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HOW TO MEASURE ISLAM?

DEVELOPING A COUNTRY-LEVEL SCALE OF ISLAMIC PRACTICE

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Abstract

Many social scientists explain variation in governance structures and economic development across countries by referring to their cultural and religious legacy. Islam emerges, among other factors, as a major culprit for poor governance structures, lack of democracy, and stalled economic development. In this paper, I argue that the measures of Islam widely used in this literature are deeply flawed. Their validity issues are rooted in unfounded assumptions, inadequate conceptualization, and poor measurement. To overcome these vitally consequential shortcomings, this study offers two novel country-level measures of Islam that are more accurate. First, using the Rasch model and Confirmatory Factor Analysis (CFA), I develop a scale of Islamic practice that focuses on measuring the practice of four out of five of the Islamic pillars. This allows one to differentiate between countries that have similarly high proportions of Muslims, but where Islam plays a substantively different role in the daily lives of its Muslim populations. Second, I provide an alternative proxy measure of Islamic practice for which data is available across a larger number of countries. Understanding the role of Islam in shaping social, economic, and political outcomes is of paramount importance for knowledge accumulation and public policy. This challenging task is attainable only if we critically refine our conceptual and empirical toolkits, enhancing them with sound measures of key concepts.

Key words: Islamic practice, Scale, New Institutionalism, Measure, Islam

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List of Abbreviations and Acronyms

CFA: Confirmatory Factor Analysis

CFI: Comparative Fit Index

Df: Degrees of freedom

EFA: Exploratory Factor Analysis

IPI: Islamic Practice Index

IPS: Islamic Practice Scale

IITA: Inductive Item Tree Analysis

ML: Maximum Likelihood

MLR: Robust Maximum Likelihood

OLS: Ordinary Least Squares

SRMR: Standardised Root Mean Square Residual

TLI: Tucker-Lewis Index

WHO: World Health Organization

WVS: World Values Survey

WLS: Weighted Least Squares

WLSMV: Weighted Least Squares Means and Variance Adjusted

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1. Introduction

"Whether democracy is measured by the Polity IV index, 1 the index of Liberal Democracy, 2 or the Freedom House index, 3 it appears to be significantly less developed in Muslim-dominated countries"

- Platteau (2011, 243)

"Women have made less progress toward gender equality in the Middle East than in any other region. Many observers claim this is due to the region's Islamic traditions. I suggest that oil, not Islam, is at fault; and that oil production also explains why women lag behind in many other countries."

- Ross (2008, 107)

Islam and its role in economic and political decision-making is a hotly debated topic across the globe. This is unsurprising considering that an estimated 1.6 billion Muslims make up almost 25% of our world population (de Silver and Masci, 2017). Recently, we have witnessed a range of ostensibly Islamic parties winning elections in the MENA region following the Arab Spring including Ennahda in Tunisia, the PJD in Morocco and the Muslim Brotherhood in Egypt (Al-Anani, 2012, 467). In Europe and the United States Islam and Muslims also frequently feature in election rhetoric even though Muslims only make up a small minority of the populations in the United States and most European countries (The Guardian, 2017). However, apart from the populist dynamics where Islam is used either as a deterrent or as a decoy for political purposes, what do social scientists argue about the role of Islam in the economic and political development of nations?

The New Institutional Economist approach provides for a theoretical framework to account for the effect of Islamic institutions on economic and political outcomes. North regarded as the founder of the New Institutional Economic framework writes that:

> "Economists have thoroughly documented that no one factor explains economic development – not capital accumulation, human capital, resource endowments, international trade, or geographical location to name a few prominent examples. Instead, the complex ways that societies structure human relationships – *the institutions that shape economic, political, religious, and other interactions* – appear to be the key to understanding why some societies are capable of sustained economic and political development." (North, Wallis, Weingast, 2006, 3)

North (1990, 3) refers to institutions as "the rules of the game". More formally institutions according to North are "the humanly devised constraints that shape human interaction. In consequence, they structure incentives in human exchange, whether political, social, or economic"(ibid.). Hence, institutions in the New-institutionalist framework refer to existing rules, laws, and policies that direct the behaviour of human beings through enforcement. Economists by and large agree that institutions are central in explaining the divergent development trajectories of different countries. Well-enforced property rights are, for instance, viewed as an important driver of economic development (Besley & Ghatak, 2010, 4528). It is therefore unsurprising that New Institutional economists aim to explain economic development and the lack thereof using institutions as a primary explanatory variable. However, institutions do not appear out of thin air. This leads us to the endogeneity problems that come with this type of research. Institutions do not only shape economic, political and religious interaction they are also *shaped by* economic, political and *religious* interaction.

Przeworski (2004, 527) argues that the theory of new institutionalism consists of two propositions of which the second indicates that institutions are "'endogenous': their form and their functioning depend on the conditions under which they emerge and endure." Hence,

institutions themselves are a product of the conditions in a given country, be it geographical conditions, the presence of abundant natural resources or otherwise. The Islamic culture and practice that has been present in many Muslim countries for centuries is one of these conditions and has most-likely at least partially shaped the institutions that are present in these countries today. Therefore, economists and political scientists who aim to explain some aspect of economic development such as Ross (2008), Rodrik, Subramanian and Trebbi (2004) and Acemoglu and Robinson (2002) take into account "Islam" as a possible determinant of economic development. They do this by using various measures that reflect the proportion of Muslims in a country. Yet, although these efforts to explicitly incorporate Islam in their analyses are praiseworthy, the crucial question is: are the cross-national measures of Islamic culture or practice that are widely used across social sciences valid? Although appealing and straightforward on face value, at a closer look these measures raise serious concerns.

In this paper, we show that the adopted measures across many celebrated and less well-known studies do not accurately reflect the degree of Islamic practice in the country. The degree to which Muslims on average practice Islam in their daily lives differs per county. Many Muslims in the post-soviet Central Asian states are so-called "nominal" Muslims that only practice their religion to a small extent (Ro'i and Wainer, 2009, 318). Measures based on the proportion of Muslims regard a Central Asian country such as Uzbekistan as equally "Islamic" as a country such as Malaysia where Islam is practiced to a much higher degree (Pew Research Centre, 2012). To correct for these problems, we offer an alternative, and as we argue a more valid measure of Islamic practice – the Islamic Practice Scale (IPS) reflects the degree to which Islam is practiced in a country by measuring four out of the five pillars of Islam. The measure is developed based on the theoretical relationship between Islamic Pillars and Islamic Practice and builds on existing measures of Islamic practice in the psychology

literature. We account for differences in difficulty of the indicators in our scale using the Rasch model and test the presented scale using Confirmatory Factor Analysis (CFA).

Thus, the research question this paper addresses is:

What are the properties of a valid country-level measure of Islam?

This is a very consequential question. If the cross-national measures of Islam employed across social sciences are valid, then we can have more trust in their findings. However, if these measures are inaccurate, flawed or invalid, then the generalizations reached by studies that use them are no longer reliable. At the time when debates rage about the role of Islam in major political, economic, social, and cultural transformations across societies, we cannot afford relying on raw or invalid measures of Islam to inform our knowledge and public policies.

2. Institutional Development and Islam: Existing Measures of Islam

2.1 Measuring Islam: Legal Measures and Crude Proxies

2.1.1 More Muslims Equals More Islam?

There are various measures of Islam adopted in the literature on the relationship between Islam and political and economic development. Similar variables to the ones that have been adopted to control for Islam on economic development have been used to infer relationships between political development and Islam. Apart from these crude population-related measures of Islam, attempts have been made to construct indices that reflect Islam by focusing on constitutions and governance outcomes. The section below provides for an overview and raises some concerns for why these measures do not measure Islam in a satisfying manner.

As indicated in the introduction Rodrik, Subramanian and Trebbi (2004), Acemoglu and Robinson (2002) and Ross (2008) all adopt proxy measure of Islam to control for some aspect of economic development. In their seminal work on the primacy of institutions Rodrik, Subramanian and Trebbi (2004) apply cross-national multi-level regression to assess the impact of geography, trade and institutions on income levels and economic development. They find that Institutions are of prime importance for economic development while geography has only a weak direct effect on income, and trade only affects income through an effect on institutional quality. In their celebrated work Acemoglu and Robinson (2002) maintain that the institutions that have been implemented by European colonial powers during the last five centuries have created a "reversal of fortunes" as they were more likely to introduce institutions that are conducive for economic development in areas that were previously relatively poor. Finally, Ross (2008) argues that not the Islamic tradition but oil is the cause for less female labour participation and consequently less female political influence

in many countries inside and outside the Middle East. He supports his argument with cross-national regressions and a comparative case study of Morocco, Algeria and Tunisia. To measure Islam in their influential study Rodrik, Subramanian and Trebbi (2004, 42) use a dichotomous dummy variable that takes the value of "1" when a country is "predominantly Muslim". Acemoglu and Robinson (2002, 1247) employ the percentage of the population that is Muslim and Ross (2008, 114) regards countries as "Islamic" if more than fifty percent of their citizens are Muslim, and [as] "Non-Islamic" otherwise."

Naturally, besides economic institutions, political institutions are also expected to be influenced by the degree to which Islam is prevalent in a given country. Platteau (2011, 243) refers to the existing quantitative literature on the relationship between Islam and democracy pointing out that "whether democracy is measured by the Polity IV index, 1 the index of Liberal Democracy, 2 or the Freedom House index, 3 it appears to be significantly less developed in *Muslim-dominated countries*." However, as Platteau (2011, 244) also states "they measure religion in a rather unsatisfactory manner, often as the proportion of Muslims (a generic, dichotomous category) in the population". None of the measures mentioned above accounts for the differences in the level to which Islam is practiced in a country. All of these measures assume that a higher proportion of Muslims automatically results in a more Islamic country. In chapter 3 and 4 this paper shows that this assumption is incorrect.

2.1.2 Islamic Goals and Islamic Constitutions

Recently Abdul Rauf (2015) published a book resulting from a 12-year project to create an index of Islamic Statehood. Several influential Islamic scholars have participated in this project, ranging from the former ministers of religious affairs in Pakistan and Malaysia to the

Secretary General of the Moroccan League of 'Ulama.[1] Their method to measure Islamic statehood revolves around the *Maqasid* or goals of the Sharia. They have selected several indicators to measure each of these six goals. For the purposes of measuring the goals of protecting property, for instance, they use indicators such as the Gini coefficient, GDP, Doing Business Index, unemployment rate, Corruption Perception Index and the International Property Rights Index. A major problem of this measure is that it measures outcomes instead of attributes of Islamic statehood (ibid, 97-114). A high GDP, for example, may be the result of many different factors, such as natural resource abundance, that are not related to governance per se. Furthermore, they did not compose a unified index but chose to measure each goal apart which does not allow us to measure Islamic Statehood as a unified concept.

