The holding behavior of Shariah financial assets within the global Islamic financial sector: A macroeconomic and firm-based model

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Abstract

The extant academic literature has shown the distinct differences between Islamic and conventional financial institutions along either a performance or efficiency front with an attribution to these differences to the adoption of a religio-financial framework merging the principles of economics and finance with those of Shariah. However, these empirical estimations do not entirely capture the religio-financial framework since they use performance and efficiency measures that include both conventional and Shariah transactions. We address this gap in the literature by examining the dynamics influencing the holding behavior of Shariah assets by Islamic financial institutions. Given that the *a priori* hypothecation of Shariah asset holding behavior is relatively nebulous, we draw extensively from the traditional macroeconomic and managerialist literature in building our econometric model. By exploiting a unique and proprietary dataset comprising 140 Islamic financial institutions (IFIs) operating in 16 different countries over the time period 2011–2015, we find that economic wealth, market liquidity and the institutional board size are robust and positive linear predictors of IFI Shariah assets' holding behavior, thus providing support for the traditional macroeconomic theory of asset demand and firm-based agency theory.

Keywords: Islamic finance, Shariah assets, Islamic financial institutions, macroeconomic dynamics, firm-based dynamics, asset management

JEL Codes: E00, G20, P40, Z12

1. Introduction

The growth of the Islamic financial services industry over the past two decades has been substantial with a current market valuation of $2.2trillion globally (Islamic Financial Services Board, 2019). Much of the trade of Islamic financial instruments and services is still predominately concentrated within the middle and far-east although that is changing to include many other nations within the Global South and the West (Islamic Financial Services Board, 2019). Islamic banking and finance differs from its conventional counterpart in that it imbues an underlying religious governance framework to the structure of the financial system (Aliyu, Hassan, Mohd Yusof, & Naiimi, 2017; Hassan & Aliyu, 2018; Narayan & Phan, 2019). This underlying religious framework has been of interests to both the religious and secular academic community as to its influence on both sovereign and institutional decision-making and performance. Fundamentally, the current academic interest surrounding Islamic banking and finance focuses on how the impartation of religion impacts the underlying business governance model and, in turn, firm performance (Hassan & Aliyu, 2018). There is the belief that the religious framework is able to provide solutions towards better understanding and addressing the drawbacks of the current economic and financial models in the lead up and over the financial crises (Narayan & Phan, 2019). Whilst there is empirical support for the differences between Islamic and conventional banks in terms of performance, the academic literature in disentangling why these differences exist is still in its infancy. The extent Islamic financial literature has undertaken this line of enquiry and current studies bifurcate along two distinct lines – i) an examination of Shariah governance and the role of the Shariah supervisory board on firm decision making (Elamer, Ntim, Abdou, & Pyke, 2019; Gözübüyük, Kock, & Ünal, 2018; Nawaz, 2019; Nawaz & Virk, 2019) and ii) a comparative evaluation of Islamic and conventional financial institutions along some measures of

efficiency (Beck, Demirguc-Kunt, & Merrouche, 2013; Bitar, Pukthuanthong, & Walker, 2019; Chaffai, 2019; Cihak & Hesse, 2010; Johnes, Izzeldin, & Pappas, 2014; Safiullah & Shamsuddin, 2019). This study contributes to both lines of discussion through our macroeconomic and firm-based conceptualization of the determinants of Shariah asset holding behavior by Islamic financial institutions (IFIs). Given the current academic development, our study departs from the comparative lines of enquiry undertaken by the extant literature but rather seeks to further decompose the dynamics of this improved efficiency of financial institutions operating within a religio-financial framework. We do so by focusing on the asset management of IFIs and, in this regard, we disentangle the holdings of Shariah assets from overall asset holdings, something that has not been undertaken within the existing literature on Shariah banking and finance yet. Our underlying conceptualization pushing us to look into this is that IFIs' greater efficiency is born out of the censored financial horizon deign from the religious framework and, due to this, there is a need to better understand the dynamics of the determinants of the behavior regarding the amount of Shariah assets held over time by IFIs. We address this research question by building a macroeconomic- and firm-based model of the determinants of the Shariah asset holding behavior of IFIs.

The development of the academic literature has raised numerous insights in that there are distinct efficiencies derived from operating within a quasi religio-financial framework. Notably, there is substantial support for the improved stability and resilience of IFIs – mainly Islamic banks – over the financial crises (Ashraf & Khawaja, 2016). Given the religious framework, asset and liability holdings of IFIs have to abide to specific conditions and thresholds, namely that they have to exist in the real economy and be permissible under Islamic law (Azmat, Skully, & Brown, 2015). This creates a situation where IFIs, existing within a censored financial system in terms of the types and structures of assets and liabilities

that they are able to hold, have a positive influence on some measure of firm performance. However, the existing examination of IFIs' efficiency does not breakdown the composition of these assets into Shariah and conventional assets but rather utilize total assets within their measures (Bitar *et al.*, 2019; Caporale, Çatık, Helmi, Ali, & Tajik, 2019; Safiullah & Shamsuddin, 2019). The distinction of Shariah assets from total assets is important towards better understanding the source of improved efficiency as it is precisely Shariah assets that undergo the screening process within the religious framework. The granularity of our hand-collected proprietary dataset allows us to capture this unique dimension within IFIs and to disentangle Shariah assets from total assets within our analysis. Moreover, these enquiries are not aided by the lack of clarity on the *a priori* theorizations of the asset and liability holdings of IFIs. From Beck *et al.* (2013):

> "Differences in asset quality across Islamic and conventional banks are also, *a priori*, ambiguous, as it is not clear whether the tendency towards equity-funding in Islamic banks provides stronger incentives to adequately assess and monitor risk and discipline borrowers…" (pg. 436)

We undertake our analysis by exploiting a proprietary dataset comprising 140 IFIs operating in 16 different countries over the time period of 2011 – 2015. By way of preview, our results indicate that economic wealth, liquidity, firm's board size and Shariah board size are robust positive linear predictors of the holding behavior of Shariah assets by IFIs. Our findings add to the extant academic literature by further disentangling the macroeconomic and firm-based dynamics of Shariah asset holding behavior. To the best of our knowledge, our investigation of the dynamics of IFIs' holding behavior of Shariah assets represents the first attempt of its kind. Our findings have relevant policy implications as they highlight to

policy makers, as well as to the managers and leaders of IFIs, the dynamics driving IFIs' holding of Shariah assets at both the industry and the firm level. From a macroeconomic perspective, our findings highlight the significance of the relationship between sovereign monetary cycles and Shariah asset holdings. From a managerialist perspective, we contribute to the wider and growing literature on Shariah governance by providing support for the contention of utilizing agency theory as a singular lens for conceptualizing Shariah supervisory board (SSB) behavior. This provides policy makers and the leaders of IFIs with a better understanding of the interface between Shariah and corporate governance from an institutional perspective and an appreciation of the roles of both conventional boards and Shariah supervisory boards within this unique governance framework.

The remainder of this study is organized as follows. Section 2 provides a breakdown of the academic literature and establishes the theoretical foundations of our hypotheses development. Section 3 highlights our data structure, together with their descriptive statistics. Section 4 explains the utilized methodological framework of our analysis. Section 5 documents our empirical findings stemming from the analysis of the determinants of Shariah asset holding by IFIs. Section 6 provides some concluding remarks along with the policy implications of our study and paves the way for further enquiry.

2. Literature Review and hypotheses development

The concept of modern Islamic banking and finance arose from post-colonial sovereign discontent with the extant governance framework after World War II and a desire to return to a more familiar structure revolved around the inclusion of religious principles (Pollard & Samers, 2007). This quasi-religious framework would permeate every facet of sovereign socio-economic life with the financial system being no exception. Under the Islamic financial

framework, all financial actors are governed by Shariah, whose core tenets include the prohibition of usurious activities (*riba*), a reduction in gambling and uncertainty (*maysir* and *gharar*), permissible (*halal*) business activities and the requirement for all transactions to exist in the real economy (Aliyu *et al.*, 2017; Hassan & Aliyu, 2018). The Islamic banking and financial framework also advocates the use of profit-and-loss sharing (PLS) financial structures much akin to equity-based financing where lenders possess an equity share in the borrowers' endeavors (Abdul-Rahman, Latif, Muda, & Abdullah, 2014). Given the imposition of these religious doctrines, Islamic financial instruments and institutions undergo a screening process to ensure their adherence to the principles of Shariah. For a matter of brevity, we do not review the critiques advanced to this screening process but rather highlight its application. There are two paradigms for screening - i) Shariah-compliant and ii) Shariah-based with the former being the more lenient and, in many instances, what is Shariah-based will be Shariah-compliant but not in the opposite direction (Ullah, Harwood, & Jamali, 2018). The screening criteria involves comparing the characteristics of a given transaction with the exact specifications established by either a central or an in-house Shariah supervisory board and can differ between exchanges as well and regional Islamic financial hubs (Berg, El-Komi, & Kim, 2016; Dharani, Hassan, & Paltrinieri, 2019). Moreover, given that Shariah interpretation can vary between scholars depending on the theological schools of Islamic thought, there can be variability between IFIs in terms of screening practices as well (Khuri, 2006). However, there is a need to not overstate this variability and it should be noted that the overarching principles of Islam still remain largely consistent across the screening practices.

