

**The impact of social cohesion on stock market resilience:
Evidence from COVID-19**

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Abstract

We investigate whether cultural tightness, the strength of social norms, provides stock markets with resilience to external shocks. There is tension in forming expectations regarding this. One reasoning, particularly following from cultural archaeology literature, is that societies best cope with challenges, disaster recovery, and loss when they are culturally comfortable with transformation, with cultural tightness arguably opposed to cultural change. On the other hand, alternative reasoning is that tightness allows for societal cohesion that supports optimism to function in a unified way to confront challenge. We test whether markets were supported by cultural tightness during COVID-19 adversity. In accordance with the latter view, we evidence that stock market volatilities during COVID-19 were significantly lower in countries with ‘tighter’ cultures.

Keywords: Stock market volatility; Economic shock; Social cohesion; COVID-19; National culture; Tightness

1. Introduction

We investigate whether cultural ‘tightness,’ as the strength of social norms, provides stock markets with resilience to external shocks. Based on a variety of literature, expectations regarding the association of cultural tightness with market resiliency are not clear. One reasoning, particularly following from cultural archaeology literature, is that societies best cope with challenges, disaster recovery, and loss when they are culturally comfortable with transformation, with cultural tightness arguably opposed to such cultural change (Fava, 2022; Holtorf, 2018). However, alternative reasoning suggests tightness allows for societal cohesion that supports optimism to function in a unified way to confront challenges. According to this reasoning, markets, as forward-looking barometers of economic conditions, will benefit during adversity from societal cohesion, as proxied by a measure of cultural tightness. It is possible that tightness engenders an optimism and unity of societies to confront challenges that buoys domestic markets. Consistent with this latter view, we evidence that stock market volatilities during COVID-19 were significantly lower in countries with tighter cultures.

Stock markets as forward-looking barometers of the economy have reacted to COVID-19 with depreciated returns and heightened volatility (Ashraf 2020b, a; Baker et al. 2020; Ramelli & Wagner 2020; Zhang et al. 2020). We reason that the circumstances of COVID-19, with its expansive global impact on economies (Goodell 2019), provides an ideal opportunity for such an investigation of the cultural determinants of market resilience during adversity.

However, the degree of adverse stock market reaction to the pandemic has varied across countries depending upon country specific characteristics. For instance, stock markets suffered more in countries with higher cultural uncertainty avoidance (Ashraf 2021), lower economic freedom (Erdem 2020) and lower societal general trust level (Engelhardt et al. 2021). In this paper, we investigate whether cultural tightness-looseness, as a country-specific social capital factor, played an important role in market reactions to the pandemic and, by extension, is likely an important factor in market resilience to shocks in general.

The COVID-19 pandemic was unanticipated and largely unprecedented. Responses to the pandemic involved government-enforced restrictions such as social distancing policies, public

awareness programs, wearing facemasks in public places, and quarantining, as well as voluntary behavioral changes on the part of individuals. Though the efficacies of government-enforced restrictions largely depended on the effectiveness of public administration, cultural and social contexts also play important roles in the extent and speed of voluntary behavioral change (Bavel et al. 2020). Social norms, clearly influence such behavior (Cialdini & Goldstein 2004).

Social norms are the collective agreements of a society about individuals' expected behaviors (Cialdini & Goldstein 2004). Social sanctions are the mechanism to reinforce these social norms. Societies punish those who disregard norms and reward those who conform to them. Meta-norms are defined as the norms of norms enforcement and consist of multilevel rewards and punishments (Axelrod 1986; Prietula & Conway 2009). Recent literature has differentiated cultures based on the extent of tightness versus looseness (Pelto 1968; Gelfand et al. 2006; Gelfand et al. 2011; Uz 2015). Tight cultures, as compared to loose ones, observe strong norms, have low tolerance for deviant behaviour, and inflict strict sanctions for norm violations. Among other things, tight cultures have broad societal socialization, with psychological accordance to self-guides and self-regulation. Loose cultures, on the other hand, have weak social norms and a high tolerance of deviant behavior. In tight cultures, individuals are more likely to follow shared norms and have similar behaviours. New social norms, such as maintaining physical distancing, washing hands, wearing facemasks, may or may not be more likely to get approval and be adopted in tight cultures. Tightness, as celebrating existing norms, may engender resistance to adoption of new norms to meet challenges. This study investigates this question by examining how tightness conditioned market reactions to COVID-19.

Collective threats, such as COVID-19, entail a need for strong coordination. Cultural tightness may act as a beneficial social capital factor in helping societies effectively navigate through challenges such as the COVID-19 pandemic. For instance, Gelfand et al. (2021) show countries higher at cultural tightness have observed lower COVID-19 confirmed cases and deaths.

