

Does religiosity affect stock investors' herding behaviour? Global evidence

Article

Published Version

Creative Commons: Attribution 4.0 (CC-BY)

Open Access

El Hajjar, S. ORCID: <https://orcid.org/0000-0002-5664-8346>,
Gebka, B., Duxbury, D. and Su, C. (2024) Does religiosity affect stock investors' herding behaviour? Global evidence. *Finance Research Letters*, 62 (A). 105165. ISSN 1544-6123
doi: 10.1016/j.frl.2024.105165 Available at
<https://centaur.reading.ac.uk/115638/>

It is advisable to refer to the publisher's version if you intend to cite from the work. See [Guidance on citing](#).

To link to this article DOI: <http://dx.doi.org/10.1016/j.frl.2024.105165>

Publisher: Elsevier

All outputs in CentAUR are protected by Intellectual Property Rights law, including copyright law. Copyright and IPR is retained by the creators or other copyright holders. Terms and conditions for use of this material are defined in the [End User Agreement](#).

www.reading.ac.uk/centaur



Does religiosity affect stock investors' herding behaviour? Global evidence[☆]



Samah El Hajjar^a, Bartosz Gebka^{b,*}, Darren Duxbury^c, Chen Su^b

^a ICMA Centre, Henley Business School, University of Reading, RG6 6UR, UK

^b Newcastle University Business School, Newcastle University, Newcastle upon Tyne, NE1 4SE, UK

^c Newcastle University Business School, Frederick Douglass Centre, Newcastle University, Newcastle Helix, 2 Science Square, Newcastle upon Tyne, NE4 5TG, UK

ARTICLE INFO

JEL classifications:

G10
G41
Z12

Keywords:
Herding
Religion
Stock market
Culture

ABSTRACT

We investigate if religiosity promotes herding among stock market investors. In a global sample of 21 markets over the period 2006–2018, increasing religiosity fosters herding only when the absolute religiosity level is relatively high. At low levels, an increase in religiosity has the opposite effect, promoting anti-herding. Our finding that changes in religiosity, depending on its level (high versus low), exert opposing effects on herding helps to understand contradictory findings in prior literature. Religiosity further induces more herding when economic freedom is low and the state is either impotent or corrupt, and promotes anti-herding when institutional quality is high.

1. Introduction

The existence of herding – a tendency of individuals to ignore their private beliefs and follow the actions of their peers instead (Hirshleifer and Teoh, 2003) – has been widely documented in both empirical (see Kallinterakis and Gregoriou, 2017, for a review) and experimental (see Duxbury, 2015, for a review) studies. Various theoretical mechanisms have been proposed to explain why herding emerges, along with its implications for individual rationality and market-wide efficiency.¹ While herding tends to prevail in emerging rather than mature stock markets (e.g., Goodfellow et al., 2009; Economou et al., 2011) and intensify due to crisis outbreaks (Cui et al., 2019; Demirer et al., 2019), the literature is not unanimous regarding what market conditions create more fertile grounds for investors to herd: rising (e.g., Economou et al., 2015) or falling (Goodfellow et al., 2009; Holmes et al., 2013) markets, high (Yang and Chuang, 2023) or low (Holmes et al., 2013; Ukpog et al., 2021) volatility or trading intensity (Economou et al., 2011, Cui et al., 2019) episodes.

Some scholars proposed that the missing piece of this puzzle, needed to better understand what drives herding, is investors' cultural background. For instance, Blasco et al. (2017) analyse a global sample of stocks from January 2000 to June 2015 through the lens of cultural characteristics as defined by Hofstede (2001: power distance, individualism versus collectivism, masculinity versus femininity, uncertainty avoidance, long- versus short-term orientation, and indulgence versus restraint). They conclude that, once the

[☆] We thank Gallup Analytics for providing data on religiosity.

* Corresponding author.

E-mail address: b.t.gebka@ncl.ac.uk (B. Gebka).

¹ See the Appendix for a brief discussion of the relevant arguments and literature.

interactions between culture and organisational and environmental characteristics have been accounted for, herding is boosted only by masculinity and is unrelated to other cultural dimensions. Relatedly, [Chang and Lin \(2015\)](#) investigate herding in a world-wide sample of listed stocks up to 2011, and also find only masculinity to be herding-inducing.