It is this censorship of the investment horizon that has been the subject of many studies within the Islamic banking and finance literature and there is increasing evidence that any outperformance in terms of return or risk stability is attributable to this quasi-religious

screening process. In terms of return, the studies focus heavily on Shariah-compliant indices (SCIs) and their ability to outperform conventional equity indices (Ashraf & Khawaja, 2016; Dharani *et al.*, 2019; El-Hawary, Grais, & Iqbal, 2007; Ho, Abd Rahman, Yusuf, & Zamzamin, 2014). This outperformance is mainly measured over periods with exogenous shocks with SCIs and portfolios containing SCIs exhibiting superior performance over their conventional counterparts (Ashraf & Khawaja, 2016). Moreover, the nature of the characteristics of the investment horizon, in light of the screening criteria, exist predominately within the real economy, thus any effect from an exogenous financial shock will be delayed (Claessens, Tong, & Wei, 2012; Lobe, Rößle, & Walkshäusl, 2012). The Shariah-screening process excludes financial institutions from investment due to their substantial levels of interest-based activities but favors companies within real sectors such as agriculture and manufacturing. Given that a financial crisis will impact financial institutions first and then progress into the real economy via some channel such as reduced lending, it is reasonable to expect lagged effects on SCIs (Claessens *et al.*, 2012). For example, over less volatile periods, studies such as Ho *et al.* (2014) highlight that this superior performance disappears as the censored investment horizon fails to capture some of gains from the prohibited investment sectors. The extant academic literature on the Shariah screening criteria and financial performance also adopts an institutional lens; in this regard existing studies such as the ones of Cihak and Hesse (2010) and Beck *et al.* (2013) provide a salient robust comparative overview of the performance and efficiency of Islamic and conventional banks. They put forward several pertinent findings including a size advantage in terms of performance for smaller Islamic banks against smaller conventional banks, whilst the inverse is true for larger institutions. Additionally, smaller Islamic banks are more financially stable when compared to their larger counterparts. Beck *et al.* (2013) further decompose the performance measures of the religio-financial framework into efficiency and stability and

highlights Islamic banks are "…better capitalized, have higher asset quality and are less likely to disintermediate during crises…" (pg. 433). Beyond these two studies, the extant literature on the performance of SCIs and comparative studies between Islamic and conventional banks have further developed along these lines. Studies such as Bitar *et al.* (2019) further highlight the performance differences between Islamic and conventional banks in terms of liquidity risk with regards to some exogenous shock utilizing a quantile regression procedure. Chaffai (2019), using a relatively novel hyperbolic distance function, puts forward similar results and additionally confirms the size-based differences in performance between Islamic and conventional banks.

Whilst the above studies confer the benefits of the adoption of a religio-financial framework in terms of firm appropriation of economic rent they fail to fully capture the effects of the religious screening processes. More specifically, in utilizing total assets within their accounting measures of stability and efficiency, they ignore the religious framework adopted in establishing the foundation of Shariah assets. Our study aims to contribute to the extant academic literature by trying to better understand the institutional dynamics of the Shariah-screening process by examining the determinants of the holding behaviour of Shariah assets by IFIs. Our focus on Shariah assets is, to the best of our knowledge, the first of its kind within the extant academic literature. More specifically, from an institutional, managerialist perspective, we are able to decompose the influence of the conventional board and the Shariah supervisory board in terms of religious-screening and governance. Moreover, by examining the determinants of the holding behaviour of Shariah assets we further disentangle the latter as a core factor of the religio-financial framework allowing for a better understanding of this outperformance between Islamic and conventional financial institutions. Given that the, *a priori*, theorisations of Shariah asset holding behaviour is relatively nebulous, we draw extensively from the traditional economic and financial literature for our

investigation. We implement a combined macroeconomic- and firm-based model of Shariah asset holding behaviour and develop our hypotheses in the following sections 2.1 and 2.2.

2.1. Macroeconomic conceptualizations of Shariah financial assets' holding behavior

There is evidence within the Islamic banking and finance literature on the nexus between the development the Islamic financial system and economic development. Studies such as Bitar, Hassan, Pukthuanthong, and Walker (2018) and Kassim (2016) highlight the positive relationship between Islamic financial development and the growth in the Malaysian real economy. Similar case studies have been undertaken in other Islamic financial hubs such as Nigeria, Bangladesh and the MENA region and have shown a similar relationship (Gheeraert, 2014; Hassan, Sanchez, & Yu, 2011). Given the intermediation roles of any financial system, this is not entirely surprisingly and confirms the Schumpeterian (1934) view of financial systems being central to economic development. However, whilst the literature is relatively rich in terms of the finance-growth nexus, the views on the nature of the relationship remain divided into supply- (McKinnon, 1973; Shaw, 1973) and demand-side (Patrick, 1972; Robinson, 1952) arguments. Given the nature of the growth of Islamic banking and finance since the Second World War II, we focus our attention on the demand-side factors of Islamic financial assets. In this light the Islamic financial literature is limited and we draw substantially from the traditional economic conceptualizations of asset demand and models of general equilibrium (Lucas, 1978; Markowitz, 1952; Roll & Ross, 1980). This also allows for a parsimonious conceptualization of economic agent behavior by nesting assumptions within the traditional rational economic theorizations. The large, established body of economic literature examining the demand-side factors is subsumed into an umbrella term known as the

theory of asset demand which highlights four predictors – wealth, expected return, expected risk and liquidity.

Within the developed theoretical base, the relationship between wealth and asset consumption and holding is seen to be linearly positive where any increase in wealth results in increased resources with which to purchase financial assets. Indeed the evidence in support for this assertion is relatively developed in relation to the income hypotheses (Friedman, 1957; Modigliani & Ando, 1957) and we continue to observe this positive linear relationship between wealth and consumption in more recent studies such as Paiella and Pistaferri (2017). This gives us our first hypothesis in relation to Shariah assets:

H_1: As wealth increases, the holdings of Shariah assets do not increase

The traditional rational economic conceptualization of the relationship between expected returns and risk and holding behavior of assets is relatively succinct. Drawing on traditional portfolio theory (Markowitz, 1952) and asset pricing models (Fama, 1986; Roll & Ross, 1980) as expected return increases, this is proceeded by an increase in the demand for a particular asset. This relationship would invert for risk where any increase in the riskiness of the asset would result in less holdings. This gives us our second and third hypothesis:

H_2: Expected return is not a positive linear predictor of Shariah asset holdings

H_3: Expected risk is not a negative linear predictor of Shariah asset holdings

Along similar lines the concept of liquidity is seen to possess a positive linear relationship with asset consumption and holding behavior in that any increase in aggregate

liquidity will encourage the holdings of both money and financial assets. The theoretical assertion is once again in relation to rational economics and efficient markets where liquidity is defined as a market with depth and breadth (Chordia, Roll, & Subrahmanyam, 2008; Sadka, 2010; Shleifer & Vishny, 1997). A liquid market also allows to the efficient trade of assets with reduced transaction costs. These lower transactions costs accrue as there is a reduction in the degree of information asymmetry within liquid markets (Bagehot, 1971). This discussion leads us to the development of our fourth hypothesis:

H_4: As markets become more liquid, Shariah asset holdings do not increase

In addition to the four determinants from the theory of asset demand, there is also a need to be mindful of the impact of inflation (Fama & Schwert, 1977) on asset holding behavior and more so in the case of Shariah assets. Given that the religio-financial framework requires that all transactions have to exist within the real economy, it is reasonable to assume that inflation would exert an influence on the holding behavior of Shariah assets. From the traditional literature on the relationship between expected inflation and asset demand, an increase in inflation results in higher prices thus growing the values for real assets increasing overall demand. Conversely, any increase in inflation reduces the real rate of return for financial assets thus reducing overall demand. Given that Shariah assets would be a combination of both Shariah-compliant real and financial assets it is unclear as to, which of these effects would dominate. As such we establish our fifth bi-directional hypothesis:

H_5: There is no relationship between expected inflation and the holding of Shariah assets

The holding of Shariah assets is also influenced by firm dynamics in terms of the unique religious governance structure present within IFIs. We further improve the explanatory power of our model by capturing these effects and establish our hypotheses on the impact of firm dynamics on Shariah asset holding behavior in the following section 2.2.

2.2. The managerialist lens on Shariah financial assets' holding behavior

Our conceptualization of the effects of firm dynamics on the Shariah asset holding behavior of IFIs adopts a managerialist perspective and utilizes an agency lens in developing our hypotheses. Given the religio-financial framework, IFIs possess a unique, multi-layered governance structure, where religious governance is assessed by an in-house quasi advisory-supervisory entity known as the Shariah supervisory board (Mollah, Hassan, Al Farooque, & Mobarek, 2017; Safiullah & Shamsuddin, 2019). In relation to our agency theory conceptualization, there is a lack of consensus within the extant literature as to the role of the conventional corporate board and Shariah supervisory board within the Shariah governance structure, in that there is no clear indication as to who has oversight over the religio-financial framework (Mollah & Zaman, 2015). There is evidence (Elamer *et al.*, 2019; Mollah *et al.*, 2017; Nawaz & Virk, 2019; Safiullah & Shamsuddin, 2018, 2019) that religious governance is nested within the overall corporate governance framework of IFI and that the corporate board still has complete overview, undertaking the underlying monitoring role within an agency framework. In this light, the corporate board, as one of the mechanisms of corporate governance can be utilized by the equity-holders to control managers thus having an impact on the managerial conduct and subsequently Shariah asset holding behavior over time. Additionally, it is also unclear as to whether the Shariah supervisory board resides as a monitor of religious governance or has an advisory and consultancy role (Halim, How,

Verhoeven, & Hassan, 2019). Summarily, it is *a priori* nebulous if it is the conventional of the Shariah supervisory board that fulfils the maintenance of overall corporate governance and as such the holding behavior of Shariah assets but the extant literature has shown some evidence in support of an agency conceptualization in terms of monitoring of managerial behavior in this context.