Social capital, a set of beliefs and values promoting societal cooperation (Guiso et al. 2006), promotes financial and economic development (Whiteley 2000; Guiso et al. 2004, 2008a, b). Consistent with this, stock market responses to the outbreak and severity of COVID-19 have also reflected cultural and social capabilities of countries to effectively manage the public good. For instance, Ashraf (2021)

evidences that stock markets declined in reaction to COVID-19 confirmed cases. However, this drop in market values was significantly more in countries higher in the cultural quality of uncertainty avoidance. Likewise, Engelhardt et al. (2021) evidence that stock market volatility increased in reaction to COVID-19 cases, with this increase being significantly lower in countries with higher levels of societal trust. Building on these studies, we hypothesize that stock market investors consciously or unconsciously (Goodell 2019) consider cultural tightness as a beneficial social capital factor in managing the disease and its concomitant economic impact. Consequently, increases in stock market volatility in response to COVID-19 should be less in countries with tighter cultures. Alternatively, we consider that cultural tightness may impede the willingness of societies to transform and so markets, *ceteris paribus*, might have reacted more adversely in tighter cultures. We test these alternative hypotheses.

Using a panel dataset of daily stock market volatility and COVID-19 confirmed cases, together with other pandemic related variables, from 62 countries for January 01, 2020–December 31, 2021, we evidence that stock market volatility during COVID-19 was significantly lower in countries with higher levels of cultural tightness.

This study offers several important additions to the literature. First, we complement recent studies that show that the COVID-19 outbreak adversely affected stock markets (Alfaro et al. 2020; Ashraf 2020b, a; Baker et al. 2020; Bavel et al. 2020; Phan & Narayan 2020; Ramelli & Wagner 2020; Ashraf 2021; Mazur et al. 2021). Additionally, with an extended dataset for January 01, 2020–December 31, 2021, we observe that stock markets remained sensitive to pandemic related variables through the end of 2021, with stock market volatility responding to daily new confirmed cases and deaths, announcements of government social distancing measures, and vaccine availability and coverage.

Second, this study also relates to literature showing that cross-country variation in stock markets' reactions to COVID-19 can be explained by country-level cultural values, such as uncertainty avoidance and individualism (Shear et al. 2020; Ashraf 2021; Fernandez-Perez et al. 2021). We show that cultural tightness also matters. Tightness is about adherence to cultural norms, while uncertainty aversion and individualism are cultural values. Cultural norms are the accepted standards of behaviour. They are unwritten laws. On the other hand, cultural values are the beliefs and principles that determine

what is considered natural and best. Values guide human behaviour during difficult situations. Cultural tightness measures the strictness of a society in following these values. Our results show stock markets responded positively to cultural tightness even after controlling for the effects of cultural values.

Third, we also add to the expanding literature that recognises the importance of cultural tightness for business, economics, and finance. For instance, Aktas et al. (2015) show that tight versus loose cultures endorse team leadership. Likewise, Li et al. (2017) find that tight cultures emphasize norm abidance and uniformity in advertising themes while loose cultures focus on norm deviance and permissiveness. Further, Eun et al. (2015) evidence that stock prices are more likely to co-move in culturally tight countries. We add to this literature by showing that stock markets display less volatility in tighter cultures during shocks.

2. Sample

We construct our sample by initially downloading pandemic related daily data, including COVID-19 confirmed cases, vaccine availability coverage, and social-distancing stringency measures, from the John Hopkins University Coronavirus Resource Centre (JHU-CRC). Further, we merge this data with daily returns of stock markets for January 01, 2020–December 31, 2021 (www.investing.com).

Regarding data on cultural variables, we use the cultural tightness-looseness index of Eriksson et al. (2021), who updates Gelfand et al. (2011). We also use generalized societal trust from World Values Surveys, and uncertainty avoidance from Hofstede et al. (2010). We append the cultural variables of each country with daily data. We keep a country in our sample if any of these three cultural variables is available. Table 1 lists and defines the variables.

(Insert Table 1 about here)

Since stock market data is not available for weekends/national holidays, we drop such missing values. We winsorise daily stock market returns and COVID-19 confirmed cases variables at the 1% level to minimize the concern of outliers in statistical analysis. Table 2 presents the list of sample countries and the stock market index from each country, together with values of cultural variables.