In this study, we contribute to this branch of the literature by studying religiosity as an important, yet distinct, element of national culture. Religiosity varies both across countries and time ([Fig. 1](#)), while other popular measures of culture (e.g., [Hofstede, 2001](#)) are time-invariant and so provide less information on the evolution of social norms and forces shaping human behaviour. We propose to study religiosity as an important element of national culture, specifically as it is an observable manifestation of socially conforming behaviour. Prior research extensively demonstrated that social agents have inherent preference for conformity ([Asch, 1958; Jones, 1984; Bernheim, 1994](#)), defined as matching the behaviour of others ([Cialdini and Goldstein, 2004](#)). Therefore, there is a significant conceptual overlap between conformity and herding. Conformity is underpinned by normative but also informational motivations, i.e., individuals accede to conformity because they believe the group knows best ([Argyle, 2005](#)). Religion is intrinsically linked to conformity, as it influences individuals' behaviours through their interactions in groups, fostering greater in-group homogeneity of beliefs and actions ([Stark, 1984](#)). In addition, religiosity sustains collaboration among non-kin by fostering pro-social preferences such as trust and reciprocity ([Caicedo et al., 2023](#)). As such, religion is therefore conceptually linked to market-wide investor herding, which also represents a manifestation of conformist and imitating behaviour, and which would not be possible without a degree of trust in others' opinions and actions.

A positive impact of religion on investor herding is therefore hypothesised, supported by ample evidence that religiosity affects other financial decisions and outcomes, such as saving and investment, risk attitudes, investor protection, and economic growth (as discussed in [Gavriliidis et al., 2016](#)). The empirical and experimental evidence is not unanimous, however. For instance, [Gavriliidis et al. \(2016\)](#) find herding to be stronger during Ramadan and attribute this result to the cohesive effect of religious festivities fostering social interactions, but [Akay et al. \(2015\)](#) report higher cooperation propensity (which might be expected to promote stronger herding) outside Ramadan among less religious people. Similarly, [Anderson and Mellor \(2009\)](#) find that religion can sustain cooperation, which might be expected to boost herding as cooperation leads to exchange of ideas and improved visibility of actions by others. In contrast, [Berggren and Bjørnskov \(2011\)](#) demonstrate that religiosity is associated with lower inter-personal trust, implying weaker reliance on the communications from, and actions of, others and, hence, expected lower imitation/herding levels. Furthermore, experimental evidence in [Corazzini and Greiner \(2007\)](#) casts doubts on the idea of prevalent preferences for conformity: absent private information, many participants in their experiments consciously choose to engage in non-conforming behaviour, even if they consciously incur financial losses as a consequence. In addition, the impact of religiosity on herding behaviour, as a manifestation of social conformity, could be conditional on other phenomena: for instance, [Caicedo et al. \(2023\)](#) show empirically for a global sample that religion and secular institutions are substitutes when it comes to fostering cooperative and pro-social behaviours. Hence religion's impact on socially conforming behaviours such as investor herding could be higher (lower) when secular institutions are weaker (stronger).

Despite the strong conceptual link, there are no prior studies examining empirically whether religiosity promotes herding among stock market investors, notwithstanding the above mixed evidence linking religiosity and other forms of social conformity. This study is the first to empirically investigate if, and in what manner, religiosity affects market-wide investor herding, while allowing the religiosity-herding relationship to be non-linear and conditional on socio-economic variables, including secular institutions' quality.

2. Data and methods

We investigate a global sample of 21 countries ([Fig. 1](#)) between January 2006 and April 2018. The sample size is dictated by data availability, e.g., the consecutive availability of at least 30 actively traded stocks in each country, to avoid biases due to low number of observations or thin trading. Daily stock prices are from Datastream. This results in daily time-series of market returns as well as cross-sectional dispersion of individual stocks' returns for each country, i.e., a daily panel dataset.² Due to heterogeneity in market size, however, the number of stocks utilised to compute country-level measures differs across countries.³ Religiosity (from Gallup Analytics) is our primary variable of interest, and is measured as the proportion of respondents in each country who gave an affirmative answer to the survey question: "Is religion an important part of your daily life?".⁴ We also employ data on variables capturing economic freedoms (eight variables, from the World Heritage Foundation) and institutional features (eight variables, from the World Bank Governance Indicators) ([Table 1](#) reports variable definitions and descriptive statistics).