The Institute for National Security and Counter terrorism (INSCT) has created an index measuring the Sharia density of the 57 members of Organization of Islamic Cooperation (OIC) between 1947 and 2014. In terms of the indicators they have included references to Sharia in a variety of areas of governance and Muslim life such as "economics, foreign policy, penal laws, family laws, societal, cultural and legislative aspects, *etc.*" (Coli et al. 2014, 13). The purpose of this data set is to examine conflict patterns in states and their relation to compliance to alternate norms than International Humanitarian Law (ibid.). Their approach of measuring Sharia, looking at references to Sharia is limited as it contributes to the problem of rulers who use Islam to legitimize their rule (Quraishi-Landes, 2015, 562; Platteau, 2011, 248). Rulers may refer to Islam to legitimize their policies, although the policies may not reflect Islamic teachings. The name of the database "Sharia Density" may be regarded as problematic as it suggests that Sharia is a code of law and therefore "Sharia laws" can be counted to calculate a density. However, there is not a unified law code of Sharia laws. One could speak of Sharia-based laws, although these laws would vary depending on different

[1] Islamic Religious Scholars, plural of 'alim

interpretations. The composers of this data set seem to have tried to account for a variety of interpretations by including indicators of a relatively general nature such as "Sharia regulates matters of marriage, divorce". However, these marriage and divorce laws differ greatly from country to country even when they all claim to base it on the Sharia (Otto, 2010). This may become problematic when one aims to infer a constant effect of "Islam" on for instance gender equality, as the same indicator refers to substantially different laws in different countries. For example the reformed family code called the *Mudawana* is explicitly based on the Sharia but in many regards more closely resembles European family law codes than the family code in for instance Saudi Arabia (Weingartner, 2005, 687-691).

Dawood Ahmed and Moamen Gouda (2014, 2) have worked on a similar project introducing the Islamic Constitutions Index (ICI) "relying on an original data set based on the coding of the constitutions of all Muslim majority countries globally". They argue that "comparing the Muslim world's constitutions for their Islamicity, ranking them and assessing their status on rights and democracy—is only possible if we have a paradigm against which we can compare it to" (ibid, 37). For this purpose they use a model for Islamic constitutions that has been drafted by Al-Azhar University in Egypt. From this model constitution they derived 30 "Islamic clauses" and subsequently devised a survey to code the clauses. These clauses were all explicitly meant to embed Islamic features in the constitution. Similar to the Sharia Density Index of the INSCT this index measures Islam as a constitutional or legal matter and not as a practice. Islamic clauses may be tempting to be included in the constitution by government for the purposes of acquiring legitimacy among a Muslim population, yet the enforcement of these laws and the daily practice of the population may diverge significantly across countries.

There have been multiple attempts in the Psychology literature to create measures of Islamic practice and religiosity. Abu-Raiya and Hill (2014, 22) provide for an overview of the

existing measures and evaluated them on "theoretical clarity, sample representation, reliability, validity, and generalizability." These measures will be further discussed in section 3.1 and used to develop the concept of Islamic practice that this paper adopts.

2.2 An alternative measure of Islam

The present study, different from the attempts to measure Islamic Institutions or proportions of Muslims, attempts to create a measure of Islam by developing a scale of Islamic practice. Measuring Islamic practice as opposed to Islamic institutions is advantageous for a number of reasons. Most importantly, rulers in Islamic countries often refer to their institutions as Islamic although these institutions diverge significantly from country to country and therefore have considerably divergent effects. To group all of these institutions under the same category is therefore problematic. As Quraishi-Landes (2015, 562) notes:

> "Because every fiqh rule is fallible, no Muslim government can claim that the fiqh rule they have enacted is in fact God's Law. Therefore, the best that can be claimed of so-called "Sharia legislation" is that the government has enacted its preferred understanding of Sharia from among many equally valid options. To call such legislation "Sharia" is to use religion in a politically manipulative manner- implying divine mandate for rules that are in reality fallible human interpretations of divine law."

This relates to a problem which Platteau (2011, 248) describes as "cynical political rulers, often with a secular background, [who] use Islam as a readily available ideology and instrument of legitimacy to deflect criticisms, entrench their power and privileges, or bolster their nationalist credentials."

A scale of Islamic practice avoids this problem as it measures to what extent Islam is practiced on the ground without depending on what the rulers would like to call Islamic.

Hence, the proposed study aims to create a measure that will help us to improve our general understanding of the relationship between Islam, institutions and development. Hopefully, this measure will allow future cross-national studies to examine the relationship between Islamic practice and variables such as economic development, rule of law, and democratic governance adopting an improved measure of Islam.

When measuring Islam one must be careful to conclude who is Islamic and who is not. The proposed measure of Islamic practice, as the name suggests, will primarily focus on measuring Islamic practice mainly for reasons of parsimony and feasibility as survey data on the religiosity of Muslims is scarce and not uniform across countries. For example AlMarri et al. (2009, 423) found significant differences between responses on items on "belief-scale" they constructed between Arab and Asian samples. The next chapter presents how this paper conceptualizes and operationalizes Islamic practice.

3. Developing a Scale of Islamic Practice

3.1 Conceptualization

This paper primarily aims to measure the 5 pillars of Islam that have been unanimously agreed upon across the Islamic community as both Sunni and Shia Muslims observe these pillars (de Long Bas, 2009). Hence, in terms of face validity this measure is regarded solid as anyone who observes the 5 pillars of Islam is intuitively and predominantly considered to be a practicing Muslim. The next paragraphs consider the existing scales of Islamic practice in the literature and thereupon further specify which dimensions and indicators form a solid conceptualization of Islamic practice. The 5 pillars of Islam are established in the following narration which is included in the most authentic hadith collections in the Sunni tradition namely; Al-Bukhari and Muslim, and is also included as the third narration in the famous selection of forty narrations by An Nawawi (Badi, 2002, 16).

> "(**It is narrated on the authority of 'Abdullah son of 'Umar that the Messenger of Allah (ﷺ) said:** (The superstructure of) al-Islam is raised on five (pillars), testifying (the fact) that there is no god but Allah, that Muhammad is His bondsman and messenger, and the establishment of prayer, payment of Zakat, Pilgrimage to the House (Ka'ba) and the fast of Ramadan.)" (ibid)

A definition of Islamic practice primarily based on the 5 pillars of Islam is relatively minimalistic. The Quran and the hadith prescribe many practices - voluntary and obligatory - for Muslims. However, as this study aims to provide for a universal country-level measure a minimalist definition is desirable for a couple of reasons. Firstly, a minimalist definition minimizes the chances of measuring practices that are viewed differently in Islamic communities around the world. Secondly, there is a larger likelihood of overlapping correlations and conflation when many practices are included. The 5 pillars of Islam are distinct practices although an order can be made of "hard" and "easy" indicators. Thirdly, data

constraints do not allow for the creation of an elaborate measure with many indicators. Therefore, this paper regards using four to five items a good balance between parsimony and a maximalist scale. Hinkin et al. (1997, 5) indicate that "adequate internal consistency reliability can be obtained with four or five items per scale".

When one bases Islamic practice on the five pillars this is automatically connected to Islamic belief as the first pillar of Islam is the utterance of the monotheist testimony testifying "that there is no god save Allah, and that Muhammad is His Messenger" (Badi, 2002, 16). Nonetheless, the five pillars are predominantly related to practice as opposed to belief. The Islamic tradition has 6 distinct pillars that relate to the belief in God, the prophets, the angels, the holy books, the last day, and predestination (Badi, 2002, 10). As we are interested in the effect of Islamic practice on the emergence of certain types of institutions, the pillars of belief are less crucial. Nonetheless, Islamic belief and Islamic practice are interrelated as Islamic practice logically follows on belief. Therefore indicators of Islamic belief may be used to evaluate the constructed measure of Islamic practice.

To further conceptualize Islamic Practice this study draws on the existing literature on scales of Islamic religiosity and practice which are found in the Psychology literature. Wilde and Joseph (1997) developed the Muslim Attitudes toward Religion Scale (MARS), which is said to be the first measure of Islamic religiousness that solely relies on Islamic practices, tenets and beliefs(Abu-Raiya and Hill, 2014, 24). This scale was tested on a sample of Muslims in Britain and its reliability and validity were later confirmed by Ghorbani et al (2000, 127), who tested the scale on a sample of 178 Iranian students in Iran. The part of the scale which measures Muslim practice consists of three items related to the second and fourth pillar of Islam. Ghorbani et al found its internal consistency to be high ($\alpha = .78$) (ibid, 128). The scale constructed in this study will build on these items using international survey data on the proportion of people that

pray and fast in a given country. The variable which accounts for the daily prayers in Mosque will not be included due to data unavailability, and its dependability on the accessibility of mosques in different countries.

Table 1: Islamic Practice Items in MARS Scale

Internal consistency	Islamic practice items in MARS scale
(α = .78)	I pray five times a day
	I fast the whole month of Ramadan
	I observe my daily prayers in the Mosque

AlMarri et al (2009) analyze two measures: the Short Muslim Practice and Belief Scale (S-MPBS) and the Khavari Alcohol Test (KAT). The S-MPBS is a self-report measure with 13 items aimed at measuring the degree of engagement in religious practices such as "(''pray five times a day,'' ''fast the holy month of Ramadan'') and religious belief" (ibid, 418). Section one consists of 6 items relating to the pillars of Islam and responses are given on a 5-point rating scale ranging from 1 indicating ''I never do this'' to 5 ''I always do this.'' An overview of these items is provided in table 2 below.

Table 2: Items in Religious Practice Subscale

Cronbach's Alpha	**Items in Religious Practise Subscale**	**Factor loadings**
(α = .82)	I follow all the pillars of Islam	0.750
	I engage in Dua'a	0.655
	I pray five times day	0.640
	I read the Qur'an	0.607
	I give Zakat	0.531
	I fast the month of Ramadan	0.512

The third, fifth and sixth items are directly related to the second, third and fourth pillar of Islam. Comparing drinkers and life-long abstainers AlMarri et al. find both a substantively and statistically significant difference in the scores on the S-MPBS as their "discriminant function successfully classified 71% of participants" (ibid, 422). These finding are of special

relevance for this study as their findings indicate that alcohol consumption is likely to be a fairly good proxy to measure Islamic practice.