Moreover, whilst the extant academic literature on the interface between Shariah and conventional corporate governance is limited, there are some studies indicating that this additional layer of religious governance has some impact on firm performance (see Gözübüyük *et al.* (2018); Mollah *et al.* (2017); Mollah and Zaman (2015); Nomran, Haron, and Hassan (2018)). We build on this and the agency dialectic highlighted within the Islamic financial literature on the nature of Shariah assets for testing Shariah financial assets' holding behavior through a managerialist lens (Beck *et al.*, 2013; Nawaz & Virk, 2019). The promotion of Shariah assets to adopt a "profit and loss sharing" (PLS) structure raises a pertinent question from a managerialist and agency perspective. PLS structures are more akin to equity financing, which is shown to induce further monitoring of the IFIs, however, this can result in poorer firm discipline as equity holders pursue returns. Moreover, there is also some evidence (Azmat *et al.*, 2015; Khan, 2010) indicating the prevalence of debt-centric assets on the balance sheets of IFIs, potentially resulting in the amelioration of agency costs between equity-holders and managers. Additionally, the purview over the initialization of the Shariah screening process is also, a priori, ambiguous. Whilst earlier studies such as Mollah and Zaman (2015) have conceptualized the Shariah supervisory board as a supra-entity that, under an agency framework, monitors the religious adherence of IFIs, recent studies have shown evidence that this is not entirely the case (Halim *et al.* (2019); and Gözübüyük *et al.* (2018) and that overall IFI monitoring still sits with the conventional board. As such, it is still indistinct as to whether it is the conventional board who have overview of the holding of

Shariah assets or if this is determined by the Shariah supervisory boards. In order to capture the role of the conventional board we utilize the traditional corporate governance measures set forth within the agency literature of conventional board size and number of independent board members as numerical proxies for conventional board influences. Under an agency framework the conceptualization of the role of the corporate board is relatively established in that a larger board results in better monitoring (Hillman & Daziel, 2003). However, what is, *a priori*, ambiguous is the impact of a larger board on the holding behavior of Shariah assets over time given the increased agency costs and the conflicts between the firms' equity and managers as a result of the structure of Shariah assets (Beck *et al.*, 2013; Nawaz & Virk, 2019). These arguments can be extended to cover the conceptualization of independent board members under an agency dialectic as well in that there are less conflicts of interest between management and independent board members thus facilitating more efficient monitoring (Hillman & Daziel, 2003; Terjesen, Couto, & Francisco, 2016). However, similar to board size, the *a priori* effects of board independence on Shariah asset holding behavior over time is also equivocal given the proliferation of agency costs and interface between equity and managers (Nawaz & Virk, 2019). This discussion leads us to define our sixth and seventh hypotheses as bi-directional conceptualizations of this agency dialectic:

H_6: The size of the board of directors has no impact on the holdings of Shariah assets

H_7: The number of independent directors has no impact on the holdings of Shariah assets

As before, the Shariah supervisory board (SSB) is conceptualized as the gatekeepers of Shariah governance within a given IFI and the literature has suggested that the SSB adopts a quasi-advisory supervisory role aimed at certifying the religiosity of the given IFI's transactions (Elamer *et al.*, 2019; Nawaz & Virk, 2019). In this regard we also investigate the influence of the in-house Shariah supervisory board on Shariah asset holding behavior. This discussion leads us to develop our eighth and final hypothesis:

H_8: The Shariah supervisory board does not have a positive impact on the holdings of Shariah assets

We present our data and describe our empirical methodology in the following sections 3 and 4.

3. Data

Our study seeks to examine the macroeconomic and firm determinants of Shariah asset holding behavior by IFIs. We do so by exploiting a unique and proprietary hand-collected dataset from the annual report of 140 IFIs originating in 16 countries over the time period 2011-2015. The breakdown of our sample is given in Table 1 reported below.

Table 1. Sample breakdown (with segmentation)

Country	Count	Institutional Type		Mode of Operation	
		Islamic Banks	Non-banking	Shariah-based	Shariah-compliant
Bahrain	19	6	13	17	2
Bangladesh	11	9	2	4	7
Brunei	1	1	0	1	0
Indonesia	32	27	5	9	23
Kuwait	5	3	2	3	2
Malaysia	32	19	13	20	12
Maldives	1	1	0	1	0
Nigeria	1	1	0	1	0
Oman	4	4	0	2	2
Pakistan	13	11	2	4	9
Palestine	1	1	0	1	0
Qatar	2	2	0	2	0
Saudi Arabia	10	8	2	6	4
Sri Lanka	2	1	1	2	0
UAE	3	2	1	2	1
UK	3	0	3	3	0
Total	**140**	**97**	**43**	**76**	**64**

Table 1 shows that the majority of IFIs exist within Global South nations with large representation from Malaysia, Indonesia, Pakistan and the MENA region. We further breakdown our sample along two nominal characterizations i) institutional type and ii) mode of operation, and observe that there is a larger proportion of Islamic banks against non-banking IFIs, whilst the composition between Shariah-based and -compliant institutions is relatively more balanced. It should be noted that non-banking IFIs include Islamic insurance companies, investment banks and development finance providers among others.

3.1. Descriptive statistics

We report the descriptive statistics for the transformed variables in Table 2 shown below where we also include the mean and standard deviation for some of the raw variables. The average value of Shariah assets is approximately $4.5mil with a standard deviation of $9.7mil, whilst the average ratio of Shariah to total assets is 63.61% with a standard deviation

of 44.24%. The annual average rates of change for Shariah assets and the ratio of Shariah to total assets are 15% and 0.2% respectively, indicating that there is not a substantial amount of change from one year to another. As for the macroeconomic dynamics, average wealth as represented by the GDP growth rate is 4.87% with a standard deviation of 1.82% across the countries composing our sample. Expected return and risk as measured by real interest rates and the ratio of non-performing loans to gross loans are 5.06% and 4.33%, with standard deviations of 5.54% and 4.23%, respectively. Average liquidity and inflation, measured by the percentage change in broad money supply (M3) and by the Consumer Price Index (CPI) respectively, stands at -1.59% and 4.16% with respective standard deviations of 4.10% and 2.64%. As for the firm dynamics, the average board size is slightly above 8 board members with a standard deviation of 3.5, whilst the number of independent board members is 3.7 with a standard deviation of 2.1. The Shariah supervisory board (SSB) is about half the size of the conventional board on average (i.e., approximately 4 board members) with a standard deviation of 2 across our sample of institutions. Turning our attention to the control variables, the average rate of change of total assets is 9.78%, and the average value of firm total assets is $9mil while the average return on assets is 1.5% with an average change of 11.56%. The average equity worth of IFIs within our sample is $2.7mil with an average annual change of 0.02% indicating time invariance across the sample period. The average population density is 440.34/km^2, with an average percentage change of 7.42/km^2, and the average index reflecting the regulatory framework is -0.1576 which, when assessed on a scale ranging from -2.5 (poorer) to +2.5 (better), falls in the poorer end of the spectrum.