For brevity, the Online Appendix (OA) discusses econometric issues such as high dimensionality and correlations, and our adopted solutions. Ultimately, we employ the principal component analysis method to shrink the dataset to four explanatory variables: reli-

² Unreported descriptive statistics reveal characteristic features of our daily data. Market returns are positive but small in magnitude, vary more in emerging than developed markets, are negatively skewed, and exhibit heavy tails. CSAD values are positive by construction, exhibit positive skewness, and heavy tails.

³ Specifically, the number of stocks per country is as follows: Argentina: 50, Belgium: 76, Brazil: 100, Canada: 250, China: 755, Denmark: 90, Egypt: 49, Finland: 90, France: 350, Germany: 324, Italy: 213, Japan: 973, New Zealand: 50, Norway: 139, Russia: 51, Spain: 107, Switzerland: 150, Thailand: 44, The Netherlands: 82, UK: 765, USA: 979. To ensure a clean measure of herding/anti-herding, the country-level compositions of stocks are constant throughout the sample period, thus avoiding changes in country-level cross-sectional return distribution due to changes in stock composition.

⁴ Data is collected as part of the Gallup World Poll, a survey which is conducted face-to-face or by telephone in a number of countries world-wide. For details of the methodology please see: <https://www.gallup.com/178667/gallup-world-poll-work.aspx>.



Fig. 1. Religiosity. This figure presents the proportion of adults who consider religion to be an important part of their daily lives (source: Gallup Analytics).

giosity ($Rel_{j,t}$), institutional quality ($INST_{j,t}$), economic freedom ($ECON_FR1_{j,t}$), and a “benevolent state” or “shackled Leviathan” factor ($ECON_FR2_{j,t}$).⁵

We model investors’ herding and its socio-economic determinants, primarily religiosity, employing an amended version of the Chang et al. (2000) model (see OA for details):

$$\begin{aligned} CSAD_{j,t} = & \beta_0 + \beta_1 |R_{m,j,t}| + \beta_2 R_{m,j,t}^2 + \\ & + \beta_3 R_{m,j,t}^2 Rel_{j,t} + \beta_4 R_{m,j,t}^2 ECON_FR1_{j,t} + \beta_5 R_{m,j,t}^2 ECON_FR2_{j,t} + \beta_6 R_{m,j,t}^2 INST_{j,t} + \varepsilon_{j,t}. \end{aligned} \quad (1)$$

where $CSAD_{j,t} = (1/N) \sum_{i=1}^N |R_{i,j,t} - R_{m,j,t}|$ measures cross-sectional (absolute) deviations of $i = 1, \dots, N$ stocks’ returns ($R_{i,j,t}$) from the market return ($R_{m,j,t}$) on day t in country j . Under CAPM, β_2, \dots, β_6 should be zero. Unconditional (unrelated to our socio-economic variables) herding is indicated when β_2 is negative, as it implies “insufficient” cross-sectional spread of stock returns (as compared to what a rational pricing model would predict); this excessive similarity of returns is interpreted as evidence of correlated investor trading, i.e., herding. Contrarily, positive values of β_2 indicate anti-herding, i.e., excessive spread of returns due to disproportionate dispersion of investors’ actions, and could be due to investors’ overconfidence, leading them to irrationally ignore market consensus and over-rely on their own beliefs instead (Gebka and Wohar, 2013), or their inherent preference for non-conforming behaviour

⁵ This factor is indicative of the “Scandinavian model”, whereby heavy taxation allows for productive government expenditures while maintaining a light-handed approach to other freedoms. It is also aligned with the “shackled Leviathan” argument of Acemoglu and Robinson (2019), whereby higher economic efficiency is achieved by combining a large state with effective social monitoring and constraints, to minimise inefficiencies and misuse of public funds.

Table 1
Variable definitions and descriptive statistics.