Jana-Masri and Priester (2007) developed a Quran based Islamic scale of religiosity of which the included items were reviewed by an Imam to ensure the validity of the items. The final scale consisted of 19 items of which 10 items were related to Islamic behavioural practice while the other items were related to Islamic belief. These items, apart from including actions to be performed, also included items relating to abstaining from certain un-Islamic behaviour such as the items "I gamble", "I drink alcohol" and "I smoke cigarettes" (ibid, 188).

For reasons indicated before, this study will not include a dimension of belief and a dimension of practice, but rather only focus on practice. It will present a single dimensional scale with four items. Higher scores on each item reflect a higher degree of Islamic practice. Table 3 provides for an overview of the indicators this paper adopts to measure Islamic practice.

Table 3: Dimensions and indicators of Islamic Practice

Dimension	**Islamic Practice**
Indicators	Testimony of Islamic belief (*Shahada*)
	Prayer
	Giving alms (*Zakat)*
	Fasting the month of Ramadan (*Ramadan)*

3.2 Operationalization and Measurement[2]

For data collection this study draws on a number of different sources. The data on the degree to which Islam is practiced is derived from surveys conducted by the Pew Research Centre. Data derived from the World Values Survey and the World Health Organization will be used to check for the reliability of this data. Furthermore, UN demography data is used to measure the proportion of Muslims as part of the total population in a country.

[2] Rstudio is used for all statistical inference in this paper, the exact R-script and the relevant data sets are available upon request.

Pew used stratified probability sampling to arrive at samples representative for the national adult Muslim population of each country included in the data set. Bosnia-Herzegovina, Russia and Thailand are exceptions to this and have been highlighted in Appendix A. Appendix A provides for an overview of the sample size and margin of error for each country. The margins of error are provided with a 95% confidence interval (Pew Research centre, 2012). The objective of the employed Pew survey was to "gauge and compare beliefs and attitudes of Muslims", therefore, only data for Muslim respondents in the participating countries is included in the data set (ibid.). Table 4 below provides an overview of the indicators and how they are operationalized.

Table 4: Items & Operationalization

Indicators	****Operationalization**	**Data source**
Testimony of Islamic belief (Shahada)	% of Muslims in a country that testifies the Shahada	Pew Research Centre (2012)
Prayer (based on dichotomous prayer variable)	% of Muslims in a country that pray several times a day	World Values Survey (WVS) (2010-2014), Pew Research Centre (2012)
Prayer (based on ordinal prayer variable)	*Average score for the prayer variable in a country rescaled to 0-100	Pew Research Centre (2012)
Fasting the month of Ramadan (Ramadan)	% of Muslims in a country that fast the month of Ramadan	Pew Research Centre (2012)
Giving alms (Zakat*)*	% of Muslims in a country that that give alms	Pew Research Centre (2012)
*Note: for scores see table 5 below **Based on a representative sample of Muslims in each country		

Measures for all Islamic pillars of Islam have been included except for the pilgrimage to Mecca. The pilgrimage has to be performed by every Muslim once in their life time if they are able to perform it. However, the feasibility of travelling to Mecca depends on many factors such as health and wealth. Moreover, in most countries there is a yearly quota on the number of pilgrims which prevents Muslims from going although they would have wanted to go

(Soloway, 2015). Finally, the distance from Saudi Arabia is a factor that might affect the number of people who go for pilgrimage to Mecca from a given country.

For our indicators data is only available for a limited number of countries between 2011 and 2012. This study aims to provide for a solution to this by introducing an alternative proxy measure of Islamic Practice in chapter 4.

3.2.1 Summary statistics

This study proposes to adopt a scaling technique inspired by Guttman scaling (Guttman, 1944). This study aims to determine relatively "hard" and relatively "easy" indicators in order to construct a pattern of expected responses. For example it is expected that praying several times a day is a relatively hard indicator, while the testimony of Islamic belief is relatively easy. Therefore, someone who performs several prayers every day is expected to also testify to the Shahada while the opposite is not true. In table 5 below an overview of the item descriptions and answer categories is provided.

Table 5: Item description & Answers (Pew, 2012)

Item	Description	Answers
Shahada	Which, if any, of the following do you believe? In one God, Allah, and his prophet Muhammed?	Yes (=1) No (=0)
Zakat	Do you give [In Iran: khoms; In all other countries: Zakat], that is give a set percentage of your wealth to charity or the mosque?	Yes (=1) No (=0)
Prayer	People practice their religion in different ways. Outside of attending religious services, do you pray several times a day, once a day, a few times a week, once a week, a few times a month, seldom, or never?	Several times a day (=7) Once a day (=6) A few times a week (=5) Once a week (=4) A few times a month (=3) Seldom (=2) Never (=1) OR for dichotomous prayer variable: Several times a day (=1) All other answers (=0)
Ramadan	Do you fast, that is avoid eating during the daytime, during the holy month of Ramadan?	Yes (=1) No (=0)

In tables 6 and 7 this paper provides an overview of the summary statistics of the scale items aggregated to the country-level. The first Box Plot displays the variables as proportions of Muslims that perform the Shahada, Zakat and Ramadan in a given country. On an individual level these are all dichotomous variables, hence, one either performs gives Zakat or not. The prayer variable, however, is an ordinal variable, as one could pray several times a day, once a week etc. Therefore, the items are rescaled to reflect as score from 0-100.

Table 6: Scale Items and Summary statistics (rescaled and based on ordinal prayer variable)

Item	Minimum	1st Quintile	Median	Mean	3rd Quintile	Maximum
Shahada	0.00	84.55	92.53	83.64	95.99	100.00
Zakat	0.00	69.46	85.81	73.91	94.58	100.00
Prayer	0.00	36.03	64.31	57.42	81.40	100.00
Ramadan	0.00	54.43	62.40	60.80	76.07	100.00

In the second Box Plot below the items are not rescaled as the prayer variable has been recoded. The answer "several times a day" becomes "1", while all other responses are coded "0".[3] The variable is recoded this way, as the Islamic prescription of prayer is to perform 5 prayers a day. Therefore, anyone who only prays once a day or less cannot be said to have completely fulfilled this pillar of Islam. The variables are not rescaled in this case, as the variables can now be intuitively interpreted as the proportion of Muslims that fulfil a certain pillar in a given country.

We use the data summarized in table 5 to construct an Islamic Practice Index (IPI) as the ordinal prayer does not allow for an examination of the response patterns as inspired by the Guttman scaling technique to construct a scale. The data summarized in table 6 on the other hand is used to construct the Islamic practice Scale (IPS), as this data set includes a dichotomous prayer variable. The individual-level data is aggregated to country-level data by calculating the proportion of Muslims in the sample who observes a practice for each of the four items in our scale. As previously indicated the samples surveyed are representative for the Muslim populations in the participating countries.

[3] Appendix D offers an overview of the possible responses to the WVS and Pew survey questions regarding prayer.

Table 7: Scale Items and Summary statistics (based on dichotomous prayer variable and not rescaled)

Item	Minimum	1st Quintile	Median	Mean	3rd Quintile	Maximum
Shahada	70.36	95.59	97.68	95.29	98.89	100.00
Zakat	37.03	70.61	75.93	74.10	81.85	98.51
Prayer	3.87	39.93	63.38	55.05	77.34	86.74
Ramadan	28.18	76.82	88.04	80.37	95.31	99.41

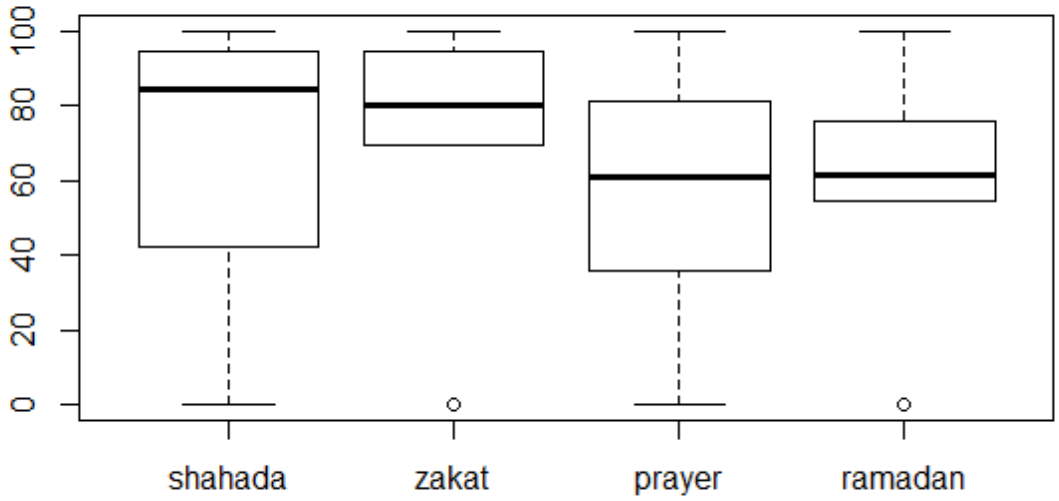

Figure 1: Box Plot of Rescaled Items (prayer based on ordinal prayer variable)

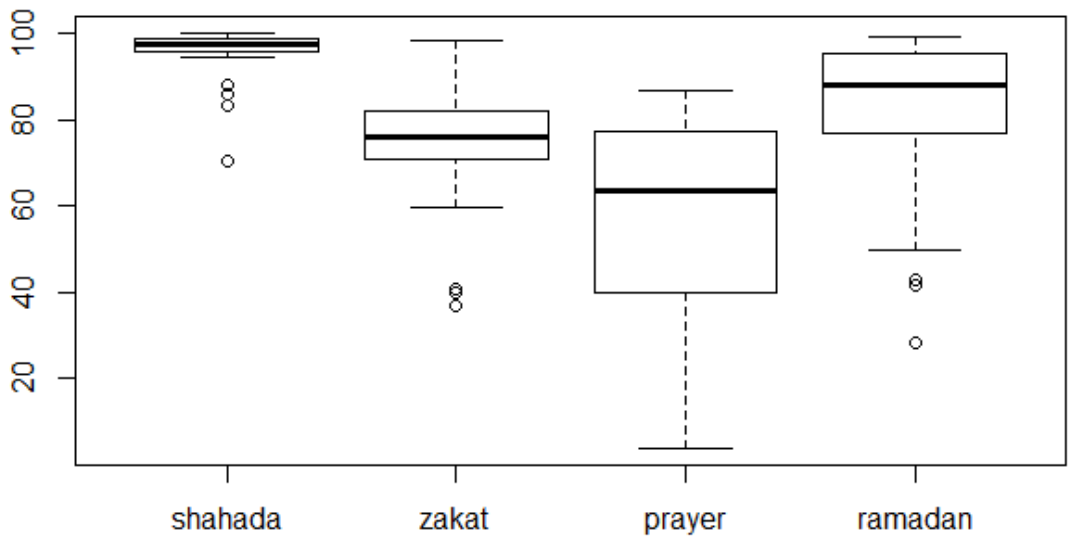

Figure 2: Box Plot of Items (prayer based on dichotomous prayer variable)

The Box Plot in figure 2 above shows that most of the variables are not normally distributed. Only the prayer variable approaches a normal distribution. The Box Plot also indicates that there is a ranking possible between “hard” and “easy” variables. Shahada and Ramadan can be identified as relatively easy variables, while prayer and Zakat are relatively hard variables.

