1)	Dynamic (2)	Static (3)	Dynamic (4)	Static (5)	Dynamic (6)	Static (7)	Dynamic (8)	
Muslim share <sub>t-1</sub>		0.778*** (0.0390)		0.765*** (0.0360)		0.771*** (0.0280)		0.750*** (0.0235)	
Democracy <sub>t</sub>	0.0723 (0.0572)		0.0234 (0.0259)		0.0185 (0.0315)		0.0119 (0.0134)		
Democracy <sub>t-1</sub>			0.0315 (0.0441)	-0.0126 (0.0148)			0.000221 (0.0251)	-0.00793 (0.000719)	
1st-stage F-statistics	25.22	24.46	22.82	22.11	50.28	50.37	48.67	48.37	
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Observations	1,506	1,506	1,326	1,326	1,564	1,564	1,406	1,406	
Countries in sample	180	180	180	180	159	159	159	159	
Panel B: first-stage estimates									
Dependent variable: democracy									
Instrument <sub>t-1</sub>	0.247*** (0.0493)	0.243*** (0.0491)	0.248*** (0.0519)	0.243*** (0.0517)	0.398*** (0.0561)	0.396*** (0.0558)	0.400*** (0.0573)	0.398*** (0.0573)	
Instrument <sub>t-2</sub>									

Notes: The table shows instrumental-variable (IV) estimates for the within-country effect of democracy on the Muslim share. Panel A shows second-stage regressions for the effect of instrumented democracy on the Muslim share. The top row informs about the measure for democracy and the second-top row specifies the empirical model. In all regressions, data is observed on a five-year frequency. Consequently, the subscript  $t - 1$  refers to the value five years ago. Columns (1)–(2) and (5)–(6) show estimates for the effect of contemporaneous democracy on the Muslim share and columns (3)–(4) and (7)–(8) show estimates for the effect of lagged democracy on the Muslim share. The 1st-stage F-statistics inform about the prediction power of the excluded instrument. Panel B shows the corresponding first-stage estimates where democracy is instrumented by the regional democracy waves measure as given by Acemoglu et al. (2019). Standard errors (reported in parentheses) are robust against heteroskedasticity and serial correlation at country-level. Significance levels are:

\*\*\*  $p < 0.01$ ,  
 \*\*  $p < 0.05$ ,  
 \*  $p < 0.1$ .

correlated to each other, we can include some of the most important variables to our model. The controls will then also remove the effects of those variables that we did not add to the model.

The estimates in Table 5 follow this strategy. In detail, they show the effect of the Muslim share on democracy conditioned on the first lag of two control variables including (log) GDP per-capita and (log) life expectancy. The measures for democracy are named in the top row and the second-top row names the empirical model (static and dynamic). The specification in column (1) shows the case when only GDP is included as a control variable and the specification in column (2) adds life expectancy as a second control. For each pair of control-specification, we repeat the analysis with the dynamic model (columns (3) and (4)). The right half of the table shows the same exercises based on the Polity 2 index as the measure for democracy. In all cases, the control variables turn out insignificant suggesting that neither economic growth nor human development matters for the relationship between Islam and democracy.<sup>7</sup> More importantly, in no specification is the pattern of the main findings canceled. The Muslim share has either no significant effect on democracy or if significant, the effect is positive.

The specifications in Tables 4 and 5 show that endogeneity concerns play no role in the relationship between the Muslim share and democracy. This pattern suggests that our main findings actually show the causal effect that runs from Islam to democracy.

### 4.3 | Country Heterogeneity

Another important assumption for the main findings is that the effect of Islam on democracy is homogeneous in all countries. Since democracy is the outcome variable, this assumption is not guaranteed. It is well possible that Islam has a negative effect on democracy but the effect is significant only in those countries where the Muslims represent a vast majority in the total population. If so, the effect of Islam on democracy is subject to country heterogeneity and the main findings are biased because they show only the average effect that applies to all countries in the sample. Here, we show that this is not the case.

There are two possibilities to explore country heterogeneous effects: One approach (called the *separated model*) is to isolate the countries of interest (here the Muslim-majority countries) running separate regressions for the sub-sample. The method is intuitive, yet, it is not efficient because it does not explore all variation that is available in the full sample. Moreover, it produces incomparable estimates. This is related to the time fixed effects. In general, they capture the effects of all shocks that are commonly shared by all countries in the sample. When the sample changes the time fixed effects change as well. The second approach is the *interacted model*. With this approach, the countries of interest are identified by a dummy interacted with the explanatory variable. This method is robust to the above-mentioned estimation issues since all countries are estimated under the same econometric conditions.