Variable	Description	Mean	Median	Std. Dev.	Min	Max	Skewness	Kurtosis
Religiosity	The proportion of adults who consider religion to be an important part of their daily lives.	0.4535	0.3600	0.2452	0.1300	1.0000	0.9596	2.6833
Economic freedom variables								
Tax burden	Calculated by dividing all types of taxes as a percentage of GDP. Measures the direct and indirect tax burden, imposed by the government, as a percentage of GDP.	63.7314	65.4500	12.5543	34.2000	90.8000	-0.1103	2.5844
Government spending	Measures a government's size, costs and intrusiveness. Includes, but is not limited to, spending on infrastructure, research, and human capital.	45.9292	47.5500	22.7684	0.0000	92.1000	-0.0723	2.4216
Business freedom	Reflects the ability of individuals to run their own businesses without intervention from the state.	79.7504	82.8000	14.6456	39.8000	99.9000	-0.7434	2.5519
Labour freedom	Reflects labour market conditions including minimum wages and rights, restraints on working hours and employment opportunities.	65.3374	62.1000	16.4330	39.9000	100.0000	0.3882	1.9594
Monetary freedom	Measures the latest three years' inflation rate in addition to a qualitative judgement of government-led distortion of prices through subsidies and other price control interventions.	77.8642	80.0000	9.5192	0.0000	94.3000	-2.5768	18.6660
Trade freedom	Measures tariffs and nontariff barriers to international trade.	81.5459	86.0000	8.2858	44.2000	90.0000	-1.3997	4.8586
Investment freedom	Measures restrictions on capital flows and investments. The higher the investment freedom score, the lower the restrictions.	67.2445	70.0000	20.3085	20.0000	90.0000	-0.7195	2.3644
Financial freedom	Measures freedom of banks' operations, allocation of credit, and state interventions.	64.0511	70.0000	18.1370	20.0000	90.0000	-0.5773	2.2710
Institutional quality variables								
Voice and accountability	Reflects citizens' perceptions of their ability to participate in choosing government and to enjoy freedom of expressing opinions.	0.7980	1.2192	0.9923	-1.7490	1.7380	-1.3455	3.3814
Political stability	Reflects citizens' projections of the possibility of witnessing political and stability shocks in their countries.	0.3815	0.5118	0.8102	-1.6388	1.5935	-0.6195	2.4166
Government effectiveness	Reflects citizens' perceptions of governments' credibility in designing and implementing effective policies.	1.1173	1.5277	0.8747	-0.8774	2.3540	-0.6765	1.9690
Regulatory quality	Reflects citizens' perceptions of governments' ability to design effective regulations that protect private sector development	0.9945	1.2878	0.8724	-1.0743	2.0886	-0.7994	2.2181
Rule of law	Reflects citizens' perceptions of the effectiveness and enforcement of property rights protection policies, the functioning of courts and police, and their expectations of the likelihood of crime and violence in their country.	1.0282	1.5071	0.9955	-0.9701	2.1003	-0.7181	1.8554
Control of corruption	Reflects citizens' perceptions of the willingness of public authorities to use their delegated power for self-serving purposes.	1.0777	1.4664	1.1241	-1.1320	2.4700	-0.5457	1.7322
Property rights	Reflects the right and the ability of individuals to accumulate property, secured by clear laws that are fully enforced by the state.	69.7460	80.0000	24.9053	15.0000	96.1000	-0.8591	2.2871
Government integrity	Reflects the degree to which governments transparently manage revenue, and refrain from corruption and bribery.	65.6555	74.0000	23.8501	21.0000	97.0000	-0.4668	1.6517

(Corazzini and Greiner, 2007). β_2 is therefore the component of herding/anti-herding independent from changes in socio-economic variables, whereas β_3, \dots, β_6 measure the magnitude and direction of changes in herding/anti-herding due to changes in religiosity, economic freedom, the benevolent state, and institutional quality, respectively (i.e., the conditional element of herding/anti-herding). Positive (negative) coefficients β_3, \dots, β_6 imply that a higher value of a given socio-economic variable is associated with higher likelihood of anti-herding (herding).⁶ Our primary interest is in how changes in religiosity impact herding (β_3).

3. Results

The results from regime-independent estimation (Table 2, column 1) reveal a significantly positive unconditional “herding” coefficient (β_2), indicating presence of excessive return dispersion and anti-herding, i.e., non-conformity. Furthermore, the impacts of religiosity/economic freedom/institutional quality on investors’ herding/anti-herding ($\beta_3/\beta_4/\beta_6$) are all insignificant, while the “shackled Leviathan” variable tends to move the stock market towards conformity, i.e., herding ($\beta_5 < 0$). These results are at odds with much empirical literature and theoretical arguments, therefore, we examine if the “herding/anti-herding” coefficients are significant only under specific conditions: we allow model (1) parameters to differ when a threshold variable is above/below its endogenously determined threshold value.⁷ We examine threshold-effects for each socio-economic factor ($\text{Rel}_{j,t}$, $\text{INST}_{j,t}$, $\text{ECON_FR1}_{j,t}$, and $\text{ECON_FR2}_{j,t}$) individually.