3.2.2 Response patterns and scaling

In order to get a better view of the hard and easy variables the data set with the individual responses to the questions regarding Shahada, Zakat, Ramadan and Prayer is examined. The data set with the dichotomous prayer variable is used for this purpose. Table 8 below provides for an overview of the 5 largest response patterns in the data. Table 9 shows how the data set looks like.

Table 8: Largest Response patterns (individual-level data)

Response pattern*	1111	1110	1011	1010	1000
N observations	13570	6675	2248	2189	1863
Total number of observations: 30418 *Note: Order from left to right: Shahada, Zakat, Ramadan, Prayer.					

Table 9: Data set (first 6 rows)

Row	Shahada	Zakat	Ramadan	Prayer
1	1	0	1	0
2	1	1	1	0
3	1	0	0	0
4	1	0	0	1
5	1	0	1	1
6	1	0	1	0

1 = Yes

0 = No

Hence, the most frequent pattern is that all four Islamic pillars are practiced. It occurs in none of the 5 largest response patterns that someone fasts the Ramadan, prays several times a day or pays Zakat without testifying the Shahada. This is in line with what was argued before. The table below shows the results of three IITA algorithms in which "competing binary relations are generated, and a fit measure is computed for every relation in order to find the quasi order that fits the data best" (Ünlü, A., & Sargin, A., 2010, 6).

Table 10: Inductive Item Tree Analysis

Algorithm	**quasi order**
Minimized corrected IITA	(1L, 2L), (1L, 3L), (1L, 4L), (3L, 2L), (3L, 4L)
Original IITA	(1L, 2L), (1L, 3L), (1L, 4L), (3L, 2L), (3L, 4L)
Correct IITA	(1L, 2L), (1L, 3L), (1L, 4L), (3L, 2L), (3L, 4L)

All three algorithms indicate the exact same binary relationships. Namely, Shahada (item 1) is implied by Zakat (item 2) Ramadan (item 3) and Prayer (item 4). Ramadan is a slightly "harder" item and is implied by Zakat and Prayer. Zakat is harder than Ramadan and implied by the Prayer item. Finally, the prayer item is the hardest variable and implied by none of the other items.

The Rasch model is fit to further examine the difficulty of the items in our data set. An overview of the results is provided in table 11 below.

Table 11: Item Difficulty based on Rasch Model

Items	Dffclt	Dscrmn	P(x=1|z=0)
Shahada	-2.4861880	1.906606	0.9913386
Ramadan	-1.3859674	1.906606	0.9335468
Zakat	-1.0345979	1.906606	0.8778869
Prayer	-0.5244923	1.906606	0.7310586
Note: The values in column 1 denote the difficulty of each items, a lower value indicates lower difficulty. The values in column 2 show how steeply a positive response of individuals changes with their ability, the model assumes this to be equal across the items.			

The Rasch model is probalistic as opposed to the deterministic Guttman scale and examines the likelihood that a certain pattern arises. The third column in table 11 "denotes the probability of a positive response to the *i*th item for the average individual." (Rizopoulos, D., 2006, 7). In other words there is, for instance, a probability of more than 99% that the average individual testifies the Shahada.

In order to take the differences in strength of the indicators into account weights are assigned to the different items based on this analysis. If we would attribute equal weight to Shahada and items that imply Shahada we would count the practice of Shahada double which would make our scale less accurate. Therefore, the items in the scale are assigned weights based on their level of difficulty. Thus, Shahada has the lowest weight and Prayer the highest weight. The weights are determined based on the probability estimates from the Rasch model. The individual scale weights are calculated as follows:

$$\frac{(\mathbf{1}-\boldsymbol{P})}{\sum(\mathbf{1}-\boldsymbol{P}\,\boldsymbol{i})}$$

Where $\boldsymbol{P}$ denotes the probability of a positive response for the scale item for which the weight is calculated, and $\boldsymbol{Pi}$ represents the probability for each of the individual scale items.

Table 12: Scale Weights

Items	Shahada	Ramadan	Zakat	Prayer
Weight	0.01857995	0.14255170	0.26195022	0.57691812

3.3 Methodology: Confirmatory Factor Analysis

The method that is used to test the IPS is primarily based on confirmatory factor analysis (CFA). This entails that a deductive approach is adopted to arrive at the items that are included in the scale as opposed to the inductive approach that is used in exploratory factor analysis (EFA). The relationship between the four items included and Islamic practice is grounded in the Islamic literature as they are mentioned in the most authoritative hadith collections of the Islamic tradition and are universally accepted by both Sunni and Shia Muslims across the world (Oxfordislamicstudies.com, 2017**)**). Hence, the selection of four of the five pillars of Islam is based on their face validity and a strong grounding in the Islamic

literature as indicators of Islamic practice. Moreover, the validity of all four indicators has been previously tested in scales of Islamic religiosity as indicated in section 3.1.

In order to test whether these items also constitute a coherent scale as a country-level measure, some of the statistical methods related to CFA are used. Schreiber et al. (2006, 323) introduce CFA as a theory driven confirmatory technique. Thus, the selection of the variables is theoretically driven and the CFA method is used to statistically test the constructed model. CFA allows one to test whether observed variables can explain a concept that cannot be measured directly. The theoretical relationship between our four observed variables and the unobserved variable "Islamic Practice" is displayed in figure 3 below. We use a single-factor model as this paper argues that Islamic practice has a single dimension and the four observable variables are expected to sufficiently explain the proposed concept of Islamic practice.

Jackson et al. (2009, 6) add that CFA is used "for developing and refining measurement instruments, assessing construct validity, identifying method effects, and evaluating factor invariance across time and groups." This paper uses CFA to assess the construct validity of the adopted concept of Islamic practice which further informs the development of the country-level Islamic practice scale that this study aims to construct.

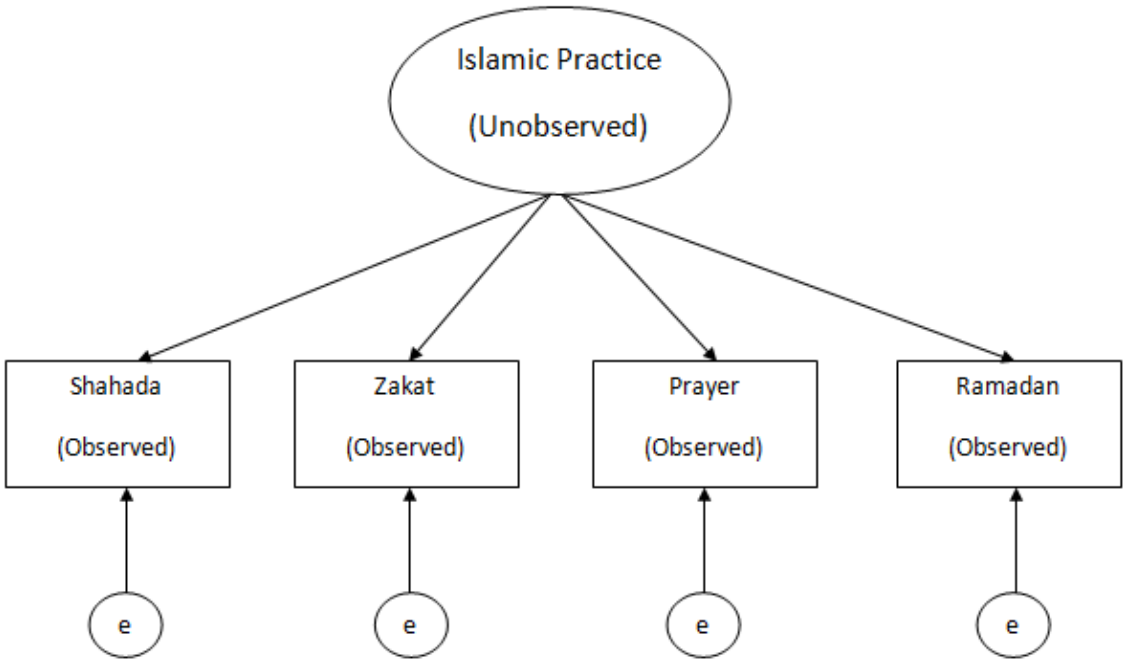

Figure 3: Confirmatory Factor Analysis

Note: e = error term

The sample size of the presented scale is relatively small, namely N=25 (countries). This is nonetheless justifiable due to the small number of items included in our scale and the high degree of intercorrelation, which is presented in figures 4 and 5. Hinkin et al. (1997, 8-9) state that the sample size necessary for robust results depends on the number of items to be assessed. They mention that recommendations for item-to-response ratios vary from 1:4 to 1:10 for a set of scales that will be factor analyzed under the condition that intercorrelations are strong (ibid.). The matrix in figure 4 is based on the rescaled aggregated items and the ordinal prayer variable. The items in figure 5 are not rescaled and the included prayer item is based on the dichotomous prayer variable.