When implementing the interacted model, it is important highlighting that the effect of the Muslim share on democracy is estimated in two parts. The formal model clarifies this point:

$$d_{ct} = ad_{ct-1} + \gamma_g l_{ct-1} + \gamma_m s_c l_{ct-1} + \mu_c + \tau_t + u_{ct} \quad (2)$$

This model is a similar version of the main model shown in Equation 1. However, it adds an interaction term ( $\gamma_m * s_c$ ). The variable  $s_c$  is a dummy that takes value 1 for the Muslim-majority countries, and 0 otherwise. In this way,  $\gamma_g$  estimates the effect of the Muslim share on democracy that applies to all countries in the sample. We call this the *general effect* (highlighted by the subscript  $g$ ). In the Muslim-majority countries (where  $s_c = 1$ ), the general effect is topped by the interaction term. Since this effect applies only to a sub-sample of countries, it is called the *marginal effect* (highlighted by the subscript  $m$ ). This point becomes clearer when rearranging the model:

<sup>7</sup>The finding that GDP per-capita turns out insignificant is in line with Acemoglu et al. (2008). The authors show that the inclusion of fixed effects removes the strong positive association between income and democracy that exists across the countries.

TABLE 5 Islam and democracy: omitted variable bias

Measure for democracy	Dependent variable: democracy							
	Political Rights Index (normalized)				Polity 2 index (normalized)			
	Static		Dynamic		Static		Dynamic	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Democracy <sub>t-1</sub>			0.422*** (0.0382)	0.421*** (0.0383)			0.557*** (0.0375)	0.536*** (0.0385)
Muslim share <sub>t-1</sub>	0.301 (0.216)	0.294 (0.214)	0.181 (0.135)	0.181 (0.135)	0.378* (0.208)	0.442** (0.176)	0.306*** (0.105)	0.299*** (0.104)
(log) GDP per-capita <sub>t-1</sub>	0.00741 (0.0237)	0.00709 (0.0239)	0.000793 (0.0167)	0.000562 (0.0168)	-0.0298 (0.0238)	-0.0276 (0.0230)	-0.0205 (0.0139)	-0.0201 (0.0149)
(log) Life expectancy <sub>t-1</sub>		0.104 (0.146)		0.0309 (0.0965)		0.265 (0.178)		0.0586 (0.0970)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,391	1,375	1,224	1,211	1,557	1,450	1,495	1,396
R-squared	0.126	0.126	0.283	0.283	0.305	0.325	0.544	0.539
Countries in sample	166	164	166	164	151	151	151	151

Notes: The table shows OLS estimates for the conditional within-country correlation between the Muslim share and two measures of democracy. The top row informs about the measure for democracy and the second-top row specifies the empirical model. All regressions are based on a five-year data frequency. Consequently, the subscript  $t-1$  refers to the value five years ago. Columns with odd numbers include the first lag of (log) GDP per-capita as control variable. Columns with even numbers add the first lag of (log) life expectancy on top. Standard errors (reported in parentheses) are robust against heteroskedasticity and serial correlation at country-level. Significance levels are:

\*\*\*  $p < 0.01$ ,

\*\*  $p < 0.05$ ,

\*  $p < 0.1$ .



$$d_{ct} = \alpha d_{ct-1} + I_{ct-1}(\gamma_g + \gamma_m s_c) + \mu_c + \tau_t + u_{ct}$$

For countries where  $s_c = 0$ , the general term  $\gamma_g$  estimates the effect of the Muslim share on democracy and for countries where  $s_c = 1$ , the sum of  $\gamma_g$  and  $\gamma_m$  shows the effect of Islam on democracy. In the analysis, we set  $s_c = 1$  for countries that have  $\geq 75\%$  Muslims in the total population, and 0 otherwise. This threshold balances the trade-off between capturing the true effect of Islam and still allowing a fair distribution of the data. Specifications with a 50%-threshold did not lead to other results than those shown here (available upon request).

In Table 6, we apply both methods to explore country heterogeneous effects. The top row of the table clarifies the measure for democracy, the second-top row names the approach (separated model and interacted model), and the third-top row specifies the empirical model (static and dynamic). When the interacted model is applied, the table explicitly displays the effect in the Muslim-majority countries (called MM-countries in the table to save space).