The results from regime-dependent models (columns 2-9) reveal that socio-economic factors do indeed have significant effects on herding/anti-herding, which vary depending on conditions. Notably, increasing religiosity pushes markets towards anti-herding when religiosity is low ($\beta_3 > 0$, column 2), but when religiosity is above its threshold, hence matters more, increasing values are associated with closer proximity to herding ($\beta_3 < 0$, column 3), and statistically so (bottom panel of Table 2).⁸ Thus, higher religiosity fosters herding but only when it is sufficiently prevalent (i.e., religiosity above threshold). As for other conditions (columns 4-9), higher religiosity is associated with higher likelihood of herding (lower anti-herding) when the Leviathan is less effectively managed ($\beta_3(\text{column6}) < 0$ and $\beta_3(\text{column6}) < \beta_3(\text{column7})$) and economic freedom is low ($\beta_3(\text{column4}) < 0$ and $\beta_3(\text{column4}) < \beta_3(\text{column5})$). These results support arguments that herding prevails under higher uncertainty (Cui et al., 2019; Demirer et al., 2019; Yang and Chuang, 2023), as an ineffective but intrusive state contributes to such an outcome. However, when institutional quality is high, stronger religiosity is associated with closer proximity to anti-herding ($\beta_3 > 0$, column 9): this supports the reasoning that countries with well-designed and functioning institutions protect citizens’ rights and foster religious plurality rather than hegemony of one religion, hence higher religiosity implies stronger adherence to one’s sub-section of society, resulting in heterogeneous behaviours of investors adhering to different religions (Berggren and Bjørnskov, 2011, report that trust, hence propensity to rely on others and therefore to herd, is lower for higher religiosity especially when religious diversity is high).⁹ This result also aligns well with findings in Caicedo et al. (2023) demonstrating that, when secular institutions are strong, religion has a weaker role to play in forging pro-social collaborative attitudes and beliefs such as trust, hence potentially also joint actions such as herding.¹⁰

Notably, our other socio-economic variables are insignificant determinants of herding under low religiosity (column 2). Only when religiosity is high (column 3) do some of them matter. For instance, economic freedom is associated with higher likelihood of anti-herding ($\beta_4 > 0$), presumably as heightened economic freedom weakens religion’s restrictive norms imposing social conformity, to create more space for non-conforming behaviour such as anti-herding. Moreover, a more effective benevolent state causes a shift towards herding ($\beta_5 < 0$), thus reinforcing the social cohesive force of high religiosity and associated social conformity, possibly due to high trust levels in other members of the society and the state.^{11,12}

⁶ Note that a positive (negative) value of β_3, \dots, β_6 does not imply existence of anti-herding (herding) for any level of the corresponding socio-economic variable, only a lower (higher) likelihood of herding for higher value of that variable (or: a shift away from herding and towards anti-herding as the variable’s values increase). For a statement on the absolute end-effect, i.e., whether herding or anti-herding prevails in a given country and year, one would need to consider the sum of coefficient values β_2, \dots, β_6 multiplied by the values of their respective socio-economic variables. As our research interest lies in marginal rather than absolute effects (i.e., if changes in socioeconomic variables affect the probability of herding) we concentrate our analysis on individual coefficients β_3, \dots, β_6 .

⁷ The Ramsey RESET test for the model in Table 2, column (1) produces an F-statistic of 51.47 (p-value < 0.0000), indicating the model is not well-specified. Results (unreported) from a fractional polynomial examination of the data indicate non-linearities in the underlying relationships. Thus, non-linear specifications such as the threshold models reported in columns 2-9 are statistically supported.

⁸ Unreported results from an alternative model with six thresholds broadly support the findings reported here that higher religiosity promotes herding (anti-herding) when the level of religiosity is high (low).

⁹ Indeed, when we re-estimate the threshold model in columns 8-9 for subsamples of high and low religious fractionalization, religion fosters herding ($\beta_3 < 0$ and significant) in countries with high fractionalisation and low institutional quality, but high institutional quality in high fractionalisation countries is associated with stronger anti-herding tendencies ($\beta_3 > 0$ and significant). Results not reported for brevity. Data on fractionalisation is from Lieberman and Singh (2016).