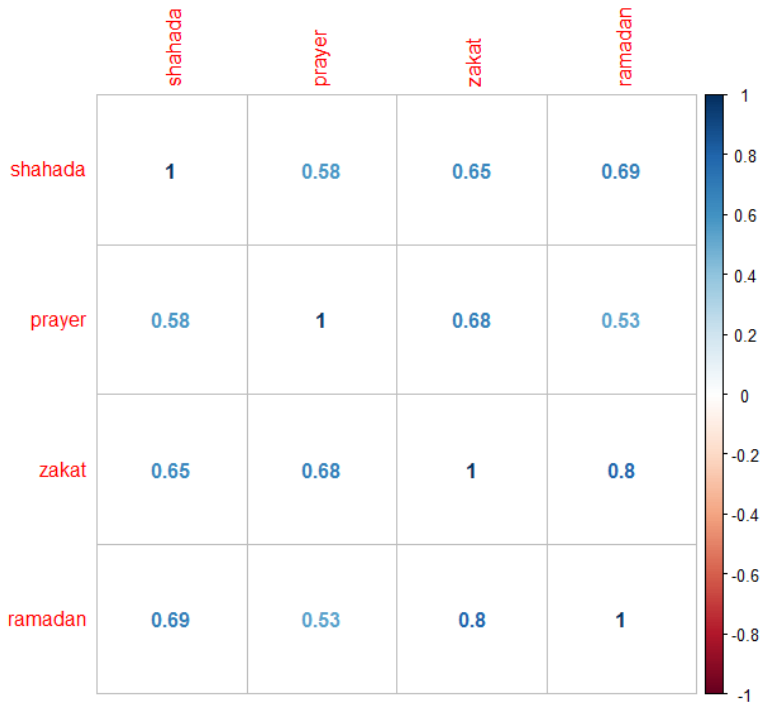

Figure 4: (Pearson) Intercorrelation Between Scale Items (prayer based on ordinal prayer variable)

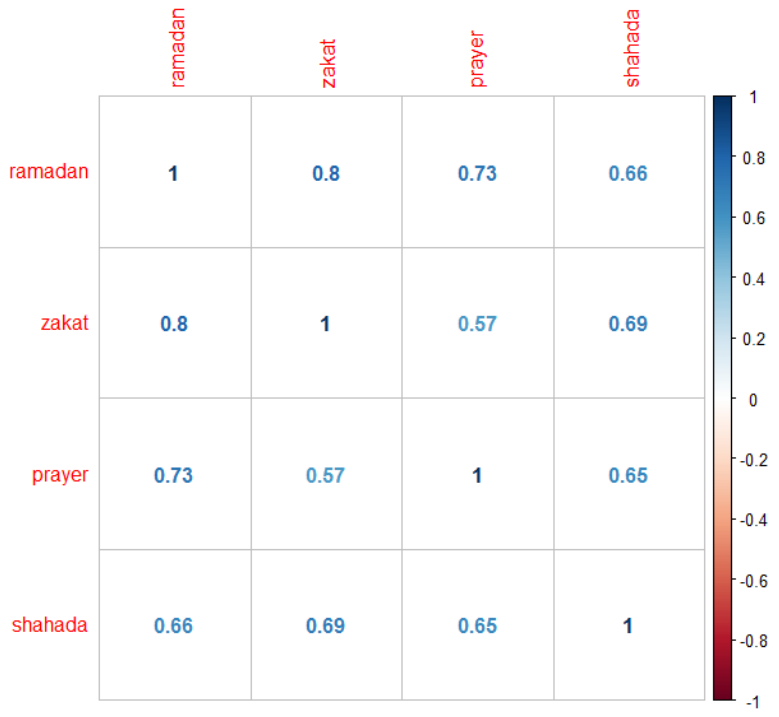

Figure 5: (Pearson) Intercorrelation Between Scale Items (prayer based on dichotomous prayer variable)

3.4 CFA results

Jackson et al. (2009, 19) indicate that for CFA a minimal set of fit indices to be reported includes "the chi-square value and the associated degrees of freedom and probability value, an index to describe incremental fit, such as the TLI, CFI (or RNI), or Bollen's delta 2, and a residuals-based measures (e.g., RMSEA and its associated confidence intervals or SRMR)".

Maximum Likelihood (ML) and Robust ML (MLR) estimation are used for the CFA. The relevant chi-square statistics, the TLI and CFI and the SRMR values are reported below. The MLR values are reported in order to account for the normality violations in the data and the small sample size as Li (2015, 936) indicates that "Robust ML (MLR) has been introduced into CFA models when this normality assumption is slightly or moderately violated" and he

finds that MLR performs better than weighted least squares means and variance adjusted (WLSMV) in estimating standard errors in cases with a small sample size and non-normal latent distributions.

The Chi-square statistic is used in CFA to examine the fit of a model. A smaller statistic generally indicates a better fit. Hinkin et al. (1997, 10) further indicate that a Chi-square statistic two or three times the degrees of freedom is regarded as acceptable and a non-significant chi-square statistic is preferred.

The table below provides the results of the CFA. The table displays two goodness-of-fit indicators, namely the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI). Hu and Bentler (1999, 27) advice a comparative fit index value higher than .95, they furthermore comment that their results suggest a cut-off value close to .95 for TLI for a reasonably good fit between the theorized model and the data observed. Schreiber et al. (2006, 327) similarly suggest cut-off values of .95 for both the TLI and CFI and they mention that for the root mean square residual (SRMR) a value below .08 has been recommended. For the first model based on the ordinal prayer variable we see that the CFI value is higher than .95 which thus indicates a good model fit. The TLI value is slightly below .95 and therefore acceptable. The SRMR value is 0.036 and thus also below the recommended value of 0.08. The chi-square statistic is insignificant, as preferred.

For the second model based on the dichotomous variable, all indices indicate values as recommended, except for the TLI with a value 0.867 which is below the recommended cut off value of 0.95. However, the TLI is underestimated for small sample sizes (Herzog, W., & Boomsma, A., 2009, 20). Therefore, despite the lower TLI we prefer the second model over the first model. This is because this paper accounts for the difficulty of the items in the second

model based on the response patterns. Moreover, the CFI, another goodness of fit index, does satisfy the recommended cut off value.

Table 13: Fit Indices for CFA Models

Model	Estimator	χ2(p)	Df	SRMR	CFI	TLI	N
(1) Single-factor model (4 items) (ordinal prayer variable)	Maximum Likelihood (ML)	0.196	2	0.031	0.977	0.930	25
	Robust ML (MLR)	0.174	2	0.031	0.974	0.923	25
(2) Single-factor model (4 items) (dichotomous prayer variable)	Maximum Likelihood (ML)	0.113	2	0.033	0.960	0.881	25
	Robust ML (MLR)	0.076	2	0.033	0.956	0.867	25

3.5 Reliability & Internal consistency

The reliability and internal consistency of the two models were tested using the widely used Cronbach's Alpha statistic. According to Bonett and Wright (2015, 1) "Cronbach's alpha reliability describes the reliability of a sum (or average) of q measurements where the q measurements may represent q raters, occasions, alternative forms, or questionnaire/test items." Our measurement reflects multiple test items and therefore we use Cronach's alpha as a measure of internal consistency. The Cronbach Alpha values of .88 and .83 indicate that all items on the one-dimensional scale appear to measure the same latent variable. Table 14 and 15 provide an overview of Cronbach's Alpha statistics for the Islamic Practice Index (IPI) and the Islamic Practice Scale (IPS), respectively.

Table 14: Cronbach's alpha & Reliability if an Item is Dropped (prayer based on ordinal prayer variable)

Internal consistency	Islamic Practice Index Items	Standard alpha	Alpha SE	Average R
(α = .88) 95 CI-interval: (.64, 1.11)	Shahada	0.86	0.16	0.67
	Zakat	0.82	0.18	0.60
	Ramadan	0.84	0.17	0.63
	Prayer	0.88	0.16	0.73

Table 15: Cronbach's alpha & Reliability if an Item is Dropped (payer based on dichotomous prayer variable and items are weighted)

Internal consistency	Islamic Practice Scale Items	Standard alpha	Alpha SE	Average R
(α = .83) 95 CI-interval: (.76, .91)	Shahada	0.87	0.048	0.70
	Zakat	0.86	0.047	0.68
	Ramadan	0.84	0.073	0.64
	Prayer	0.88	0.039	0.72

To further test the reliability of the four items included in the Islamic practice measure, conduct correlation analyses are conducted between the Pew Prayer variable and a prayer variable derived from the WVS. This analysis comes with several limitations. First, only 15 out of the 25 countries that are used for the prayer indicator are also covered by the WVS which increases the problem of a small sample size. Also, the questionnaires performed by the Pew research centre were only directed at a sample of Muslims in each country, while the questionnaires of the WVS were directed at samples from the whole population of a country independent from religion. Finally, the answers to the questionnaires of the WVS and Pew differ. However, this is taken into account by recoding both the Pew and WVS prayer variables to dichotomous variables, where praying several times a day is "1" in both cases and all other answers are coded to "0." Keeping in mind these limitations, the correlation matrix below shows the correlation between prayer variable form the WVS and the prayer variable extracted from the Pew data set.

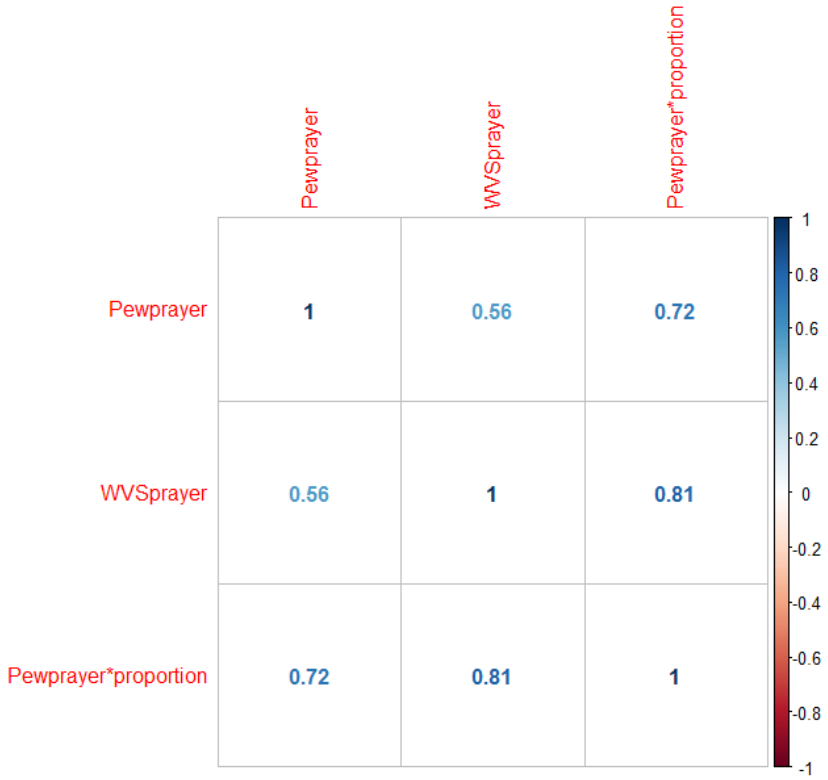

Figure 6: (Pearson) Correlation Between Pew prayer variable and WVS prayer variable (N=15)

The correlation between the prayer variables of the Pew research centre and WVS is 0.56 is low considering that these variables are supposed to measure the same concept. To control for the variation in proportions of Muslims across countries an interaction variable between the Pew prayer variable and the proportion of Muslims in a country is included. The interaction increases the correlation between both variables to 0.81. Further tests of the reliability of the prayer variable are conducted using regression analysis in chapter 4. Also the construct validity of the constructed scale is tested by examining its relationship with a variable that is expected to be directly related to Islamic practice in chapter 4.