**TABLE 6** Islam and democracy: country heterogeneity

Measure for democracy	Dependent variable: democracy							
	Political Rights index (normalized)				Polity 2 index (normalized)			
	Separated model		Interacted model		Separated model		Interacted model	
	Static	Dynamic	Static	Dynamic	Static	Dynamic	Static	Dynamic
Empirical model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democracy <sub>t-1</sub>		0.324*** (0.0985)		0.427*** (0.0371)		0.477*** (0.124)		0.586*** (0.0347)
Muslim share <sub>t</sub>	0.407 (0.529)	0.0736 (0.400)	0.188 (0.396)	0.0759 (0.249)	1.078** (0.496)	0.764* (0.400)	0.117 (0.255)	0.150 (0.148)
Muslim share <sub>t-1</sub> * s <sub>c</sub>			0.0726 (0.121)	0.0621 (0.0805)			0.171** (0.0776)	0.0826 (0.0525)
Effect in the MM-countries			0.261 (0.278)	0.138 (0.175)			0.288 (0.194)	0.233* (0.118)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	281	248	1,478	1,344	341	316	1,667	1,647
R-squared	0.050	0.139	0.121	0.280	0.289	0.443	0.302	0.553
Countries in sample	36	36	189	189	35	35	161	161

Notes: The table shows OLS estimates for the within-country correlation between the Muslim share and two measures for democracy in countries where Muslims represent  $\geq 75\%$  of the total population (referred to as Muslim-majority [or MM-]countries). The top row informs about the measure for democracy and the second-top row specifies the approach how the MM-countries are identified. In columns (1)–(2) and (5)–(6), the MM-countries are separated from the other countries running isolated regressions only for them. In columns (3)–(4) and (7)–(8), the MM-countries are identified by a 75%-dummy interacted with the Muslim share. In this case, the addition of the two individual estimates for the Muslim share shows the overall effect in the MM-countries (see Section 4.3 for details). The third-top row informs about the empirical model. All regressions are based on a five-year data frequency. Consequently, the subscript  $t - 1$  refers to the value five years ago. Standard errors (reported in parentheses) are robust against heteroskedasticity and serial correlation the country-level. Significance levels are.

\*\*\*  $p < 0.01$ ,

\*\*  $p < 0.05$ ,

\*  $p < 0.1$ .

Some of the specifications show evidence for country heterogeneity. Yet, the evidence speaks in favor of a positive effect. In detail, when democracy is measured by the Political Rights index, all estimates are insignificant. We observed the same pattern in the main findings. However, when the Polity 2 index is employed, it turns out that the positive effect of the Muslim share on democracy shown in the main findings is basically driven by the Muslim-majority countries. In column (5), the coefficient for the Muslim share is 1.078 (0.496). This is more than three times the average effect that applies to all countries (0.313 shown in Table 3, Panel A, column (5)). The coefficient remains large even when lagged democracy is considered. This is shown in column (6) where the coefficient is 0.764 (0.400). This is also three times the corresponding coefficient for the average effect across all countries (0.258 shown in Table 3, Panel B, column (5)). The pattern becomes slightly less clear when the interaction model is applied. The marginal effect of the Muslim share is significant, 0.171 (0.0776), yet, the general effect is too imprecisely estimated, 0.117 (0.255). This makes the estimate for the effect of the Muslim share on democracy in the Muslim-majority countries insignificant, 0.288 (0.194). However, when the dynamics of democracy are considered, the estimate in column (8) shows that the positive average effect shown in Table 3 is driven by the Muslim-majority countries.

The exercises in Table 6 are insightful because they show that the main findings apply to all countries irrespective of whether Muslims represent a minority or majority in the total population. If anything, a larger Muslim share supports democracy in the Muslim-majority countries.

#### 4.4 | Long-Term Effect

The main findings assume that Islam shows its effect on democracy in a short period. The specifications in Tables 2 and 3 consider a time gap of up to 10 years between the Muslim share and the measures for democracy. Yet, it is possible that Islam shows its true effect over longer periods. Here, we explore this issue showing that even over a half-century period there is no evidence for a negative effect of Islam on democracy.

When exploring the long-term effect of the Muslim share on democracy, we deviate from the five-year data frequency. Instead, we consider the changes in the averages of the measures for Islam and democracy over the sample period. In detail, for each measure, we determine the average over the initial 11-year period for which data is given. Then, we do the same with the last 11-year period for which data is given. Finally, we calculate the change as the difference between the last period minus the initial period. This approach leads to a sample with only one observation per country. Yet, it enables the estimation of the long-term effect of Islam on democracy over the sample period.