¹⁰ Following the approach in BenSaida (2017), further (unreported) results indicate that the positive (negative) impact of religiosity on herding under the conditions of high (low) levels of religiosity is especially prevalent when market returns are positive and their volatility is low.

¹¹ The impact of other socio-economic variables on herding/anti-herding is also highly conditional (see OA for a discussion).

¹² We leave it to future research to examine the robustness of the religiosity-herding relationship to different measures of herding (Lin and Lin, 2014).

Table 2
Results.

Threshold variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Below/above threshold	Parameter	None	Rel _{j,t} Below	Above	ECON_FR1 _{j,t} Below	Above	ECON_FR2 _{j,t} Below	Above	INST _{j,t} Below	Above
R _{m,j,t}	β_1	0.2100***	0.2409***	0.1860***	0.3430***	0.2135***	0.2724***	0.1978***	0.1952***	0.2566***
R ² _{m,j,t}	β_2	0.0213***	0.0314***	0.0483***	0.0040	0.0345***	0.0048	0.0382***	0.0100*	0.0228***
R ² _{m,j,t} Rel _{j,t}	β_3	0.0029	0.0244**	-0.0416**	-0.0825***	-0.0422**	-0.0452***	-0.0145***	-0.0071	0.0141**
R ² _{m,j,t} ECON_FR1 _{j,t}	β_4	-0.0015	0.0032	0.0116*	-0.0119	0.0128***	0.0337***	0.0153***	0.0066	-0.0145***
R ² _{m,j,t} ECON_FR2 _{j,t}	β_5	-0.0043***	0.0010	-0.0031***	-0.0048	-0.0036***	-0.0127***	-0.0010	0.0015	-0.0071***
R ² _{m,j,t} INST _{j,t}	β_6	-0.0058	-0.0031	0.0048	-0.0183	0.0102**	0.0372***	0.0152***	-0.0360***	-0.0179***
Constant	β_0	1.2950***	1.1446***	1.5530***	1.0199***	0.9291***	1.4091	1.2206***	1.1471***	1.1260***
$\beta_2(Below) - \beta_2(Above)$		-0.0169***		-0.0305***		-0.0334***			-0.0128**	
$\beta_3(Below) - \beta_3(Above)$		0.0660***		-0.0403**		-0.0307*			-0.0212*	
$\beta_4(Below) - \beta_4(Above)$		-0.0084		-0.0246**		0.0184**			0.0211***	
$\beta_5(Below) - \beta_5(Above)$		0.0041***		-0.0012		-0.0116**			0.0086***	
$\beta_6(Below) - \beta_6(Above)$		-0.0079		-0.0285**		0.0219*			-0.0181	

Notes: Estimation results (model (1)) including country- and year-fixed-effects. N=56,024, robust standard errors. ***p < 0.01, **p < 0.05, *p < 0.1.

4. Summary and conclusions

We investigate the impact of religiosity on herding among stock market traders in a sample of 21 countries. Prior theoretical arguments and empirical/experimental results concerning the determinants of herding are inconclusive, and in an unconditional setting we find no link between religiosity and herding. However, more detailed analysis reveals that religiosity does foster socially-conforming herding (in line with [Anderson and Mellor, 2009](#), and [Gavriliidis et al., 2016](#)), albeit only when the absolute levels of religiosity are relatively high. For low religiosity levels its increase has an opposite effect - it promotes anti-herding as non-conforming behaviour (in line with [Corazzini and Greiner, 2007](#), [Berggren and Bjørnskov, 2011](#), and [Akay et al., 2015](#)). Hence, our results reconcile two seemingly contradictory streams of the literature: religiosity fosters conformity or non-conformity, manifested by herding and anti-herding, respectively, depending on its strength. Religiosity further tends to raise herding when economic freedom is low and the state is ineffective, and promotes non-conforming anti-herding when institutional quality is high, the latter finding supporting the arguments in [Caicedo et al. \(2023\)](#) that religion and secular institutions are substitutes. Overall, the impact of religiosity on investors' conforming behaviour is highly non-linear and conditional on socio-economic characteristics. More generally, this result also supports and extends findings in [Chang and Lin \(2015\)](#) and [Blasco et al. \(2017\)](#) with herding being dependent on cultural characteristics of traders.