Table 2. Descriptive statistics

Name	Identifier	Unit	Obs.	Mean	Std. Dev.	Norm.
		Dependent variables				
Shariah assets	SHA	% Δ	464	0.1452	0.3122	No
Ratio of Shariah to total assets	TSHA	Ratio Δ	474	0.0027	0.1050	No
		Macroeconomic dynamics				
Wealth	WEALTH	%Δ	695	4.8677	1.8166	No
Expected return	RET	%	607	5.0654	5.5432	No
Expected risk	RISK	Ratio Δ	455	-0.173	1.0988	No
Liquidity	LIQUID	Ratio Δ	552	-1.5919	4.1022	No
Expected inflation	INF	% Δ	695	4.1632	2.6456	No
		Firm dynamics				
Corporate board size	BSIZE	Members	633	8.0332	3.5955	Yes
Corporate board independent members	BINDP	Members	586	3.6655	2.0707	Yes
Shariah board size	SSB	Members	628	3.9920	2.0242	No
		Control variables				
Value of total assets	TOAS	% Δ	497	0.0978	0.7185	No
Return on assets	ROA	% Δ	401	0.1165	1.0144	No
Equity	EQ	% Δ	436	-0.0002	0.0160	No
Population density	POPDEN	Ratio Δ	552	7.4284	10.7851	No
Regulatory differences	REG	Country Index	690	-0.1576	0.5392	Yes

4. Estimated model

In order to investigate the effects of macroeconomic and firm determinants on Shariah asset holding behavior, we undertake fixed-effects panel regression estimation. We utilize a fixed-effects panel method, controlling for both cross-sectional and period effects given the conceptual framework surrounding panel-based studies in terms of unobserved heterogeneity within the sample, in that we cannot be sure that latent variations are uncorrelated across regressors in the model. Under these methodological assumptions a fixed effect model will be consistent in estimation (Woolridge, 2018). Furthermore, we run additional Hausman tests and the test statistics are in line with our methodological conceptualization in favoring the use of the fixed-effects model. All estimations are conducted with White's robust standard errors on the diagonal to mitigate heteroscedasticity issues. We implement our model on two different dependent variables i) the first difference of the log of total Shariah assets and ii) the first difference of the ratio of Shariah assets to total assets. We control for additional *a priori*

variables which could have an impact on asset holding behavior other than our variables of interest. In line with the findings in Cihak and Hesse (2010), we include total assets as a proxy for the firm's size. Additionally, we control for the given IFI's equity given the suggested agency dialectic between equity-holders and managers in light of the nature of Shariah assets and the religio-financial framework. Firm performance is shown to have an impact on asset holdings within the conventional financial literature from an *a priori* capital structure conceptualization with better performing firms more inclined to finance utilising retained earnings, thus having an effect on asset holdings. We use the returns on assets (ROA) as a proxy for firm performance. We account for regulatory differences between the sovereign nations by creating an equally weighted index of the World Bank governance indicators. This index sits on a linear scale of ±2.5 with values at the negative end representing a poorer regulatory framework and vice versa. This is important given the different banking paradigms within the Islamic financial world – i) purely Islamic banking system ii) parallel banking system and iii) Shariah-compliant systems. Moreover, we further account for these differences in banking paradigm with our stratification into Shariah-based and -compliant. Finally, we also control for the Muslim population as this would have an impact on the demand for Shariah financial services and products. Since the Pew research data on the Muslim population (Pew Research Centre, 2009) is relatively dated, we overcome this by generating a population density measure using the World Bank metrics.

In order to test hypotheses $\mathbf{H_1}$ – $\mathbf{H_8}$ we estimate the following equations with our dependent measures of Shariah asset holding behavior. Equation (1) uses the first difference transformation of the log of total Shariah assets as our dependent measure whilst Equation (2) utilizes the first difference of the ratio of Shariah to total assets as our dependent variable:

$$SHA_{i,t} = \alpha_{i,t} + \beta_1 WEALTH_{i,t} + \beta_2 RET_{i,t} + \beta_3 RISK_{i,t} + \beta_4 LIQUID_{i,t} + \beta_4 INF_{i,t} + \beta_5 BSIZE_{i,t} + \beta_6 BINDP_{i,t} + \beta_7 SSB_{i,t} + \overrightarrow{\beta_8 CONTROLS_{\iota,t}} + \gamma_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

$$TSHA_{i,t} = \alpha_{i,t} + \beta_1 WEALTH_{i,t} + \beta_2 RET_{i,t} + \beta_3 RISK_{i,t} + \beta_4 LIQUID_{i,t} + \beta_4 INF_{i,t} + \beta_5 BSIZE_{i,t} + \beta_6 BINDP_{i,t} + \beta_7 SSB_{i,t} + \overrightarrow{\beta_8 CONTROLS_{\iota,t}} + \gamma_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

Where

$SHA_{i,t}$ = first difference of the log of total Shariah assets for firm *i* at time *t*

$TSHA_{i,t}$ = first difference of the ratio of Shariah to total assets for firm *i* at time *t*

$WEALTH_{i,t}$ = sovereign GDP growth rate for firm *i* at time *t*

$RET_{i,t}$ = sovereign annual real interest rates for firm *i* at time *t*

$RISK_{i,t}$ = first difference of non-performing loans to gross loan for firm *i* at time *t*

$LIQUID_{i,t}$ = first difference of board money (M3) for firm *i* at time *t*

$INF_{i,t}$ = sovereign measure of change in consumer price index (CPI) for firm *i* at time *t*

$BSIZE_{i,t}$ = log of number of board members for firm *i* at time *t*

$BINDP_{i,t}$ = log of number of independent board members for firm *i* at time *t*

$SSB_{i,t}$ = log of the number of Shariah supervisory board members for firm *i* at time *t*

$\overrightarrow{CONTROLS_{\iota,t}}$ = vector of control variables for firm *i* at time *t*

γ_i = cross-sectional fixed-effects

δ_t = period fixed effects

A full description of the model variables and their respective identifiers and transformations is provided in Table 3 reported below.

Table 3. Description of variables

Name	Identifier	Description and transformation
		Dependent variables
Shariah assets	SHA	First difference transformation of the log of total Shariah assets (source: FT Banker database)
Ratio of Shariah to total assets	TSHA	First difference transformation of the ration of Shariah to total assets (source: FT Banker database, institutional annual reports)
		Macroeconomic dynamics
Wealth	WEALTH	Sovereign GDP growth rate (source: World Bank)
Expected return	RET	Sovereign real interest rates (source: World Bank)
Expected risk	RISK	First difference transformation of ratio of non-performing loans to gross loans (source: World Bank)
Liquidity	LIQUID	First difference transformation of sovereign measure of board money (M3) as a % (source: World Bank)
Expected inflation	INF	One period, year-on-year change in the consumer price index (CPI) represented as a percentage (source: Bloomberg)
		Firm dynamics
Corporate board size	BSIZE	Log transformation of the number of members on the corporate board (source: institutional annual reports)
Corporate board independent members	BINDP	Log transformation of the number of independent corporate board members (source: institutional annual reports)
Shariah board size	SSB	Log transformation of the number of members on the Shariah board (source: institutional annual reports)
		Control variables
Value of total assets	TOAS	First difference transformation of the log of total assets as a measure of firm size (source: institutional annual reports)
Return on assets	ROA	First difference transformation of return on assets as a measure of firm performance (source: institutional annual reports)
Equity	EQ	First difference transformation of the log of total equity as a measure of firm equity holdings (source: institutional annual reports)
Population density	POPDEN	First difference transformation of measure of population density calculated as $POPDEN_{i,t} = {Population_{i,t}}/{Land\ mass\ (sq.km)_{i,t}}$ (source: World Bank)
Regulatory differences	REG	Equally weighted index constructed using the 6 World Bank governance indicators as a measure of sovereign regulatory differences. Measure is on a scale of -2.5 (poorer) to +2.5 (better) regulation (source: World Bank)

We report the correlation matrix in Table 4 shown below. Any pair-wise correlation beyond ±10% is significant at a 10% level at least. In this regard, Table 4 shows that the majority of the pair-wise correlations in Table 4 are within acceptable bounds.

Table 4. Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SHA	1														
TSHA	**-0.15****	1													
WEALTH	0.01	0.03	1												
RET	0.02	-0.01	**-0.28*****	1											
RISK	-0.1	-0.01	**0.37*****	-0.02	1										
LIQUID	0.04	-0.01	**-0.18*****	-0.04	-0.03	1									
INF	0.04	0.04	**0.27*****	**0.20*****	**0.14****	**0.27*****	1								
BSIZE	0.01	-0.07	0.08	**-0.15****	**-0.10***	**0.16****	**-0.11***	1							
BINDP	**0.15****	-0.06	-0.04	**-0.15****	-0.04	**-0.19*****	**-0.44*****	**0.41*****	1						
SSB	-0.07	-0.03	**0.30*****	**-0.17*****	**0.19*****	**-0.13***	**-0.36*****	**0.50*****	**0.43*****	1					
TOAS	**0.39*****	**-0.49*****	0.06	0.01	-0.06	-0.05	-0.05	**0.12***	**0.13****	**0.13****	1				
ROA	-0.01	-0.06	0.02	-0.07	-0.08	0.01	-0.06	**0.12***	**0.12***	0.06	0.04	1			
EQ	-0.03	0.01	-0.07	-0.04	-0.04	0.02	-0.03	0.01	0.08	-0.01	0.02	**0.12***	1		
POPDEN	-0.08	0.01	0.02	**0.16****	**-0.19*****	**0.18*****	**0.16****	**0.45*****	**-0.18*****	0.02	-0.01	-0.01	-0.02	1	
REG	**-0.12***	-0.02	-0.06	**-0.30*****	**0.13****	**-0.25*****	**-0.68*****	**-0.12***	**0.40*****	**0.39*****	-0.03	0.04	0.07	**-0.39*****	1

*** p<0.01, ** p<0.05, * p<0.1

5. Results and discussions

We elect to run both restricted and unrestricted versions of our core econometric model shown in Equation (1) and (2). Table 5 and 6 highlight the results from both the restricted and unrestricted models for our two dependent variables - *SHA* and *TSHA*. From Table 5, models (1) – (6) and (7) – (10) represent the restricted macroeconomic and firm-based models respectively, while model (11) highlights the results for the unrestricted model that simultaneously investigate the influence of both macroeconomic and firm dynamics on our dependent variable *Shariah assets (SHA)*. All models are performed with institutional and temporal fixed effects with the majority of the models with adjusted R-squared values within the region of 30% with the exceptions of models (6), (7) and (9) reporting an adjusted R-squared of 14%. We consider the unrestricted model to begin with as it provides the most parsimonious representation of linear macroeconomic and firm predictors of Shariah asset holdings. From model (11) we observe that economic wealth and liquidity are positive linear, macroeconomic predictors of Shariah assets holdings suggesting the acceptance of $\mathbf{H_1}$ and $\mathbf{H_4}$. Examining the coefficients for both variables, a 1% increase in both wealth and liquidity would result in an increase of 0.108% and 0.024% of Shariah asset holdings by IFIs respectively, ceteris paribus. Our results also indicate that board size is a positive, firm-based predictor of Shariah assets, thus leading to accept $\mathbf{H_6}$, with Shariah asset holdings increasing by 0.399% for every 1% change in conventional board size. We see no other significant macroeconomic and firm-based effects other than those reported above. Regarding our control variables, both firm size and population density exert a positive influence on Shariah asset holding behavior, whilst the regulatory index displays is negatively associated with Shariah asset holdings. The coefficients for all significant models are in the expected direction based upon our, *a priori*, hypothecations. We utilize the restricted models as tests

for robustness of our reached results. In this regard, the output of models (6) and (10) are supportive of the acceptance of both our macroeconomic **(H_1** and **H_4)** and firm-based (**H_6**) hypotheses developed in section 2.