The plots in Figure 2 illustrate this specification. They suggest that there is no negative effect. Table 7 supports that conclusion by showing the estimates for the long-term specifications. The top row of the table informs about the measure for democracy, the second-top row names the countries that are included in the sample, and the third-top row specifies the empirical model (static and dynamic). Columns (1) and (2) show a specification where all countries are included in the sample. Irrespective of whether initial democracy is considered, the estimates turn out insignificant suggesting that there is no effect of the average Muslim share on average democracy over the period 1972–2015. This effect might be biased by the two outliers (Qatar and the UAE) shown in the top-plot of Figure 2. Without these countries, the slope of the regression line becomes flatter in the middle-plot. We observe the same pattern in columns (3) and (4) where the two outliers are excluded from the sample. In the static model, the coefficient becomes less than half compared to the case in column (1) and in the dynamic model when initial democracy is considered, the estimate even changes sign becoming negative. Albeit, in both cases, the estimates are insignificant by wide margins. The same insignificant pattern emerges in columns (5) and (6) where democracy is measured by the Polity 2 index.<sup>8</sup>

<sup>8</sup>In Table 7, initial democracy turns out negative. Note that this is not a misspecification. The pattern suggests that the change in democracy over the sample period is smaller the higher initial democracy was at the beginning of the sample period. In unreported specifications, we found that depending on the measure for democracy, the change in sign occurs after 20 to 30 years. Acemoglu et al. (2008) observe the same pattern in their Tables 2 and 3 after a period of 20 years.

**TABLE 7** Islam and democracy: long-term effects

Measure for democracy	Dependent variable: change in democracy					
	Political Rights index (normalized)				Polity 2 index (normalized)	
	All countries		All but Qatar & UAE		All countries	
	Static	Dynamic	Static	Dynamic	Static	Dynamic
Sample	(1)	(2)	(3)	(4)	(5)	(6)
Empirical model						
Initial democracy (1972–1982)		−0.352*** (0.0558)		−0.365*** (0.0576)		
Change in average Muslim share (1972–1982 to 2005–2015)	0.398 (0.285)	0.304 (0.306)	0.175 (0.534)	−0.172 (0.487)		
Initial democracy (1950–1960)						−0.650*** (0.0667)
Change in average Muslim share (1950–1960 to 2005–2015)					0.269 (0.369)	0.0803 (0.255)
Country fixed effects	No	No	No	No	No	No
Year fixed effects	No	No	No	No	No	No
Observations	162	162	160	160	103	103
R-squared	0.007	0.178	0.001	0.182	0.004	0.451
Countries in sample	162	162	160	160	103	103

Notes: The table shows OLS estimates for the correlation between country-specific changes in the averages of the Muslim share and two measures for democracy over the sample period. In columns (1)–(4), the averages are taken over the periods 1972–1982 (sample beginning) and 2005–2015 (sample end). In columns (5)–(6), the averages are taken over the periods 1950–1960 (sample beginning) and 2005–2015 (sample end). The top row informs about the measure for democracy and the second-top row specifies the countries in the sample. The third-top row names the empirical model. Standard errors (reported in parentheses) are robust against heteroskedasticity and serial correlation the country-level. Significance levels are:

\*\*\*  $p < 0.01$ ,

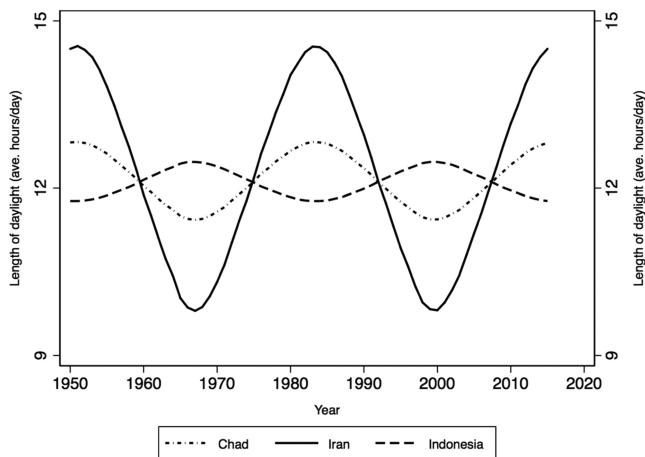
\*\*  $p < 0.05$ ,

\*  $p < 0.1$ .

In sum, the specifications in Table 7 show that there is also no evidence for a negative effect of Islam on democracy over a half-century period.

## 5 | RAMADAN FASTING AND DEMOCRACY

So far, Islam is measured by the Muslim share. As mentioned above, this measure follows the claim that the larger the share of Muslims in the total population the more are Islamic views expressed in political outcomes. Although this is plausible, it is similarly possible that the true effect of Islam on democracy does not run through the scope of its followers but rather through its core teachings. In this case, the Muslim share is irrelevant for decision-making and it does not represent an appropriate measure for Islam. In this section, we explore this issue. In detail, instead of the Muslim share, we measure Islam by Ramadan Fasting. Since this feature is not known in general, we briefly explain that practice also highlighting its advantages for the empirical analysis.