(Insert Table 2 here)

3. Measurement of cultural tightness-looseness

We measure cross-country differences in cultural tightness with the cultural tightness-looseness index of Gelfand et al. (2011). Gelfand et al. (2011) constructed this index for 33 countries on a six-item likert scale using survey data from 6,823 students and non-students participants. The scale items include "There are many social norms that people are supposed to abide by in this country," "In this country, if someone acts in an inappropriate way, others will strongly disapprove," and "People in this country almost always comply with social norms." Higher values of the index represent that social norms are strong with few deviances. In another recent study, Eriksson et al. (2021), update the index to 57 countries with extended survey of 22,863 participants. This updated tightness measure has a correlation of 0.87 with 33-countries measure. In robustness tests, we also use the tightness-looseness index of Uz (2015) as an alternative measure of cultural tightness.

4. Methodology

Following Ashraf (2020a,b), we specify the following pooled panel ordinary least squares regression model.

$$\begin{aligned} Y_{c,t} = & \alpha_c + \beta_1(\text{Tightness}_c \times \text{COVID} - 19 \text{ confirmed cases}_{c,t}) \\ & + \beta_2(\text{COVID} - 19 \text{ confirmed cases}_{c,t}) + \beta_3(\text{Vaccine index}_{c,t}) \\ & + \beta_4(\Delta\text{Stringency index}_{c,t}) + \varepsilon_{c,t} \quad \text{Eq. (1)} \end{aligned}$$

Here, c and t subscripts represent country and day, respectively. α_c is a constant term. Y stands for stock market volatility in country c on day t . Stock market volatility is measured as the 7-days rolling window standard deviation of daily stock market returns. COVID-19 confirmed cases are measured as the daily new laboratory confirmed cases for each country. The tightness variable captures the cross-country differences in the strength of social norms, represented with the cultural tightness-looseness index of Gelfand et al. (2011). The significant interaction term, $\text{Tightness}_c \times \text{COVID} - 19 \text{ confirmed cases}_{c,t}$, shows the increase in stock market volatility due to COVID-19 is differing in tight versus loose cultures.

We include the Δ Stringency index and Vaccine index as control variables. The stringency index measures government social distancing policies, including the closure of schools, offices, and

public places, and bans on travel. We expect that announcements of government enforced social distancing restrictions, captured by Δ Stringency index, increases stock market volatility.

Since the mortality risk of COVID-19 declines with vaccination, we expect less market volatility as a higher proportion of the population gets vaccinated. To control for this effect, we generate and include a vaccination index as a control variable in our models. Vaccination index equals the sum of vaccine prioritization, vaccine availability, and vaccine financial support indexes. The vaccine prioritization index captures whether an official priority group plan is published in a country. The Vaccine availability index measures whether the COVID-19 vaccine is being administered in a country, with values becoming highest when all individuals above the age 16 are eligible to be vaccinated. The Vaccine financial support index represents whether the vaccine is government supported, rather than self-administered by individuals. $\mathcal{E}_{c,t}$ is an error term. Heteroskedastic-robust standard errors, clustered at country-level, are used to estimate p -values in regressions.

5. Empirical analyses

This section reports the results of empirical analysis including summary statistics, main regression results, and robustness tests.

5.1. Summary statistics

Table 3 presents summary statistics of the main variables. The mean value of stock market volatility is 0.88, with a minimum value of 0 and a maximum of 3.95. This suggests substantial variation in market volatility over the sample period. Likewise, the tightness variable has a mean value of 1.92, a minimum value of 1.46, and a maximum of 2.46. Other variables also display considerable variation.

(Insert Table 3 here)

Pearson correlations coefficients are reported in Table 4. Correlation coefficients between variables are not strong, suggesting little multicollinearity in the multivariate analysis.

(Insert Table 4 here)

5.2. Tightness and market volatility during COVID-19

Table 5 reports multivariate regressions results. Model 1 is the baseline specification. The coefficient of COVID-19 confirmed cases is significantly positive, consistent with market volatility being positively associated with levels of COVID-19 outbreaks. Likewise, Stringency index is positively significant, while Vaccine index is negatively significant. These results suggest that government imposed social distancing policies increased volatility while vaccination availability and coverage calmed markets. These results are consistent with recent literature that shows COVID-19 social distancing policies adversely affected stock markets (Al-Awadhi et al. 2020; Ashraf 2020b, a, 2021).

To further validate our model, we first confirm the findings of previous studies regarding the cultural variables of uncertainty avoidance and trust. The interaction term, Uncertainty avoidance \times COVID-19 confirmed cases is positively significant, suggesting, consistent with Ashraf (2021), that the adverse effect of COVID-19 confirmed cases on stock market volatility is stronger in cultures with higher uncertainty avoidance. Likewise, the negative, significant coefficient of the interaction term, Trust \times COVID-19 confirmed cases, suggests that higher levels of societal trust mitigated the adverse effect of the pandemic on stock markets, a finding consistent with Engelhardt et al. (2021). These results in keeping with other literature suggest our model is appropriate to examine the moderating effect of cultural tightness on the positive relationship between COVID-19 confirmed cases and stock market volatility.