Table 5. Baseline model – Dependent variable SHA (without sample segmentation)

VARIABLES	(1) FE Panel Model	(2) FE Panel Model	(3) FE Panel Model	(4) FE Panel Model	(5) FE Panel Model	(6) FE Panel Model	(7) FE Panel Model	(8) FE Panel Model	(9) FE Panel Model	(10) FE Panel Model	(11) FE Panel Model
WEALTH	**0.046****					**0.072***	**0.073***	**0.095****	**0.071***		**0.108****
	(0.023)					**(0.039)**	**(0.040)**	**(0.047)**	**(0.039)**		**(0.044)**
RET		-0.001				0.001	0.001	-0.003	0.001		-0.002
		(0.004)				(0.004)	(0.004)	(0.003)	(0.004)		(0.003)
RISK			**-0.026***			-0.001	-0.004	-0.010	-0.000		-0.008
			(0.014)			(0.029)	(0.032)	(0.012)	(0.030)		(0.011)
LIQUID				0.002		**0.034*****	**0.034*****	**0.027*****	**0.035*****		**0.024****
				(0.003)		**(0.009)**	**(0.009)**	**(0.009)**	**(0.010)**		**(0.010)**
INF					-0.011	**-0.039****	**-0.038****	-0.022	**-0.038****		-0.020
					(0.014)	**(0.016)**	**(0.017)**	(0.016)	**(0.017)**		(0.017)
BSIZE	**0.345****	**0.316***	**0.339***	**0.294***	**0.309***		0.079			**0.297***	**0.399***
	(0.166)	**(0.178)**	**(0.183)**	**(0.163)**	**(0.168)**		(0.185)			**(0.163)**	**(0.212)**
BINDP	-0.122	-0.144	-0.107	-0.108	-0.118			-0.031		-0.112	-0.147
	(0.076)	(0.098)	(0.106)	(0.080)	(0.077)			(0.137)		(0.077)	(0.135)
SSB	0.119	0.131	**0.140***	0.131	0.103				-0.002	0.131	0.039
	(0.077)	(0.086)	**(0.084)**	(0.081)	(0.075)				(0.065)	(0.081)	(0.072)
TOAS	**0.424*****	**0.425*****	**0.318*****	**0.434*****	**0.428*****	-0.032	**-0.032**	**0.272*****	-0.033	**0.433*****	**0.270*****
	(0.108)	**(0.112)**	**(0.092)**	**(0.110)**	**(0.112)**	(0.073)	**(0.073)**	**(0.075)**	(0.073)	**(0.110)**	**(0.073)**
EQ	**-0.024***	**-0.024***	-0.013	-0.023	-0.023	-0.019	-0.017	-0.015	-0.019	-0.023	-0.015
	(0.014)	**(0.014)**	(0.011)	(0.014)	(0.014)	(0.014)	(0.018)	(0.010)	(0.014)	(0.014)	(0.010)
ROA	0.093	0.184	-0.053	0.167	0.164	0.729	0.781	0.118	0.729	0.145	0.254
	(0.818)	(0.878)	(0.839)	(0.772)	(0.772)	(0.899)	(0.826)	(0.812)	(0.929)	(0.776)	(0.758)
POPDEN	**0.012*****	**0.008****	**0.007*****	**0.008****	**0.007****	**0.025*****	**0.025*****	**0.023*****	**0.025*****	**0.007****	**0.024*****
	(0.004)	**(0.003)**	**(0.002)**	**(0.003)**	**(0.003)**	**(0.005)**	**(0.005)**	**(0.006)**	**(0.005)**	**(0.003)**	**(0.006)**
REG	-0.325	0.007	-0.290	-0.261	-0.190	**-2.423*****	**-2.449*****	**-1.320****	**-2.394*****	-0.176	**-1.298****
	(0.282)	(0.281)	(0.390)	(0.313)	(0.286)	**(0.895)**	**(0.904)**	**(0.567)**	**(0.889)**	(0.288)	**(0.575)**
Observations	322	283	270	322	322	264	264	235	263	322	234
Adj. R-squared	0.39	0.38	0.29	0.38	0.38	0.14	0.14	0.31	0.14	0.38	0.34
Institution FE	116	102	97	116	116	92	92	85	92	116	85
Yearly FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6 reported below presents the results reached when performing our core regression model on our second dependent variable represented by the *ratio of Shariah assets to total assets (TSHA)*. Similar to Table 5, models (1) – (6) and (7) – (10) represent the restricted macroeconomic and firm-based models respectively, whilst model (11) reflects the unrestricted model inclusive of both macroeconomic and firm-based dynamics. Our results for *TSHA* are not as strong as the ones obtained on the other dependent variable *SHA* with adjusted R-squared values falling in the region of 20%. Looking at the individual variable significance in the unrestricted model (11), economic wealth turns out to be the only significance linear and positive predictor of the change in the holding ratio of Shariah to total assets, where a 1% increase in economic wealth results in an increase of Shariah to total asset holding of 0.034%. Outside the core independent variables, both size and population density are significant, however, interestingly firm's size has a negative relationship with Shariah to total asset holding, thus suggesting that an increase in a given IFI's size results in lower holdings of Shariah assets in relation to non-Shariah assets. It is not, *a priori*, clear the underlying explanation for this but a potential argument could arise from the traditional agency dialectic in terms of firm size and diversification (Aron, 1988; Hoskisson & Hitt, 1990; Martin & Sayrak, 2003). Examining the results of the restricted model displayed in column (6), we notice that the variable economic wealth is still a significant and positive linear predictor of *TSHA*, however this significance drops-off when further restricted, as shown in model (1). We also see positive firm-based effects in terms of the influence of the Shariah supervisory board on *TSHA* within the restricted models (1) – (5) and model (10).

With regards to the significance of our macroeconomic measure of economic wealth, our results are consistent with the view that economic agents are inclined to demand more Shariah-assets as wealth increases (Paiella & Pistaferri, 2017). We can utilize a similar analogy for our positive liquidity effect found when investigating liquidity, as the demand for

Shariah-assets increases proportionally to market liquidity (Chordia *et al.*, 2008; Fama & Schwert, 1977; Sadka, 2010; Shleifer & Vishny, 1997). These findings potentially represent a testament to the development and growth of the market for Shariah-assets over the past two decades and that issuance of both Shariah-compliant money and capital market instruments, for example Islamic bonds and Shariah-compliant equities, have been increasing year on year (Gheeraert, 2014; Islamic Financial Services Board, 2019; Narayan & Phan, 2019). Our results are also supportive of our agency conceptualization of firm dynamics as drivers of Shariah asset holding behavior of IFIs with corporate board size being a positive linear predictor of the percentage annual change in Shariah assets, i.e. *SHA*. A possible interpretation of this finding is that larger boards result in greater monitoring in relation to adherence to the religio-financial framework of Islamic finance, thus inducing managers to hold a higher proportion of Shariah assets (Apaydin, 2018; Halim *et al.*, 2019). Furthermore, the suggestion from our results that the size of the Shariah supervisory board is a positive linear predictor of the change in the ratio of Shariah assets to total assets, i.e. *TSHA*, is also pertinent within this context in that it indicates that the Shariah supervisory board has some influence on the religio-financial framework as well but not in the traditional agency manner as posited by some of the extant literature (Halim et al., 2019; Nawaz & Virk, 2019). Our results suggest that whilst the Shariah supervisory boards have a say on the Shariah-screening process in terms of the ratio of Shariah assets to total assets, the decision as to what Shariah assets to hold still resides with the conventional board. This is potentially indicative that the Shariah supervisory boards exist within a resource provision capacity by advising on the ratio of Shariah and total assets but the conventional board decides on the composition of the Shariah assets being held. This assertion has relevant implications for the burgeoning academic literature on Shariah governance since it provides further support that it is the corporate board that retains a monitoring role and the Shariah supervisory board resides as

resource provision in terms of religious expertise and consultancy (Safiullah & Shamsuddin, 2019).