**FIGURE 3** The figure shows the development of the average per-day length of Ramadan Fasting for three selected countries. Fasting lengths are measured by the average per-day hours between sunrise and sunset times for a 30-day period beginning with the month of Ramadan in a given year and they apply only to the capital of an individual country. See Section 2 for more information.

## 5.1 | Ramadan Fasting as Measure for Islam

Ramadan is the name of the ninth month of the Islamic calendar. According to Islamic theology, the month is holy because the first verses of the Quran were revealed to Prophet Muhammad during this period. In commemoration of the event, Muslims observe Ramadan as a month of fasting, prayer, reflection, alms giving, and community.<sup>9</sup> Fasting in Islam means that all types of consumption are stopped from sunrise (*fajr*) until sunset (*maghrib*) for the days of Ramadan. Instead, religious values are put at the center of daily routines. Thus, fasting includes the core teachings of Islam. The importance of the fast can also be inferred from the fact that Ramadan Fasting represents one of the five pillars of Islam (next to faith (*shahada*), prayer (*salah*), alms-giving (*zakat*), and pilgrimage (*hajj*)).

Next to its simple correlation with the teachings of Islam, Ramadan Fasting is an appropriate measure for the empirical analysis because it varies across both countries and years. This feature results from the definition of fasting in Islam. In detail, Muslims are called to begin the fast with sunrise and to end it by sunset. Thus, the times are country-specific. In addition, the times rotate over the calendar. This feature is related to the fact that Islamic dates follow the Islamic calendar. Unlike the Gregorian calendar that is solar-based and has 365 days per year, the Islamic calendar is moon-based and has only 354 days per year. Due to the shorter period (10–11 days per year), Islamic dates rotate backwards in the Gregorian calendar. It takes 33 years for the Islamic calendar to get back in accord with the Gregorian calendar. Figure 3 illustrates the phases for three selected countries.

The figure shows the average per-day length of fasting in Chad, Iran, and Indonesia. As discussed in Section 2, the length of fasting is approximated by the average per-day length of daylight in the capital for a 30-days period beginning with the first day of Ramadan. It can be seen that the Ramadan measure varies in a plausible range. The mean value is slightly above 12 hours (since all Muslim-majority countries are slightly above the equator), the curves

<sup>9</sup>In Islam, Ramadan is a blessed month ordained by God. During this period, Satan and his minions are said to be locked away in Hell to prevent them from misleading, deceiving, and whispering in the ears of believers. Thus, Muslims consider fasting as an act of deeply personal worship seeking a raised level of closeness to God. Like in other religions, this is done by putting more effort into studying and following the teachings of the religion. Islamic theology supports this behavior by claiming that acts of good deeds earn multiplied rewards while committing sins during this period is greater and more serious than sins at other times. The effectiveness of such claims is documented in a 2013 PEW survey conducted in 39 Muslim countries where a median of 93% of Muslims indicate that they follow the practices of Ramadan. The report is available at [www.pewresearch.org](http://www.pewresearch.org).

interact when Ramadan overlaps with the beginning of spring or autumn (capturing day and night equinox), the amplitudes correspond to the distance of the capitals to the equator, and the curves run contrary for capitals above vs below the equator. In our dataset, there are only two Muslim-majority countries with capitals below the equator: Comoros (Moroni) and Indonesia (Jakarta). Even the 33-year cycle is clearly visible. For example, for the countries above the equator, the maximum length of fasting is reached in 1950, 1983, and 2016 (suggestive in the figure since our dataset ends in 2015).

When employing the Ramadan measure, we claim that the intensity of the teachings of Islam varies with the length of fasting in a given country. To better understand this claim, it is helpful to specify the situation during Ramadan in the Muslim-majority countries. In longer fasting periods, Muslims have few opportunities other than religion. In some of the countries, restaurants close for the day hours or they run on reduced capacity serving only the demand that comes from those groups that are exempt from the fast (children, elderly, ill people, pregnant women, breastfeeding mothers, and travelers). Similarly, companies with physically demanding work reduce their working hours since workers are exhausted by the fast. In contrast to that, Islamic entities attract the people by offering legitimate alternatives throughout the month. For example, mosques offer gatherings where Muslims can discuss their affairs with other believers (*shura*). In case of ambiguity, the advice of religious scholars can be sought (*ijma*). Alternatively, Muslims can join scholarly speeches where issues of modern times are interpreted in the context of Islamic law (*ijtihad*). The opportunities are utilized by the Muslims spending additional time (i.e. beyond the five mandatory prayers per day) studying and sharing the teachings of the Quran (e.g. Afifi, 1997). To keep the people engaged, activities are extended to the evening. At sunset, prayers are carried out with the community (*ummah*) and thereafter (free) food is offered to the public to break the fast (*iftar*). The consequences of the increased engagement are also present in the data. Campante and Yanagizawa-Drott (2015) show that longer fasting hours have a negative effect on economic growth but a positive effect on happiness and life satisfaction of the Muslims. An increased spiritual orientation of the Muslims during this period is also reported by Seyyed et al. (2005) and Bialkowski et al. (2012).