3.6 The Islamic Practice Scale (IPS)

Table 16: Islamic Practice Scale[4][5]

Ranking	Country	IslamicPractice Scale (IPS)
#1	Malaysia	86.87159
#2	Indonesia	86.37902
#3	Iraq	86.01516
#4	Thailand[6]	85.01800
#5	Morocco	84.40665
…		
#21	Russia[7]	39.97303
#22	Kyrgyzstan	39.83208
#23	Uzbekistan	37.91150
#24	Albania	22.38810
#25	Kazakhstan	17.49507

The Islamic practice scale presented above is thus based on survey data that is representative of the Muslim populations in 25 countries. The sample of countries includes countries from different geographical areas; countries with Muslim populations in the Middle East, Africa, Southeast Asia and Central Asia are represented. The value for each country is based on the proportion of Muslims that practice four out of the five Islamic pillars in each country. This scale accounts for differences in difficulty amongst variables based on Rasch model as explained in section 3.2.2.

[4] This scale does not take into account the proportion of Muslims in a country.
[5] Appendix B provides the full data set of the IPS.
[6] Sample of Muslims are not representative for all Muslims in Thailand and Russia, see Appendix A for further details.
[7] Ibid.

Table 17: Islamic Practice Index (IPI)[89]

Ranking	Country	Islamic Practice Index (IPI)
#1	Indonesia	95.88492
#2	Malaysia	95.31613
#3	Thailand[10]	94.96183
#4	Morocco	94.75393
#5	Palestinian Territories	91.65092
…		
#21	Kyrgyzstan	71.52004
#22	Uzbekistan	70.31516
#23	Russia[11]	63.30535
#24	Albania	53.58825
#25	Kazakhstan	51.68934

Table 17 above presents the IPI which includes the same countries as the IPS. The IPI differs from the IPI in three aspects. Firstly, the prayer variable adopted in the IPI is ordinal and therefore represents a larger variety of answers to the question how often people pray. Secondly, the weights of the variables in the IPI are not adjusted to the difficulty of the items. This is because we were unable to compare the response patterns due to the ordinal nature of the prayer variable. Therefore, all items have equal weights in the IPI. Finally, as indicated before all items in the IPI are rescaled from 0 to 100 as this had to be done for the prayer item as it does not represent the proportion of Muslims that pray in a country.

[8] This index also does not take into account the proportion of Muslims in a country
[9] Appendix C provides the full data set of the IPI.
[10] Ibid.
[11] Ibid.

4. An Alternative Measure of Islamic Practice: Alcohol

> **"Ibn 'Umar, through another chain of transmitters; reported Allah's Messenger (ﷺ) having said this:** Every intoxicant is Khamr and every intoxicant is forbidden." **(**Sunnah.com, 2017**)**

4.1 Theoretical foundation & Operationalization

The constructed Islamic practice scale has only data available for 25 countries. In order to allow for large-N cross national comparisons a proxy measure of Islamic practice is presented that is available for a much larger number of countries. The proxy measure is based on alcohol consumption in litres per country. Perhaps "proxy" is not the right word for a measure based on alcohol as it is directly related to Islamic practice. However, instead of measuring affirmative Islamic practice, alcohol consumption measures negative Islamic practice. Consuming alcohol is prohibited in Islam and categorized as a major sin (ibid.). Therefore, a higher alcohol consumption rate indicates a lower degree of Islamic practice.

To measure alcohol consumption we use country-level data on per capita alcohol consumption provided by the World Health Organization (WHO). Table 18 provides for an overview. The Box Plot in 7 shows that the distribution of the Alcohol variable is right-skewed, this is probably due to the small sample size (N=23). This is 2 observations less than for the IPS and IPI as there is no data available on alcohol consumption for the Palestinian territories and Kosovo.

Table 18: Operationalization of Alcohol

Indicator	Operationalization	Data source
Alcohol consumption	Yearly Alcohol consumption per capita in litres	WHO (2016)

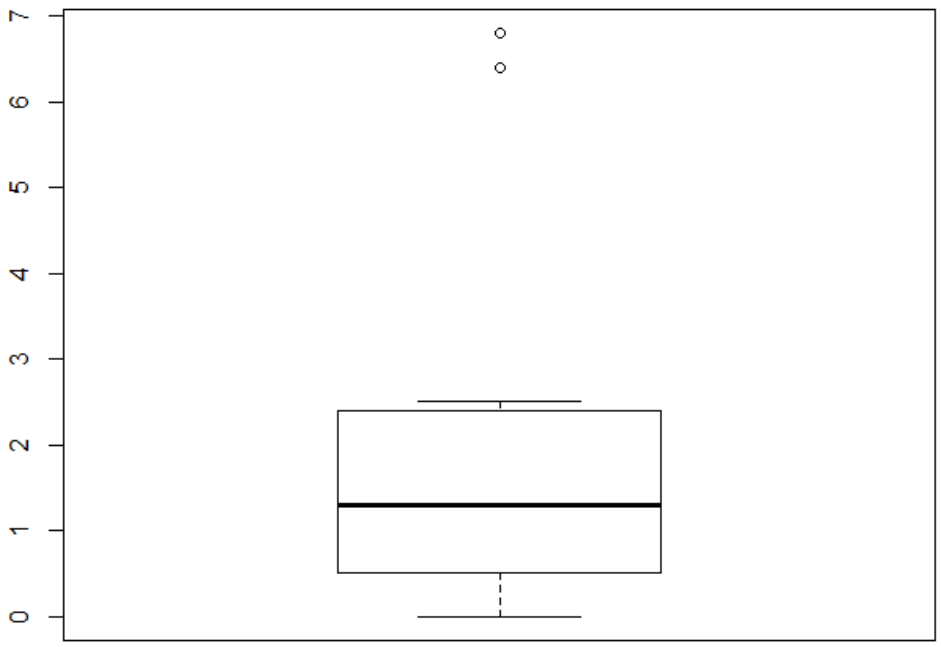

Figure 7: Box Plot Alcohol Consumption

4.2 Results

Figure 8 below shows that this proxy variable is, as expected, negatively correlated with all of the items in the IPS. The correlation between the IPS and alcohol consumption becomes even stronger if when an interaction variable between alcohol consumption and the proportion of Muslims is created. Theoretically this makes sense, as the country-level alcohol consumption will be distorted by non-Muslims who consume large amounts of Alcohol and we are only interested in the degree that Islam is practiced by Muslims. The correlation with the Zakat variable is the weakest with a correlation of 0.41. The variable is negatively correlated with negative correlation coefficients of 0.58 and above for all other Islamic practice items. Interestingly, the correlation between the proportion of Muslims in a country and the IPS

items is very low. This confirms the argument that a variable that measures the proportion of Muslims in a country is not reflective of the degree to which Islam is practiced in a given country. Moreover, these results suggest that the alcohol consumption variable is reflective of the degree of Islamic practice while not facing the problems of a small sample size. The alcohol consumption variable does correlate with the proportion variable. This makes intuitive sense as *generally* a higher proportion of Muslims in a country is expected to result in lower alcohol consumption. However, this is not always the case as for instance Kazachstan with a proportion of Muslims of 56.4% has a higher alcohol consumption rate than Thailand where the proportion of Muslims is only 5.8% of its population (UN data, 2017; WHO, 2016).

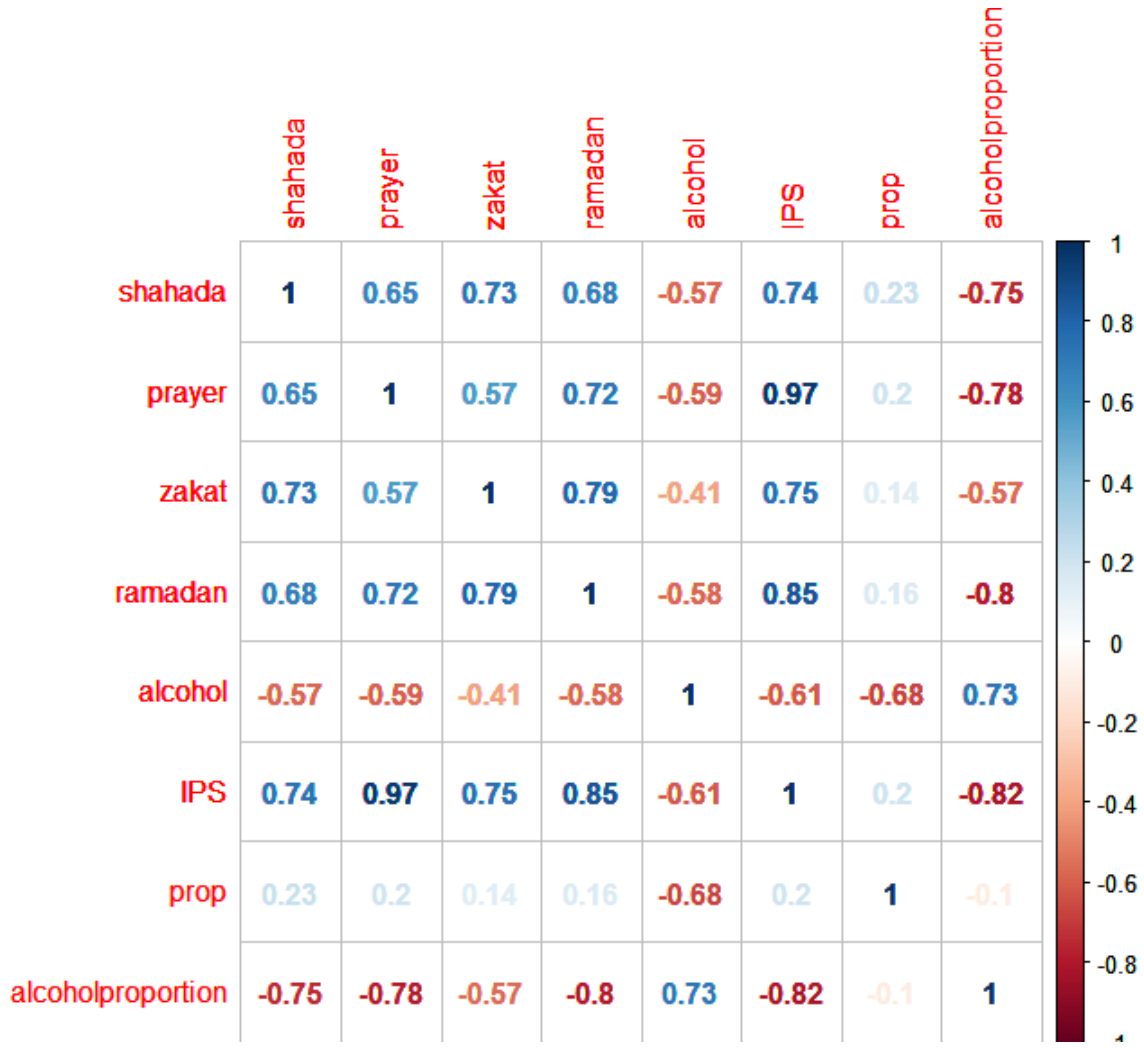

Figure 8: (Pearson) Correlation Matrix Alcohol (N=23)

The table below shows the five highest and lowest ranking countries based on alcohol consumption. Thailand ranks very low due to the small proportion of Muslims in Thailand. A direct comparison between the alcohol proxy, the IPS and the variable that measures the proportion of Muslims in a country is difficult for a couple of reasons. Section 4.3 further discusses and explains how these three variables relate to each other.