Table 6. Baseline model – Dependent variable TSHA (without sample segmentation)

VARIABLES	(1) FE Panel Model	(2) FE Panel Model	(3) FE Panel Model	(4) FE Panel Model	(5) FE Panel Model	(6) FE Panel Model	(7) FE Panel Model	(8) FE Panel Model	(9) FE Panel Model	(10) FE Panel Model	(11) FE Panel Model
WEALTH	0.008					**0.021****	**0.019****	**0.038****	**0.021****		**0.034****
	(0.011)					**(0.010)**	**(0.010)**	**(0.015)**	**(0.010)**		**(0.014)**
RET		-0.004				-0.001	-0.002	-0.003	-0.001		-0.003
		(0.003)				(0.001)	(0.001)	(0.002)	(0.001)		(0.003)
RISK			-0.001			-0.009	-0.006	-0.002	-0.011		-0.003
			(0.006)			(0.009)	(0.007)	(0.005)	(0.009)		(0.006)
LIQUID				-0.003		0.000	0.001	0.001	-0.001		0.000
				(0.002)		(0.006)	(0.006)	(0.006)	(0.006)		(0.006)
INF					**0.011***	0.001	0.001	-0.001	0.006		0.005
					(0.007)	(0.006)	(0.005)	(0.006)	(0.007)		(0.009)
BSIZE	-0.087	-0.089	-0.104	-0.090	-0.107		-0.114			-0.096	-0.092
	(0.079)	(0.092)	(0.093)	(0.084)	(0.087)		(0.084)			(0.085)	(0.092)
BINDP	-0.015	-0.031	-0.027	-0.022	-0.008			-0.053		-0.013	-0.022
	(0.014)	(0.025)	(0.024)	(0.017)	(0.015)			(0.052)		(0.014)	(0.032)
SSB	**0.051***	**0.052****	**0.055***	**0.053***	**0.081***				0.058	**0.053***	0.052
	(0.030)	**(0.025)**	**(0.030)**	**(0.029)**	**(0.041)**				(0.035)	**(0.029)**	(0.032)
TOAS	**-0.113****	**-0.197****	**-0.133****	**-0.122****	**-0.113****	**-0.134*****	**-0.134*****	**-0.289*****	**-0.133*****	**-0.114****	**-0.284*****
	(0.054)	**(0.077)**	**(0.065)**	**(0.053)**	**(0.052)**	**(0.037)**	**(0.036)**	**(0.060)**	**(0.036)**	**(0.054)**	**(0.060)**
EQ	-0.010	-0.010	-0.009	-0.010	-0.010	-0.006	-0.010	-0.008	-0.004	-0.010	-0.008
	(0.007)	(0.006)	(0.008)	(0.007)	(0.007)	(0.005)	(0.007)	(0.006)	(0.006)	(0.007)	(0.006)
ROA	0.390	0.380	0.672	0.341	0.366	0.351	0.281	0.404	0.298	0.393	0.284
	(0.288)	(0.336)	(0.521)	(0.272)	(0.282)	(0.423)	(0.380)	(0.444)	(0.422)	(0.289)	(0.395)
POPDEN	0.002	**0.003***	-0.000	0.000	0.001	0.003	0.002	**0.006*****	0.003	0.001	**0.006****
	(0.001)	**(0.002)**	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	**(0.002)**	(0.002)	(0.001)	**(0.002)**
REG	-0.080	-0.193	-0.161	0.097	-0.038	-0.053	-0.015	-0.186	-0.108	-0.051	-0.225
	(0.101)	(0.152)	(0.142)	(0.106)	(0.092)	(0.271)	(0.285)	(0.257)	(0.263)	(0.088)	(0.241)
Observations	326	285	273	326	326	265	265	236	264	326	235
R-squared	0.17	0.22	0.20	0.18	0.18	0.30	0.31	0.30	0.31	0.17	0.31
Institution FE	116	102	97	116	116	92	92	85	92	116	85
Yearly FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

We further disentangle the effects of the core regression models by running auxiliary regressions on segmented samples, stratifying the IFIs along both an institutional and a "modus operandi" dimensions. Table 7 presents the results obtained for both our dependent variables reflecting IFI's Shariah asset holding behavior according to the type of institution, i.e. Islamic bank versus non-banking IFIs. Models (1) and (2) show the results for our dependent variable *SHA*. On the one hand, from models (1) and (2) we notice that economic wealth is a significant and positive linear predictor of Shariah assets holdings for both Islamic banks and non-banking IFIs, even if the economic wealth effect is likely to be stronger for Islamic banks. On the other hand, we observe that the effects of macroeconomic liquidity and firm-based board size turn out to be positive and statistically significant only for Islamic banks. Similar to our previous findings without sample segmentation, the estimation results for *TSHA* as the dependent variable are not as strong as the ones obtained for the dependent variable *SHA* with lower adjusted R-squared values. In this regard, examining models (3) and (4) we notice that economic wealth is a significant and positive linear predictor only for Islamic banks. Whilst it is ambiguous, *a priori*, as to the cause of this, we argue that, since commercial and retail banking represent the largest sector of the global Islamic financial industry, it seems reasonable that economic wealth would affect Islamic banks rather than non-banking IFIs (Islamic Financial Services Board, 2019; Narayan & Phan, 2019). Regarding the significant and positive effects of the corporate board size for Islamic banks only, there is evidence that the Islamic banking sector experiences more innovation than their non-banking counterparts and as such there is a need for greater monitoring on the part of the board to ensure greater adherence to the religio-financial framework (Abedifar, Giudici, & Hashem, 2017; Alamad, 2017). In this light, with the increased financial innovation in the banking sector, Islamic banks could be pushed to mimic conventional financial products which could be in conflict within the religio-financial framework characterizing the Islamic

financial world (Abdul-Rahman *et al.*, 2014). However, it is worth noting that the direction of all individual significant variables in models (1) – (4) is similar to the one of the variables present in the main regression models run without sample segmentation.

Table 7. Baseline model – Sample segmentation by type of institution

	Dependent variable - SHA		Dependent variable - TSHA	
VARIABLES	(1) FE Panel Model – Islamic Banks	(2) FE Panel Model – Non-banking IFIs	(3) FE Panel Model – Islamic Banks	(4) FE Panel Model – Non-banking IFIs
WEALTH	**0.115****	**0.064***	**0.053****	-0.001
	(0.055)	**(0.034)**	**(0.024)**	(0.004)
RET	0.004	-0.003	-0.006	-0.008
	(0.006)	(0.021)	(0.004)	(0.008)
RISK	-0.002	0.006	0.003	0.008
	(0.014)	(0.014)	(0.008)	(0.008)
LIQUID	**0.037*****	0.004	-0.001	0.006
	(0.012)	(0.014)	(0.010)	(0.005)
INF	-0.022	-0.009	0.009	-0.008
	(0.021)	(0.016)	(0.013)	(0.005)
BSIZE	**0.484****	-0.214	-0.091	-0.172
	(0.223)	(0.214)	(0.100)	(0.115)
BINDP	-0.180	0.075	-0.011	0.029
	(0.142)	(0.124)	(0.033)	(0.027)
SSB	-0.012	-0.130	0.075	-0.077
	(0.096)	(0.233)	(0.057)	(0.074)
TOAS	**0.238*****	**0.600*****	**-0.304*****	0.026
	(0.060)	**(0.200)**	**(0.058)**	(0.033)
EQ	-0.016	**0.018***	-0.010	0.002
	(0.012)	**(0.010)**	(0.009)	(0.001)
ROA	-4.437	0.406	1.628	0.162
	(4.167)	(0.483)	(2.661)	(0.162)
POPDEN	0.191	0.011	-0.068	0.004
	(0.116)	(0.014)	(0.063)	(0.004)
REG	-0.714	-0.825	**-0.510***	-0.831
	(0.818)	(1.567)	**(0.276)**	(0.617)
Observations	178	56	179	56
Adj. R-squared	0.37	0.75	0.35	0.46
Institution FE	64	21	64	21
Yearly FE	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Secondly, we segment our sample along a Shariah-based and Shariah-compliant characterization. The results for the *"modus operandi"* regressions are presented in Table 8 reported below. By stratifying our sample between Shariah-based and -compliant institutions, we aim to capture the differences in Islamic banking paradigms. Similar to Table 7, models (1) and (2) are performed with *SHA* as the dependent variable. In this regard, our results indicate there is minimal variability between Shariah-based and Shariah-compliant IFIs with the only difference being that liquidity has a significant positive effect on Shariah asset holding behavior only for Shariah-compliant firms. Once again, we have, *a priori*, no explanation for this but afford an elucidation. A possible interpretation is that, given that Shariah-based screening processes are religiously stricter than Shariah-compliant screening process, Shariah-based instruments would be Shariah-compliant by default resulting in a wider and deeper market in terms of instruments and clientele for Shariah-compliant firms (Apaydin, 2018). Moreover, given the relative leniency of the Shariah-compliant screening processes against the Shariah-based, there is greater room for financial innovation, once again manifesting a more liquid market. Model (3) of Table 8 reports our results when focusing on the other dependent variable, i.e., *TSHA.* This analysis can be performed only for Shariah-compliant institutions as Shariah-based firms have no variability in their ratio of Shariah to total assets as they are entirely composed of Shariah assets.