It is worth highlighting that the Ramadan measure includes exogenous variation. As explained above, Ramadan is determined by nature. This makes the measure exogenous to all other variables that play a role for the relationship between Islam and democracy. This feature is valuable for empirical work because it enables the estimation of the causal effect that runs from Islam to democracy. Albeit, Ramadan is a meaningful practice only in the Muslim countries. In countries where Islam plays a minor role, that practice has no effect on outcomes (see e.g. Campante and Yanagizawa-Drott (2015)). Thus, we focus on the Muslim-majority countries when applying the Ramadan measure.

## 5.2 | Estimation

Table 8 shows the effect of Ramadan Fasting on the measures for democracy in the Muslim-majority countries. The measures for democracy are named in the Panel-head. We present two types of specifications including one where the outcome variable is the level of the democracy index and one where the outcome variable is the change in the democracy index. The top row specifies the outcome variable. The second-top row names the model specification and the third-top row clarifies the empirical model.

Columns (1) and (2) represent a basic specification where we estimate the effect of (log) Ramadan on democracy. The specifications show that longer fasting hours have a positive effect on democracy. The inclusion of the first lag of democracy does not matter for the pattern. Moreover, it holds true with both measures for democracy. Even though this specification is insightful, it assumes that Ramadan Fasting is equally important in all the Muslim-majority countries irrespective of whether Muslims represent 75% or 100% of the total population. In columns (3) and (4), we address this issue by weighting the Ramadan measure by the Muslim share (displayed as *Muslim* in the table to save space). This approach helps identifying where the significance comes from in the basic cases. When democracy is measured by the Political Rights index (Panel A), the static model in column (3) produces insignificance estimates. This pattern suggests that neither Ramadan nor Ramadan fasting performed by the Muslims has an individual effect

TABLE 8 Islam and democracy: ramadan fasting as alternative measure

Outcome variable	Dependent variable: democracy										
	Panel A: Political Rights index (normalized)										
	Basic		Index level		Weighted & controls		Index change		Max variation		
Static	Dynamic	Static	Dynamic	Static	Dynamic	Static	Dynamic	Static	Dynamic	Static	Dynamic
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(7)	(8)	(7)	(8)
Democracy <sub>t-1</sub>	0.304*** (0.0993)	0.304*** (0.0996)	0.304*** (0.103)	0.304*** (0.103)	0.304*** (0.103)	0.304*** (0.103)	0.304*** (0.103)	0.304*** (0.103)	0.304*** (0.103)	0.304*** (0.103)	0.304*** (0.103)
(log) Ramadan <sub>t-1</sub>	0.571** (0.217)	0.634** (0.234)	0.404 (0.244)	0.615** (0.268)	0.482** (0.203)	0.690** (0.261)	0.690** (0.261)	0.482** (0.203)	0.690** (0.261)	0.482** (0.203)	0.690** (0.261)
(log) Ramadan <sub>t-1</sub> * Muslim <sub>t-1</sub>			0.185 (0.220)	0.0190 (0.170)	0.158 (0.185)	0.0146 (0.162)	0.0146 (0.162)	0.158 (0.185)	0.0146 (0.162)	0.158 (0.185)	0.0146 (0.162)
Initial democracy (@1981 – 1985)											-0.797*** (0.184)
Change in average Fasting length (@1981 – 1985 to @1998 – 2002)										0.00857 (0.0237)	0.0170 (0.0196)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Observations	281	248	281	248	254	224	224	254	224	39	39
R-squared	0.073	0.170	0.078	0.170	0.083	0.172	0.172	0.083	0.172	0.003	0.360
Countries in sample	36	36	36	36	33	33	33	33	33	39	39

TABLE 8 (Continued)

Panel B: Polity 2 index (normalized)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democracy <sub>t-1</sub>		0.490*** (0.113)		0.475*** (0.126)		0.500*** (0.142)		
(log) Ramadan <sub>t-1</sub>	0.305* (0.175)	0.267* (0.150)	-0.0836 (0.232)	-0.0240 (0.192)	-0.0452 (0.161)	0.00844 (0.133)		
(log) Ramadan <sub>t-1</sub> * Muslim <sub>t-1</sub>			0.436** (0.202)	0.318* (0.164)	0.545*** (0.167)	0.374** (0.154)		
Initial democracy (#1981 – 1985)								-0.539* (0.286)
Change in average Fasting length (#1981 – 1985 to #1998 – 2002)							0.00663 (0.0260)	0.0240 (0.0263)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Observations	341	316	341	316	276	261	35	35
R-squared	0.266	0.435	0.294	0.447	0.324	0.486	0.002	0.171
Countries in sample	35	35	35	35	32	32	35	35