Table 19: Alcohol Consumption and IPS[12]

Ranking	Country	Alcohol	IPS
#1	Algeria	0.0	58.83865
#2	Indonesia	0.0	78.42117
#3	Niger	0.0	69.68845
#4	Bangladesh	0.1	83.38680
#5	Iran	0.1	86.37902
…			
#19	Iraq	2.5	39.97303
#20	Uzbekistan	4.6	44.81736
#21	Tunisia	4.9	22.38810
#22	Malaysia	6.4	85.01800
#23	Turkey	6.8	17.49507

To further test the relationship between the different measures of Islam this paper conducts regression analyses. For this purpose weighted least squares regression (WLS) is used as the sample size of our sample is too small and does not fulfil the OLS regression assumptions. Willett and Singer (1988, 237) explain that WLS regression corrects for homoskedasticity in the random errors by minimizing the sum of squared residuals. Therefore, the R^2 value as a measure of fit is not provided for WLS regression by most statistical packages including the one we use. For that reason, a modified estimator for WLS regression as provided by Willet and Singer (1988, ibid) is used to calculate a pseudo R^2WLS statistics. However, one must be cautious to interpret this value as the R^2 obtained under WLS regression is usually much higher than the R^2 obtained for a similar model under OLS regression (ibid.). Willett and Singer (ibid.) interpret the R^2WLS statistic as " a measure of the proportion of the variation in *weighted* Y that can be accounted for by *weighted* X, and is the quantity that is output as R^2

[12] Appendix E offers the IPS data set including the alcohol variable.

by the major statistical computer packages when a WLS regression is performed". The manually calculated R^2 statistic under OLS regressions is also provided as an indication.

Table 20: WLS Regression Results

	Islamic Practice Scale (IPS)				Pew prayer
			WLS		
	(1)	(2)	(3)	(4)	(5)
Alcohol	-8.070***	-	3.978	-10.343***	-
	(1.3378)		(3.579)	(2.311)	
Proportion	-	0.135	-0.237	-0.320*	-
		(0.163)	(0.188)	(0.149)	
WVS prayer	-	-	-	-	0.569**
					(0.227)
Alcohol:Proportion	-	-	-0.231***	-	-
			(0.054)		
Pseudo R^2WLS	0.68	0.36	0.91	0.82	0.45
R^2 (OLS)	0.33	0.035	0.71	0.29	0.30
Residual SE	0.74	20.81	8.32	11.98	21.35
df	21	22	11	12	13
Observations	23	24	23	23	15

Note: *p<0.1; **p<0.05; ***p<0.01

The WLS regression results in table 20 above largely confirm the relationships that have been indicated by the correlation analysis. Alcohol consumption per capita has a statistically substantive and significant relationship with IPS. For every one increase in litres per capita alcohol consumption in a country the average estimated decrease on the IPS is 8 points. The proportion variable is not correlated with the IPS which confirms that a variable that measures the proportion of Muslims in a country does not reflect the degree of Islamic practice in that country.

The alcohol consumption variable measures the average alcohol consumption of a country independent from the proportion of Muslims and the IPS only measures the degree of Islamic

practice of Muslims. Therefore, in model 3 an interaction variable between alcohol consumption and the proportion of Muslims is included. As expected, this results in a significant increase in the measure of fit, as the Pseudo R^2 indicates that 91% of the variation in the weighted IPS variable can be explained by the weighted interaction variable between alcohol consumption and the proportion of Muslims. Finally, model 5 indicates that there is a statistically and substantively significant relationship between the Pew Prayer and WVS prayer variables. When the proportion of people who pray several times a day as measured by the WVS variable increases with 1 the average estimated increase of the proportion of Muslims who pray several times a day as measured by the Pew variable is 0.57. These findings suggest that, taking into account the limitations of this comparison, the Pew variable for prayers is reasonably reliable.

4.3 Analysis and Discussion

To better understand why and how the proportion, IPS, and alcohol variables are correlated this paper identifies four broad categories of countries based on their "Islamicness". Table 21 provides for an overview of these categories and examples of countries that fit in the different categories.

Table 21: Types of Islamic Countries

	High proportion of Muslims	**Low proportion of Muslims**
High degree of Islamic Practice among Muslims	**Type 1** Morocco, Malaysia (low per capita alcohol consumption)	**Type 2** Thailand (high per capita alcohol consumption)
Low degree of Islamic Practice among Muslims	**Type 3** Uzbekistan, Kazachstan (high per capita alcohol consumption)	**Type 4** Russia (high per capita alcohol consumption)

Countries of type 1 are most Islamic based on these indicators as they score high on all three indicators. Countries of type 2 have a small community of highly practicing Muslims. Therefore, depending on the degree of influence this minority of Muslims has, a country of type 2 may be regarded as more or less Islamic. Countries of type 3 have a large community of Muslims that only practice their religion to a small extent. Finally, countries of type 4 are least Islamic and have a small community of Muslims that only practice their religion to a small extent. A problem that arises when the proportion of Muslims in a country is used as the only measure of Islam is that it is impossible to distinguish between countries op type 1 and

type 3, while in countries of type 1, Islam is likely to have a more substantial influence on the country and its institutions. The alcohol variable does distinguish between type 1 and type 3 countries, but not between type 3 and type 4, whereas countries of type 3 are arguably more Islamic than countries of type 4. Therefore a combination of the proportion and alcohol variables would reflect the degree of Islamicness better than any of these two variables separately, as it would be able to differentiate between countries of type 1, 2 and 3. However, the combination of the alcohol and proportion variables would still not be able to distinguish between a type 2 and type 4 country as both types have a low proportion of Muslims and high per capita alcohol consumption.

Therefore, this paper recommends that the IPS is combined with the proportion variable in order to best reflect the differences between the "Islamicness" of different countries. The combination of the IPS and proportion variable is able to distinguish between all four different types of countries.

6. Limitations & Discussion

> "Abu Hurayra said, "The Prophet, may Allah bless him and grant him peace, was asked, 'Messenger of Allah! A certain woman prays in the night, fasts in the day, acts and gives sadaqa, but injures her neighbours with her tongue.' The Messenger of Allah, may Allah bless him and grant him peace, said, 'There is no good in her. She is one of the people of the Fire.' They said, 'Another woman prays the prescribed prayers and gives bits of curd as sadaqa and does not injure anyone.' The Messenger of Allah, may Allah bless him and grant him peace, said, 'She is one of the people of the Garden.'" (Sunnah.com, 2017)

6.1 Measuring Islam?

The title of this study suggests that we are measuring Islam with the constructed scale. This is slightly nuanced in the subtitle which specifies Islamic practice. In this paragraph we add further nuance and point out some pitfalls that one may fall into when trying to measure this concept. One specific problem with our model specification is that we have not taken into account that the ability of people to pay the Zakat or fast the month of Ramadan. The proportion of people that are willing but unable to fulfil these practices is likely to vary across countries. Poorer countries are expected to have higher proportions of people that are willing but not able to pay the Zakat, and of people that are willing but not able to fast the month of Ramadan due to health problems. Moreover, the description of the different Islamic pillars in the Pew survey is limited, as for example fast during the Ramadan is described as "avoid eating during the daytime" (Pew Research Centre, 2012). This description misses many important aspects of fasting during the Ramadan of which the most obvious is probably that Muslims are then also not allowed to drink during the daytime (Fasting, 2003). The narration at the beginning of the chapter shows that from an Islamic perspective someone who appears to observe more prayers still can be less Islamic than someone who observes fewer prayers.

Ultimately, we are thus unable to accurately judge which persons or countries are more Islamic than others.

6.2 Sample Size & Time dimension

As has been repeatedly mentioned, the small sample size of the data set that is used is a limitation of this study. Nonetheless, countries of different areas are represented in the sample and this paper has aimed to account for the heteroskedasticity of the errors by conducting WLS regressions. The few number of sources on which our findings are based can also be a source of critique as the constructed data sets are primarily based on data from the Pew Research Centre. Hopefully, future surveys conducted by different institutes will resolve these issues by increasing both the scope of the data set and the number of sources. Another possible critique of the constructed Islamic Practice Scale database is its cross sectional nature. The data for the Prayer, Shahada, Zakat and Ramadan variables all come from a survey conducted by the Pew research centre between October 2011 and November 2012 (Pew Research Centre 2012). As indicated in the introduction this study aims to contribute to inter alia the new-institutionalist literature which aims to explain economic development by adopting institutions as a central explanatory variable. In order to infer causal relationships and study the causal chains that lead to economic development a study over time is necessary. This data set is nonetheless valuable in the study of economic development through institutions when Islamic practice is not very dynamic. However, there are examples known of countries where Islamic practice has changed over relatively short periods. For instance, Akcali (1998, 126-127) mentions that following the dissolution of the Soviet Union Islamic revival emerged in Uzbekistan, Tajikistan, Kirgizstan, Kazakhstan and Turkmenistan. He also mentions that such revivals, although to a lesser extent, have been observed in many other areas around the world (ibid.). Hence, a panel data set of the scale of Islamic practice would be required.