Our findings have practical implications for investors and policy makers alike. The former are interested in understanding what affects stock market inefficiency (in the form of herding or anti-herding) across different countries, as higher efficiency implies fairer pricing, higher price information content, lower probability of irrational bubbles and crashes, but also ineffectiveness of certain trading strategies such as technical analysis, feedback trading, etc. Hence, investors will benefit from the insight that irrational herding tends to be more prevalent when religiosity is close to its extreme (low and high) values, while irrational anti-herding prevails for medium religiosity levels. For instance, if ones' strategy is to ride on price momentum driven by herding, countries with extremely high or low religiosity would appear a more attractive investment environment. For policy makers aiming at improving the informational efficiency of their national stock markets, it is important to realise what form of irrationality (herding or anti-herding) prevails, in order to deploy appropriate regulatory measures. For instance, in highly religious countries herding tends to be the prevailing factor, hence any policies supporting an increase in heterogeneity of investment decisions would be advisable (e.g., improving financial reporting standards to provide investors with higher quality information to enable them to make individual judgements rather than following the herd, or boosting stock market access to hitherto underrepresented investor types (e.g., women, foreign investors) to achieve a more diverse investor cohort, etc.). Both groups, investors and policy makers, should also be aware that economic freedom and effective benevolent state affect the tendency to herd in high-religiosity conditions, and that secular institutions and religiosity are substitutes with regard to their impact on socially conforming behaviours. Hence, no investment or regulatory approach is globally optimal, and national characteristics, such as religiosity, supported by economic freedom and institutional strength, should be taken into account when designing appropriate strategies and policies in face of investor herding/anti-herding.

Declaration of competing interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.frl.2024.105165](https://doi.org/10.1016/j.frl.2024.105165).

Appendix: Investor herding, individual rationality, and market efficiency

Regarding theoretical mechanisms as to why herding emerges, the literature identifies *intentional* herding, which occurs when investors perceive their peers to be better informed, resulting in suppression of their own opinions and following others, or when investors are evaluated against their peers, hence attempting to copy their decisions to avoid being negative performance outliers. On the other hand, *spurious* herding occurs when the observed correlation of actions between investors is coincidental, not intentional, and driven by exogenous factors such as the homogeneity of the regulatory environment, of performance management practices, or of information sources. Spurious herding could further arise due to correlated trading based on popular styles or stock characteristics. See [Hirshleifer and Teoh \(2003\)](#) and [Kallinterakis and Gregoriou \(2017\)](#) for reviews of the cognate literature.

Herding interacts with individual rationality and market-wide efficiency through a variety of channels. For instance, ignoring one's beliefs and following peers could be individually rational, especially if they possess superior information, thus giving rise to more informationally efficient markets. However, if the peers are not better informed, or if superior information is not acted upon due to herding, higher quality information is not incorporated into stock prices and markets are prone to be less efficient. Even mimicking poorly informed peers may be individually rational if one is evaluated compared to that benchmark and risk-averse. Additionally, correlated actions induced by regulations or fads in investing will lead to increased homogeneity of traders and their institutions, resulting in diminished resilience of the financial system.

References

Acemoglu, D., Robinson, J.A., 2019. *The Narrow Corridor: States, Societies, and the Fate of Liberty*. Penguin, New York.

Akay, A., Karabulut, G., Martinsson, P., 2015. Cooperation and punishment: The effect of religiosity and religious festival. *Econ. Lett.* 130, 43–46.

Anderson, L.R., Mellor, J.M., 2009. Religion and cooperation in a public goods experiment. *Econ. Lett.* 105 (1), 58–60.

Argyle, M., 2005. Psychology and religion: an introduction. Routledge.

Asch, S.E., 1958. Effects of group pressure upon the modification and distortion of judgements. In: E.E. Maccoby, T.M. Newcomb, E.L. Hartley (Eds.), *Readings in Social Psychology*, Holt, Rinehart, and Winston, New York, 174–183.

BenSaida, A., 2017. Herding effect on idiosyncratic volatility in US industries. *Financ. Res. Lett.* 23, 121–132.

Berggren, N., Björnskog, C., 2011. Is the importance of religion in daily life related to social trust? Cross-country and cross-state comparisons. *J. Econ. Behav. Organ.* 80 (3), 459–480.

Bernheim, B.D., 1994. A theory of conformity. *J. Polit. Econ.* 102 (5), 841–877.