Table 8. Baseline model – Sample segmentation by mode of operation

	Dependent variable - SHA		Dependent variable - TSHA
	(1)	(2)	(3)
VARIABLES	FE Panel Model – Shariah-based	FE Panel Model – Shariah-compliant	FE Panel Model – Shariah-compliant
WEALTH	0.001	0.027	0.069
	(0.026)	(0.138)	(0.046)
RET	0.002	-0.125	0.017
	(0.004)	(0.090)	(0.023)
RISK	-0.012	-0.016	0.008
	(0.010)	(0.031)	(0.010)
LIQUID	0.015	**0.045****	0.005
	(0.013)	**(0.021)**	(0.005)
INF	-0.014	0.002	0.012
	(0.017)	(0.029)	(0.010)
BSIZE	0.291	0.383	-0.042
	(0.248)	(0.248)	(0.064)
BINDP	0.181	-0.305*	0.012
	(0.135)	(0.176)	(0.036)
SSB	-0.086	0.178	0.061
	(0.125)	(0.221)	(0.047)
TOAS	**0.496****	**0.278*****	**-0.334*****
	(0.228)	**(0.071)**	**(0.025)**
EQ	0.009	**-0.060*****	**-0.016****
	(0.006)	**(0.017)**	**(0.007)**
ROA	0.549	-0.249	-0.500
	(0.566)	(3.499)	(0.708)
POPDEN	0.008*	0.587	0.051
	(0.005)	(0.777)	(0.164)
REG	-0.712	-3.286	-0.238
	(0.543)	(2.493)	(0.788)
Observations	113	121	121
Adj. R-squared	0.37	0.45	0.80
Institution FE	41	44	44
Yearly FE	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6. Robustness tests

6.1. Comparison to generalized method of moments (GMM) estimation

The validity and robustness of our previous estimates and their interpretations are dependent upon the assumption of exogeneity of regressors and the non-presence of reverse causality with the regression models. To address these issues, we now compare our previous estimates with the results obtained via a GMM estimation process (Arellano & Bond, 1991). In this regard, we utilize the AR(1) transformations of all the variables from the main regression model as instruments affording us the ability to treat them as exogenous thus eliminating unobserved heterogeneity and addressing omitted variable bias. Prior to our GMM estimations and given our unbalance panel structure, we run Fisher-type unit root tests, using a Schwarz information criterion for lag length determination (Im, Pesaran, & Shin, 2003). The results of these tests indicate the non-existence of a unit root in first difference for all variables. Our GMM results are presented in Table 9 reported below, where models (1) and (2) use *SHA* and *TSHA* as dependent variables, respectively. The generated Hansen J-stats for both models are small and not significant indicating the appropriateness of the AR(1) transformations of the variables as instruments and that the overidentification restrictions are valid within the GMM framework. Overall, our GMM estimation results are consistent with those previously obtained through panel data fixed effects estimation, with variables wealth, liquidity and board size being significant and positive predictors of *SHA*, whilst economic wealth being the only significant and positive predictor of *TSHA*.

Table 9. Baseline model – Generalized method of moments (GMM) estimation

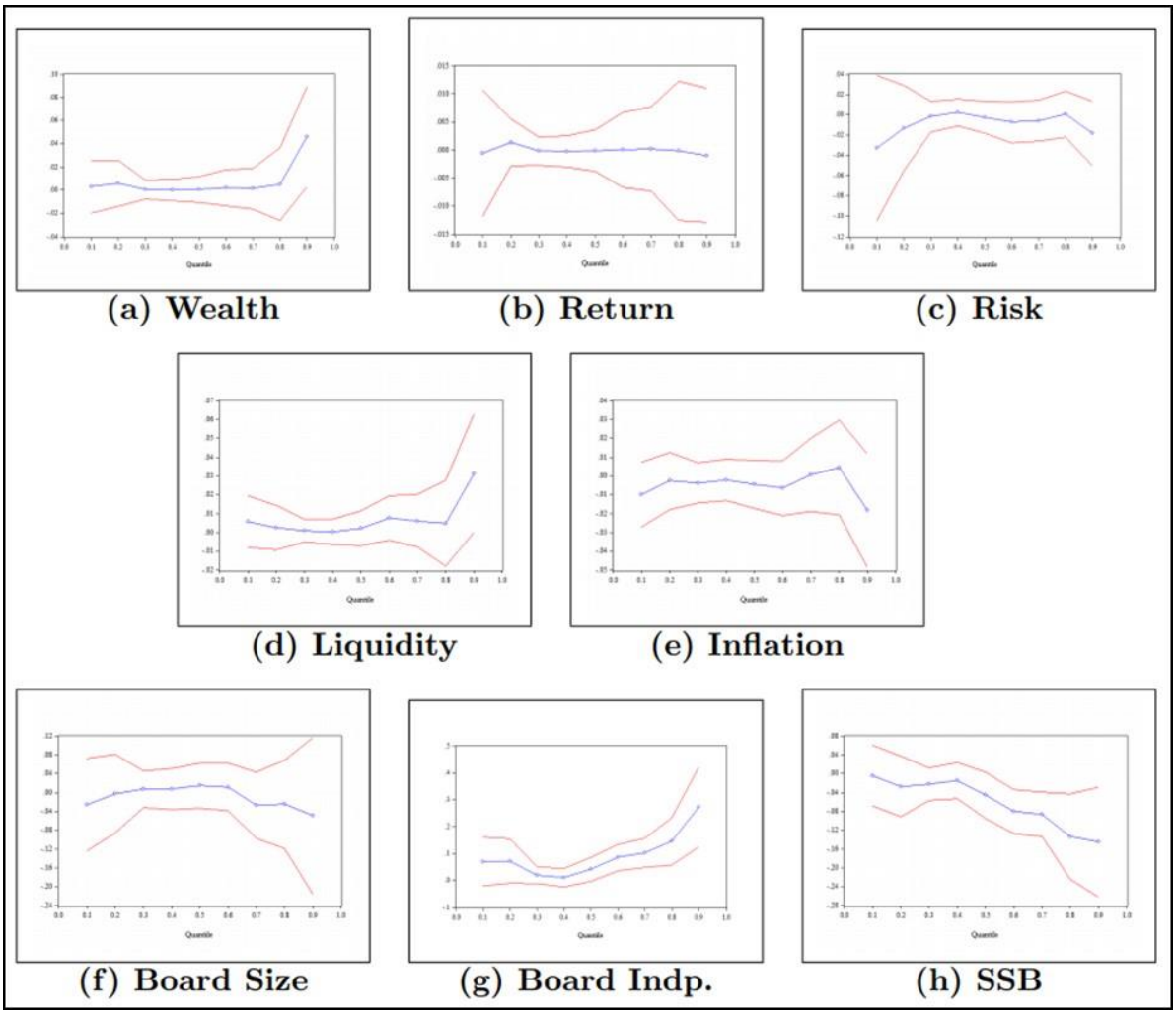
	Dependent variable - SHA	Dependent variable - TSHA
VARIABLES	(1) FE Panel Model	(2) FE Panel Model
WEALTH	**0.108****	**0.034****
	(0.044)	**(0.014)**
RET	-0.002	-0.003
	(0.003)	(0.003)
RISK	-0.008	-0.003
	(0.011)	(0.006)
LIQUID	**0.024****	0.000
	(0.010)	(0.006)
INF	-0.020	0.005
	(0.017)	(0.009)
BSIZE	**0.399***	-0.092
	(0.212)	(0.092)
BINDP	-0.147	-0.022
	(0.135)	(0.032)
SSB	0.039	0.052
	(0.072)	(0.032)
TOAS	**0.270*****	**-0.284*****
	(0.073)	**(0.060)**
EQ	-0.015	-0.008
	(0.010)	(0.006)
ROA	0.254	0.284
	(0.758)	(0.395)
POPDEN	**0.024*****	**0.006****
	(0.006)	**(0.002)**
REG	**-1.298****	-0.225
	(0.575)	(0.241)
Observations	234	235
Adj. R-squared	0.39	0.31
Institution FE	85	85
Yearly FE	YES	YES
Hansen J-Stat	0.0001	0.0001

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6.2. Testing for sample quantile heterogeneity