Notes: The table shows OLS estimates for the effect of Ramadan Fasting (average per-day hours) on two measures for democracy in countries where Muslims represent  $\geq 75\%$  of the total population. The Panels vary by the measure for democracy. The top row informs about the nature of the outcome variable and the second-top row specifies the model specification. The third-top row names the empirical model. In columns (3)–(4), the first lags of both (log) GDP per-capita and (log) life expectancy are included (not shown in the table). The regressions in columns (1)–(6) are based on a five-year data frequency. Consequently, the subscript  $t - 1$  refers to the value five years ago. In columns (7)–(8), the average change in the variables is considered. The periods for the averages are 1981–1985 (longest Ramadan) and 1998–2002 (shortest Ramadan). Standard errors (reported in parentheses) are robust against heteroskedasticity and serial correlation at country-level. Significance levels are:

\*\*\*  $p < 0.01$ ,\*\*  $p < 0.05$ ,\*  $p < 0.1$ .

on democracy. In column (4) when the dynamic model is applied, one of the two estimates is significant. Yet, since this is the estimate for Ramadan Fasting, the specification suggests that Ramadan itself has a positive effect on democracy irrespective of the Muslim share in the Muslim-majority countries. The picture changes entirely in Panel B when the Polity 2 index is employed. Both specifications show that not Ramadan itself but Ramadan performed by the Muslims has a positive effect on democracy.<sup>10</sup>

The specifications in columns (1) to (4) assume that Ramadan has a direct effect on democracy. However, this is not necessarily true since it is shown that increased Ramadan hours decrease economic growth and increase subjective well-being in the Muslim countries (see e.g. Campante and Yanagizawa-Drott (2015)). Thus, it is possible that our estimates show the effect that these variables have on democracy rather than the effect that Islam has on democracy.<sup>11</sup> We explore this possibility in columns (5) and (6) where we add the first lags of two control variables including (log) GDP per-capita and (log) life expectancy (not shown in the table to save space).<sup>12</sup> In all cases, the coefficients for the controls turn out insignificant. More importantly, the estimates for Ramadan in Panel A and Muslim-weighted Ramadan in Panel B remain significant and positive.

Columns (7) and (8) present a different type of analysis. Therein, we consider the effect of a change in the Ramadan measure on the change in the democracy index. Unlike the long-term specifications shown in Table 7, the specifications here consider a change over a half-cycle of Ramadan. The idea is to capture the effect of a maximum-change in the measure for Islam. As shown in Figure 3 one maximum in the length of fasting is reached in the year 1983. Given the 33-year cycle of the Islamic calendar, the following minimum length is reached in the years 1999/2000. We consider the year 2000. For each of the two extreme years (1983 and 2000), we calculate the average value for both fasting length and democracy index within a 5-year window. Then, we determine the change as the difference between the last average minus the initial average. The resulting figure includes the maximum change in the measure for Islam and its corresponding effect on democracy. In all specifications, that effect turns out to be insignificant.<sup>13</sup>

The specifications in Table 8 show that even Ramadan Fasting has no negative within-country effect on democracy. If anything, it has a positive effect. This is an important part of the analysis because Ramadan Fasting includes the core teachings of Islam. Together with the main findings, they draw a clearer picture of the effect of Islam on democracy.

## 6 | CONCLUSION

Islam is the world's fastest growing religion. According to data by Pew (2017), Muslims will outnumber Christians by 2075 making Islam the world's largest religion. The consequences of this development go beyond the traditional Muslim countries of the Middle East. Due to globalization and mass migration, Muslim communities exist worldwide. Although most of them already live in democratic countries (e.g. Karatnycky (2002)), there is considerable concern as to whether Islam is compatible with democracy. Our analysis confirms that there is a negative cross-country link between the Muslim share and democracy. However, this pattern is not sufficient to blame Islam for the democracy

<sup>10</sup>An alternative to weighting the Ramadan measure with the Muslim share is to estimate the effect of Ramadan on democracy only for countries where the Muslim share is  $\geq 95\%$  of the total population. This sample excludes noise in the data since it drops out those countries where Islam's supreme position is not always guaranteed. Depending on the measure for democracy, this specification shows that Ramadan's effect is either positive (Political Rights index) or insignificant (Polity 2 index). In no case though did we find evidence for a negative effect (not shown here but available).