7. Conclusion & Implications

The influence of Islam and Muslims on political and economic developments around the world cannot be understated as Muslims make up an increasingly large share of the world population. Yet, until now, the empirical measures that have been adopted in cross-national studies to study Islam have been insufficient at best and plausibly fatally flawed. The construction of the IPS provides researchers with a more detailed variable that is reflective of Islamic practice on a country-level. This paper argues that the IPS is more accurate in reflecting the variable "Islam". The findings of this paper have several implications for our understanding of how to measure Islam on the country-level. Firstly, the assumption that seems to be made by those who adopt the population of Muslims as a measure for Islam on the country-level is that a higher proportion of Muslims equals a higher degree of Islamic practice. Our findings suggest that this assumption is incorrect, as we find no statistically significant relationship between the proportion of Muslims in a country and the IPS. Secondly and related, we argue that, based on the proportion of Muslims and the degree of Islamic practice observed by Muslims, one can distinguish four different types countries that vary in their degree of "Islamicness". To distinguish between all four types of countries we recommend that researchers combine the IPS with a variable that measures the proportion of Muslims in a country. Thirdly, to infer causal relationships between Islam and other variables such as economic and political development a panel data set of Islam is required as the degree of Islamic practice in a country may change over time. The IPS data set presented in this study is of a cross-sectional nature. To solve this issue in the short term we recommend that one uses alcohol consumption per capita as an alternative for the IPS as both measures are highly correlated and alcohol consumption directly measures an aspect of Islamic practice. However, measuring Islam with the alcohol consumption measure combined with a measure

of the proportion of Muslims is not flawless as such a measure is unable to distinguish between countries that have a low proportion of Muslims and a high degree of Islamic practice and countries that have a low proportion of Muslims and a low degree of Islamic practice.

Furthermore, this study has policy relevance in two ways. Firstly, our study shows that policy makers should be careful to base their policy on studies that have used flawed measures of Islam such as the proportion measure, as this measure ignores crucial information, namely to what degree Islam is practiced by the Muslims in a given country. Secondly, Islamic practice as measured by the IPS may be viewed as an informal institution as it implies certain norms and values, for instance that one should annually give alms (Zakat). Adopting a measure of Islamic practice in future studies will allow researchers to examine the relationship between the particular informal institutions related to Islamic practice and formal institutional effectiveness as formal and informal institutions tend to compete with each other (Helmke, & Levitsky, 2004, 729). Therefore, future studies adopting the proposed measure may reveal policy relevant information regarding the effectiveness of formal policies in an environment with Islamic informal institutions.

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Appendix A: Sample Size and Margin of Error of Pew Survey Data Set[13]

Country	Sample Size for Muslims Only	Margin of Error
Albania	788	±5.3 points
Algeria	1,181	±5.0 points
Azerbaijan	996	±5.6 points
Bangladesh	1,918	±4.4 points
Bosnia-Herzegovina*	1,007	±4.2 points
Egypt	1,798	±3.7 points
Indonesia	1,880	±3.4 points
Iran	1,519	±3.2 points
Iraq	1,416	±5.8 points
Jordan	966	±5.9 points
Kazakhstan	998	±4.9 points
Kosovo	1,266	±5.3 points
Kyrgyzstan	1,292	±5.0 points
Lebanon	551	±6.1 points
Malaysia	1,244	±4.4 points
Morocco	1,472	±4.3 points
Niger	946	±5.6 points
Pakistan	1,450	±5.6 points
Palestinian territories	994	±6.3 points
Russia*	1,050	±2.8 points
Tajikistan	1,453	±5.4 points
Thailand^	1,010	±5.6 points
Tunisia	1,450	±3.3 points
Turkey	1,485	±5.8 points
Uzbekistan	965	±4.7 points

*The Bosnia-Herzegovina and Russia surveys included oversamples of Muslim respondents. In Bosnia-Herzegovina, interviews were conducted among a nationally representative sample of 1,100 respondents and supplemented with 505 additional interviews among Muslims. The Russia survey was conducted among a nationally representative sample of 1,810 respondents and supplemented with 894 additional interviews among Muslims ^The survey in Thailand was conducted among Muslims only in five southern provinces: Narathiwat, Pattani, Satun, Songkhla and Yala. It is representative of Muslims in these five provinces.

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Appendix B: IPS Data Set

Country	Ramadan	Zakat	prayer	Shahada	IPS
Malaysia	98.59272	93.95695	80.380795	98.59272	86.87159
Indonesia	98.98721	98.50746	77.398721	97.49467	86.37902
Iraq	94.62366	78.78136	86.738351	99.49821	86.01516
Thailand	99.40535	92.26957	77.700694	99.60357	85.01800
Morocco	98.05680	92.22720	77.055306	97.68311	84.40665
Niger	95.31416	75.50586	83.599574	96.37913	83.38680
Palestinian Territories	94.80652	84.52138	78.004073	98.98167	82.49626
Iran	81.84979	67.24618	81.988873	98.88734	78.42117
Lebanon	90.64220	81.83486	67.889908	97.98165	75.34527
Algeria	87.71930	73.07018	72.017544	94.38596	74.94720
Jordan	86.92946	73.44398	68.257261	100.00000	72.86746
Tunisia	95.31034	79.44828	63.379310	100.00000	72.82081
Egypt	94.67190	70.61133	62.871565	100.00000	70.12203
Pakistan	97.16111	88.92832	53.229241	98.72250	69.68845
Azerbaijan	42.84243	59.83522	72.090628	97.83728	65.18931
Kosovo	81.32780	75.93361	46.141079	86.05809	59.70282
Bangladesh	96.11752	77.54460	39.926548	96.32739	58.83865
Tajikistan	88.03894	67.38526	46.244784	98.60918	58.71329
Turkey	83.84668	71.52635	41.273101	96.44079	56.29190
Bosnia and Herzegovina	76.82051	81.84615	18.461538	95.58974	44.81736
Russia	53.64173	39.76378	35.137795	88.18898	39.97303
Kyrgyzstan	53.33857	76.19796	18.224666	94.42262	39.83208
Uzbekistan	49.73822	74.34555	16.544503	96.96335	37.91150
Albania	41.37022	40.84321	7.773386	70.35573	22.38810
Kazakhstan	28.17904	37.02950	3.865717	83.31638	17.49507

Appendix C: IPI Data Set

Country	Prayer	Ramadan	Zakat	Shahada	IPS
Indonesia	81.370597	100.000000	99.34067	91.54506	95.88492
Malaysia	88.917418	91.602413	98.69014	93.20343	95.31613
Thailand	81.405708	89.720118	100.00000	98.66060	94.96183
Morocco	88.848768	88.956790	98.06869	92.64788	94.75393
Palestinian Territories	80.806414	77.161446	93.49143	96.25737	91.65092
Iraq	93.526177	67.146807	92.50783	98.08928	91.27322
Pakistan	49.649628	84.573432	96.47803	94.16901	90.24213
Niger	88.691892	61.683760	93.71234	87.84491	89.44345
Lebanon	74.524840	72.813468	87.58825	93.24833	89.12467
Tunisia	61.948471	68.879614	94.25177	100.00000	89.03202
Egypt	57.270994	54.085396	93.41809	100.00000	86.18623
Jordan	66.662903	58.970375	82.52704	100.00000	85.87193
Algeria	76.722872	58.304961	82.76989	79.95443	85.27403
Bangladesh	29.513436	65.651633	95.34557	87.48070	84.77049
Iran	87.731520	49.068215	75.23970	95.99239	84.73887
Tajikistan	48.301911	49.118803	84.02635	95.34484	82.57071
Turkey	35.571625	55.451123	77.67812	87.47417	80.63275
Bosnia and Herzegovina	16.486753	72.286502	67.80167	84.55106	79.44075
Kosovo	43.768893	60.110112	74.44856	48.70940	78.67119
Azerbaijan	78.061295	36.612997	19.38475	92.52978	71.72605
Kyrgyzstan	11.512447	63.117781	35.54637	80.36780	71.52004
Uzbekistan	5.509686	60.621743	30.14892	89.83655	70.31516
Russia	37.404113	3.206446	35.47002	60.38259	63.30535
Albania	8.738884	5.710610	18.90263	0.00000	53.58825
Kazakhstan	0.000000	0.000000	0.00000	42.73010	51.68934

Appendix D: Answers to Prayer Question Pew & WVS

Prayer (Pew) *Q61, - People practice their religion in different ways. Outside of attending religious services, do* *you pray several times a day, once a day, a few times a week, once a week, a few times a* *month, seldom, or never?*		Prayer (WVS) *V146.- Apart from weddings and funerals, about how often do you pray?*	
Code	label	code	label
1	Several times a day	1	Several times a day
2	Once a day	2	Once a day
3	A few times a week	3	Several times each week
4	Once a week	4	Only when attending religious services
5	A few times a month	5	Only on special holy days
6	Seldom	6	Once a year
7	Never	7	Less often than once a year
8	Don't know (DO NOT READ)	8	Never, practically never
9	Refused (DO NOT READ)		

Appendix E: IPS Data Set with Alcohol and Proportion Variables

Country	Alcohol	Ramadan	Zakat	Prayer	Shahada	IPS	Proportion	Alcohol* Proportion
Albania	4.9	41.37	40.84	7.77	70.36	22.39	82.1	402.29
Algeria	0.7	87.71	73.07	72.02	94.39	74.95	98.2	68.74
Azerbaijan	1.3	42.84	59.83	72.09	97.84	65.19	98.4	127.92
Bangladesh	0.0	96.11	77.54	39.93	96.33	58.84	90.4	0.00
Bosnia and Herzegovina	4.6	76.82	81.84	18.46	95.59	44.82	41.6	191.36
Egypt	0.2	94.67	70.61	62.87	100.00	70.12	94.7	18.94
Indonesia	0.1	98.98	98.50	77.40	97.49	86.38	88.1	8.81
Iran	0.0	81.84	67.24	81.99	98.89	78.42	99.7	0.00
Iraq	0.2	94.62	78.78	86.74	99.50	86.02	98.9	19.78
Jordan	0.5	86.92	73.44	68.26	100.00	72.87	98.8	49.40
Kazakhstan	6.8	28.17	37.02	3.87	83.32	17.50	56.4	383.52
Kyrgyzstan	2.4	53.33	76.19	18.22	94.42	39.83	88.8	213.12
Lebanon	1.9	90.64	81.83	67.89	97.98	75.35	59.7	113.43
Malaysia	0.3	98.59	93.95	80.38	98.59	86.87	61.4	18.42
Morocco	0.5	98.05	92.22	77.06	97.68	84.41	99.9	49.95
Niger	0.1	95.31	75.50	83.60	96.38	83.39	98.3	9.83
Pakistan	0.0	97.16	88.92	53.23	98.72	69.69	96.4	0.00
Russia	2.5	53.64	39.76	35.14	88.19	39.97	11.7	29.25
Tajikistan	0.3	88.03	67.38	46.24	98.61	58.71	99.0	29.70
Thailand	6.4	99.40	92.26	77.70	99.60	85.01	5.8	37.12
Tunisia	1.3	95.31	79.45	63.37	100.00	72.82	99.8	129.74
Turkey	1.4	83.84	71.52	41.27	96.44	56.29	98.6	138.04
Uzbekistan	2.4	49.73	74.34	16.54	96.96	37.91	96.5	231.60