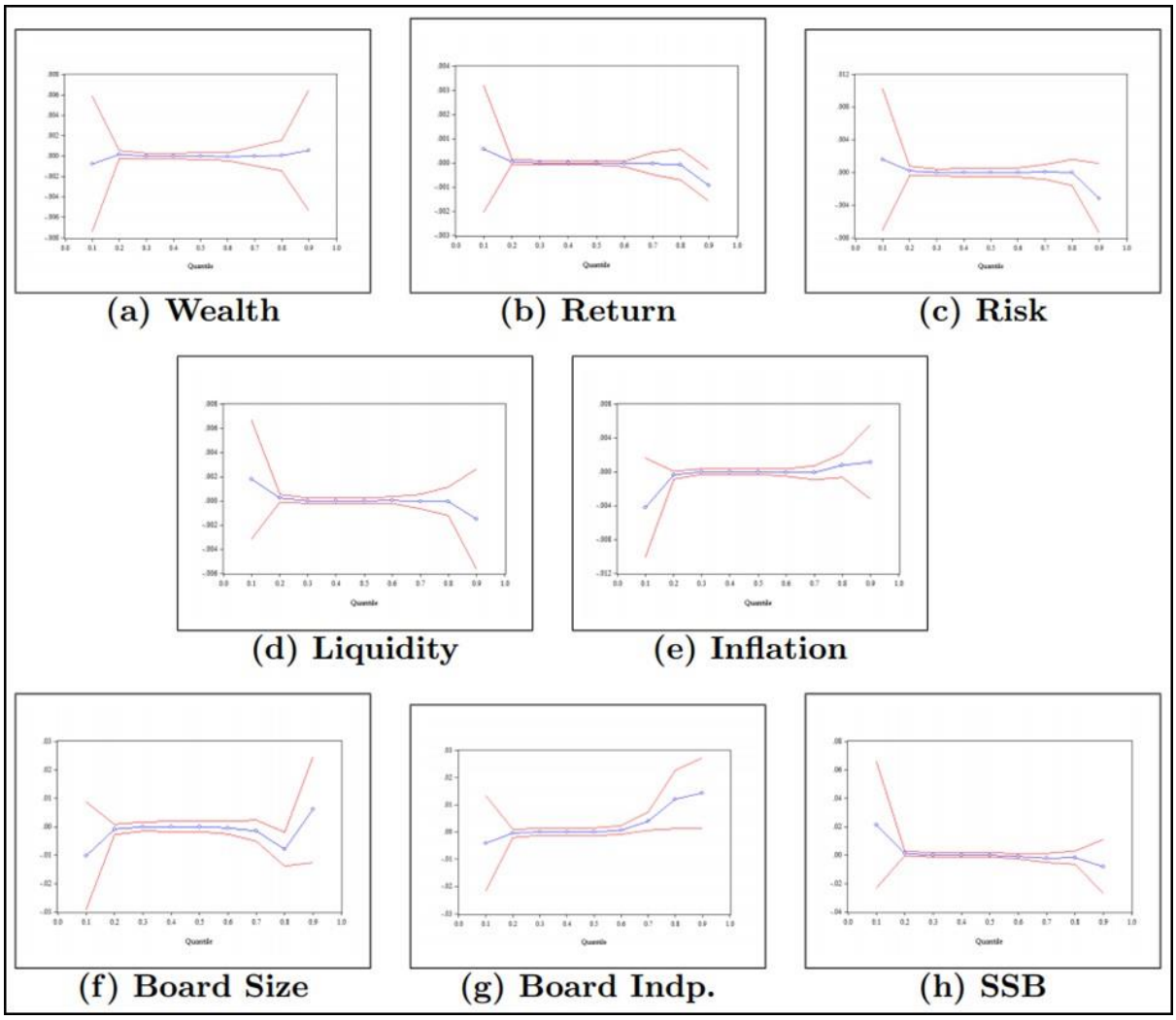
As our data is organized in ranked order, we are able to further test for sample heterogeneity along a size dimension. We engage this via the use of quantile regressions by decomposing our IFIs into the 25^{th}, 50^{th} and 75^{th} percentiles according to their size; this allows us to determine whether there are significance differences across IFIs of different sizes. We present the graphical representations of the quantile process coefficients below. On the one hand, Figure 1 highlights the process coefficients for the model with *SHA* as the dependent whilst Figure 2 indicates the process coefficients for the model with *TSHA* as the dependent variable. In Figure 1 shown below, panels (a) to (e) and (f) to (h) represent the quantile process coefficients for the macroeconomics and firm dynamics, respectively, on the dependent variable *SHA*. The non-patterned lines indicate a 95% confidence interval. The patterned central lines in panels (a) – (f) are relatively flat suggesting consistency across the quantiles. It should be noted that, whilst panels (g) and (h) possess some trend in the upper quantiles, the spread along the y-axis is minimal.

Figure 1. Quantile process representations for macroeconomic and firm dynamics – Dependent variable *SHA*



The conclusions reached when investigating Figure 2 displayed below are largely similar to those reached when analyzing Figure 1. In Figure 2, panels (a) to (e) and (f) to (h) represent the quantile process coefficients for the macroeconomics and firm dynamics, respectively, on the dependent variable *TSHA*. The process quantile plots are, once again, relatively flat indicating the overall stability of our estimates across the entire sample.

Figure 2. Quantile process representations for macroeconomic and firm dynamics – Dependent variable *TSHA*



We further utilize the Wald test to determine the equality of slope coefficients between the three aforementioned percentiles, with the non-rejection of the null hypothesis indicating no difference; results from running the Wald test are reported in Table 10 shown below. To sum up, the intent of a quantile stability test is to determine if the smaller models from the quantiles are appropriate in relation to the unrestricted specification (Koenker & Bassett, 1982). In this regard, the Wald test's results indicate that the chi-squared statistics are 27.488 and 31.632 and are not statistically significant, thus suggesting that there is no difference between the quantiles for both models run on our two dependent variables.

Table 10. Test statistics for quantile slope equality

Model	Test Quantiles	Chi-Sq. Stat	D.F.
Model 1 (*SHA* dependent)	4	27.488	26
Model 2 (*TSHA* dependent)	4	31.632	26

*** p<0.01, ** p<0.05, * p<0.1

7. Conclusions

Our study aims to investigate the determinants of the Shariah asset holding behavior of Islamic financial institutions (IFIs) by adopting both a macroeconomic and a firm-based lens by exploiting a unique and proprietary dataset comprising 140 IFIs operating in 16 different countries over the time period 2011–2015. We adopt a traditional economic and agency theorization respectively for our, *a priori*, conceptualizations of the individual determinants of Shariah asset holding behavior. The existing academic literature highlights the superior performance of IFIs against their conventional counterparts along some dimension of efficiency and argues that this is borne out of the inception of a religio-financial framework. However, the extant literature fails to disentangle the application of this religio-financial framework within the empirical examinations of IFIs' efficiency by not being able to decompose the elements of a given institution's transaction undergoing a Shariah-screening process. We aim to address this gap in the literature by distinguishing between Shariah assets and total assets in our empirical investigation. Overall, our results indicate that IFIs' Shariah asset holding behavior is influenced by both macroeconomic and firm-based dynamics. From a macroeconomic perspective, our results are supportive of the traditional economic conceptualizations of asset demand and highlight that both wealth and liquidity are robust and positive linear predictors of Shariah asset holdings. From a managerialist perspective, our results on firm dynamics indicate that board size is a robust and positive linear predictor of Shariah asset holding behavior. Moreover, our findings also support the

evidence within the wider academic literature that the Shariah supervisory board does not adopt an active monitoring role within the perimeter of IFIs, but rather resides as resource provision in terms of religious expertise and consultancy (Safiullah & Shamsuddin, 2019), and that it is precisely the conventional board that performs a monitoring role within the Shariah governance framework. Our results are consistent across robustness tests, including GMM estimation and quantile regression analysis. Interestingly, when we segment our sample into Islamic banks and non-banking IFIs, we find that, while wealth is significant and positive across both Islamic banks and non-banking IFIs, liquidity and board size are significant and positive only for Islamic banks. Furthermore, when we segment our sample into Shariah-based and Shariah-compliant IFIs, our results suggest that there is no substantial differences as far as findings are concerned, except for the liquidity measure that turns out to be significant and positive only in the case of Shariah-compliant IFIs. Overall, our investigation of the macroeconomic and firm-based dynamics of Shariah asset holding behavior of IFIs at the global level is supportive of both the traditional macroeconomic and agency theoretical conceptualizations of asset holdings

Our findings have relevant policy implications as they highlight to policy makers, as well as to the managers and leaders of IFIs, the dynamics driving IFIs' holding of Shariah assets at both the industry and the firm level. From a macroeconomic perspective, our findings highlight the significance of the relationship between sovereign monetary cycles and Shariah asset holdings. From a managerialist perspective, we contribute to the wider and growing literature on Shariah governance by providing support for the contention of utilizing agency theory as a singular lens for conceptualizing Shariah supervisory board (SSB) behavior. This provides policy makers and the leaders of IFIs with a better understanding of the interface between Shariah and corporate governance from an institutional perspective and an appreciation of the roles of both conventional and Shariah supervisory boards within this

unique governance framework, and paves the way for further research in this area within the global Islamic financial sector.

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Authors' statement

We, the authors, acknowledge that the submitted manuscript abides by the ethical standards of *Global Finance Journal* and has not been published nor is it currently under consideration for publication elsewhere. We, the authors, acknowledge the contribution of all parties to this manuscript and are in agreement with the content of this manuscript. We have no conflicts of interest to disclose. This work has been supported by mainstream QR funding from Liverpool John Moores University Liverpool Business School.

Highlights

- Conceptualizations of Shariah asset holding behaviour are, a priori, nebulous

- We utilize a macroeconomic and managerialist lens for our conceptualization

- Macroeconomic wealth and liquidity are positive predictors of Shariah asset holdings

- Institutional corporate boards have an influence on Shariah asset holdings

- Shariah supervisory boards have an effect on the ratio of Shariah to total assets