<sup>11</sup>As discussed in Footnote 7, income is shown to have no within-country effect on democracy. Yet, Cervellati et al. (2014) discover that this conclusion is driven by heterogeneity related to the colonial history. They show that the effect is negative for former colonies, but positive for non-colonies. Thus, depending on that feature, income has an effect on democracy. When controlling for income though that mechanism is cancelled.

<sup>12</sup>We do not have appropriate proxies for subjective well-being. However, it is reasonable assuming that this figure is correlated with GDP per-capita. Moreover, the inclusion of life expectancy as a control variable is justified because the literature documents that Ramadan Fasting has an effect on health (see e.g. Bialkowski et al. (2012) for a discussion).

<sup>13</sup>The pattern is the same when we exclude Comoros and Indonesia where the development of Ramadan is opposite since the (capitals of the) countries are located below the equator (not shown here but available upon request).



deficit. As we show, the lower level in democracy is due to fixed differences across the countries. When the differences are considered, there is no evidence for a negative effect of Islam on democracy. This is true irrespective of whether Islam is measured by the scope of the believers or by its core teachings. It also applies to Muslim-majority and Muslim-minority countries alike. If anything, Islam has a positive within-country effect on democracy.

Despite extensive analysis, it remains open which of the fixed country characteristics led to the lower initial level in democracy in the Muslim countries. The literature offers two prominent theories including geography and institutions. In Appendix Table A.3, we consider proxies for both theories. Yet, neither of them removes the negative cross-country link. This leaves us with two possibilities: Either Islam did have a negative influence on democracy but the effect has cancelled in modern times or the relationship between Islam and democracy is even more complicated. There is some evidence that speaks against the first idea. For example, Chaney et al. (2012) point out that the democracy deficit is persistent in those countries that were conquered by the Arab armies following the death of Prophet Muhammad in 632 CE. Countries that implemented Islamic law later have developed very similar to the rest of the developing world. Instead, the authors suggest that the institutional framework in the initial Muslim countries is prone to autocratic leadership. If so, the question is whether Islam has promoted weak institutions and thus is responsible for the lower initial level? Again, evidence shows differently. Until 500 years ago, most societies were non-democratic. This pattern changed during the period of European colonization. Depending on existing levels of wealth, the colonizers have established either extractive or inclusive institutions. Countries with extractive institutions perform weaker (e.g. Cervellati et al., 2014). The fact that Islam was irrelevant for the decision-making of the Europeans is shown in Table 8B by Acemoglu et al. (2008).

We prefer the second alternative (the relationship between Islam and democracy is even more complicated). The idea of modern democracy began in the US and it was brought to Europe in the second half of the 19th century. In the beginning of the 20th century, it spread to some countries in Latin America. Since all the countries have a Christian background, leaders in the non-Christian countries (whether Islamic or not) began to form an opposition. To be effective, they focused on factors that are commonly shared by the people, e.g. culture, creating a national identity. In the countries of the Middle East, Islam served this purpose. On the one hand, the religion has no generally accepted representative who can speak for all the Muslims in the world. This leaves room for *adjustments*. On the other hand, Islam has a long history and a reputation that the people trust. This setting is well-suited to direct the people (e.g. Rohac (2013)). This kept democracy out of the Muslim world leading to a lower initial level.<sup>14</sup> Still, it is not an Islamic problem. This is shown in Appendix Table A.3 where the negative cross-country link applies to all countries (i.e. all latitudes) even after controlling for the Muslim share. The effectiveness of such tools (national identity or religion) is changing over time though. New media tools became available that enabled the exchange of information outside of the state control. Thus, the idea of democracy is spreading across the world. As shown in Figure 1, the Muslim countries are also affected by that development.

It is possible to support the development. Policy-makers can emphasize that neither Muslims nor the teachings of Islam (as a religion) poses a threat to democracy. This reduces prejudices in the population and it offers the opportunity to get to know each other working out the values that are important to all the people.

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<sup>14</sup>Natural resources add to the issue since they represent a source of income that is independent of the approval of the people (e.g. Ross (2001)). Yet, it is important nothing that the democracy deficit predates that income source. Thus, oil and gas cannot explain the origin of the lower initial level of democracy in the Muslim countries.

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## DATA AVAILABILITY STATEMENT

All data used in this study is publicly available and all sources are named in Section 2 to replicate the results. The empirical analysis is performed with STATA (version 15 or higher). The data and all codes that support the findings of this study are available from the corresponding author upon reasonable request.

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### SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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