Blasco, N., Corredor, P., Ferreruela, S., 2017. Can agents sensitive to cultural, organizational and environmental issues avoid herding? *Financ. Res. Lett.* 22, 114–121.

Caicedo, F.V., Dohmen, T., Pondorfer, A., 2023. Religion and cooperation across the globe. *J. Econ. Behav. Organ.* 215, 479–489.

Chang, C.H., Lin, S.J., 2015. The effects of national culture and behavioral pitfalls on investors' decision-making: Herding behavior in international stock markets. *Int. Rev. Econ. Financ.* 37, 380–392.

Chang, E.C., Cheng, J.W., Khorana, A., 2000. An examination of herd behavior in equity markets: an international perspective. *J. Bank. Financ.* 24, 1651–1679.

Cialdini, R.B., Goldstein, N.J., 2004. Social influence: compliance and conformity. *Annu. Rev. Psychol.* 55, 591–621.

Corazzini, L., Greiner, B., 2007. Herding, social preferences and (non-)conformity. *Econ. Lett.* 97 (1), 74–80.

Cui, Y., Gebka, B., V Kallinterakis, V., 2019. Do closed-end fund investors herd? *J. Bank. Financ.* 105, 194–206.

Demirer, R., Leggio, K.B., Lien, D., 2019. Herding and flash events: evidence from the 2010 flash crash. *Financ. Res. Lett.* 31, 476–479.

Duxbury, D., 2015. Behavioral finance: insights from experiments I: theory and financial markets. *Rev. Behav. Financ.* 7 (1), 78–96.

Economou, F., Gavriilidis, K., Kallinterakis, V., Goyal, A., 2015. Herding dynamics in exchange groups: evidence from Euronext. *J. Int. Financ. Markets Inst. Money* 34, 228–244.

Economou, F., Kostakis, A., Philippas, N., 2011. Cross-country effects in herding behaviour: evidence from four south European markets. *J. Int. Financ. Mark. I. Money* 21, 443–460.

Gavriilidis, K., Kallinterakis, V., Tsavoutas, I., 2016. Investor mood, herding and the Ramadan effect. *J. Econ. Behav. Organ.* 132, 23–38.

Gebka, B., Wohar, M.E., 2013. International herding: does it differ across sectors? *J. Int. Financ. Mark. I. Money* 23, 55–84.

Goodfellow, C., Bohl, M., Gebka, B., 2009. Together we invest? Individual and institutional investors' trading behavior in Poland. *Int. Rev. Financ. Anal.* 18, 212–221.

Hirschleifer, D., Teoh, S.T., 2003. Herd behavior and cascading in capital markets: a review and synthesis. *Eur. Financ. Manag.* 9, 25–66.

Hofstede, G., 2001. *Culture's consequences: comparing values, behaviors. Institutions and Organizations across Nations*. Sage Publication, Beverly Hills.

Holmes, P.R., Kallinterakis, V., Leite-Ferreira, M.P., 2013. Herding in a concentrated market: a question of intent. *Eur. Financ. Manag.* 19, 497–520.

Jones, S.R.G., 1984. *The Economics of Conformism*. Blackwell, Oxford.

Kallinterakis, V., Gregoriou, G.N., 2017. Herd behaviour: a survey. *Aestimatio IEB Int. J. Financ.* <https://doi.org/10.5605/IEB.14.1>.

Lieberman, Evan, Singh, Prerna, 2016. Replication data for Lieberman, Evan and Prerna Singh, "census enumeration and group conflict: a global analysis of the consequences of counting. *World Polit.* 1–53. <https://doi.org/10.7910/DVN/KJV6OJ>. January 2017Harvard Dataverse, V1, UNF:6, RttAZ22Skol5Nz5B6gA4XQ== [fileUNF].

Lin, A.Y., Lin, Y.-N., 2014. Herding of institutional investors and margin traders on extreme market movements. *Int. Rev. Econ. Financ.* 33, 186–198.

Stark, R., 1984. Religion and conformity: Reaffirming a sociology of religion. *Sociol. Anal.* 45 (4), 273–282.

Ukpong, I., Tan, H., Yarovaya, L., 2021. Determinants of industry herding in the US stock market. *Financ. Res. Lett.* 43, 101953.

Yang, W-R., Chuang, M-C., 2023. Do investors herd in a volatile market? Evidence of dynamic herding in Taiwan, China, and US stock markets. *Financ. Res. Lett.* 52, 103364.