The interaction term, Tightness \times COVID-19 confirmed cases, is negatively significant, indicating that the positive relationship between COVID-19 confirmed cases and stock market volatility weakens for countries higher in cultural tightness. Overall, these findings suggest that stock market participants are conditioned by cultural tightness when reacting to external economic shocks.

(Insert Table 5 here)

5.3. Robustness testing

A problem of endogeneity may occur due to reverse causality, measurement error, or omitted variables. Reverse causality is not a concern in our modeling because of the exogenous nature of COVID-19. COVID-19 confirmed cases is exogenous; with stock prices responding to changes in

COVID-19 cases, but not the other way around. Likewise, the cultural tightness variable is measured with questions from surveys that were conducted well before the start of COVID-19, eliminating concerns that cultural tightness is impacted by cultural changes during the COVID-19 outbreak.

To account for concerns of measurement error, we use alternative measures of COVID-19 and cultural tightness. For COVID-19, we use daily number of confirmed deaths from each country as an alternative measure of COVID-19. Stock market volatility is likely to be higher during periods of severe COVID-19 outbreaks with relatively higher numbers of daily deaths.

Results are reported in Table 6. Model 1 is the baseline specification. COVID-19 deaths enters positive and significant, confirming stock markets increase in volatility during periods with higher numbers of confirmed deaths. The interaction term between COVID-19 confirmed deaths and cultural tightness enters negative and significant, consistent with stock markets reacting less negatively in tighter cultures. For cultural tightness, we alternatively use the tightness-looseness index of Uz (2015) (Tightness (Uz)). Uz (2015) calculates country-level tightness-looseness scores from the standard deviation of responses to cultural-norms related questions in World Values Surveys. Higher dispersion in responses indicate that individuals of a society perceive specific norms differently. We use the combined CTL (combined cultural tightness-looseness index) index of Uz (2015). This index shows the highest validity in her study. Higher values of it represent loose cultures while lower values tight cultures. As shown in Table 7, interaction terms of Tightness (Uz) with both COVID-19 proxies enter positive suggesting that adverse effects of COVID-19 variables on stock market volatility is stronger in loose cultures.

(Insert Table 6 here)

(Insert Table 7 here)

Following previous studies (Erdem 2020; Ashraf 2021; Engelhardt et al. 2021), we add a number of additional control variables to eliminate concern of omitted variable bias: Stock market volume, Δ Govt economic support index, Log (GDP), Democratic accountability and Economic freedom. Stock market volume is measured as the natural log of daily trading volume. Daily trading volume data is downloaded from www.investing.com. Δ Govt economic support index is calculated as the daily

change in government economic support index from the Oxford COVID-19 Government Response Tracker (OxCGRT) database (Hale et al. 2020).

Log (GDP) equals the natural log of gross domestic product. Democratic accountability index is from International Country Risk Guide (ICRG) database and calibrates political institutions from democracies to autocracies. Economic freedom is represented with the Index of Economic Freedom from the Heritage Foundation (Heritage_Foundation 2020), to control for conditioning effects of financial and economic openness on COVID-19 shocks.

(Insert Table 8 here)

As shown, the interaction terms of cultural tightness with both the COVID-19 variables remain negative and significant even after adding additional control variables. Together these results additionally evidence that our main results are robust to endogeneity concerns.

5.4. Tightness and stock market volatility in response to social distancing policies

Government social distancing policies help to contain COVID-19. Higher levels of voluntary social distancing by individuals in culturally tight countries may complement government social distancing policies in containing COVID-19. Therefore, it's possible that cultural tightness weakens the positive association between stringency index and COVID-19 confirmed cases. To check for this possibility, we introduce in regressions the interaction term, Tightness \times Δ Stringency index. Consistent with expectations, this interaction term is negatively significant, suggesting that the positive association of stringency index with stock market volatility weakens with greater cultural tightness.

(Insert Table 9 here)

5.5. Channel analysis

Our evidence suggests that stock markets responded less adversely to COVID-19 for societies more pronounced in tightness. Cultural tightness may help to socially enforce new norms such as washing hands, wearing masks, keeping distance, and avoiding unnecessary outside trips. In this sense then tightness may allow enforcement of transformation, and so our results may also be consistent with Fava (2022) and Holtorf (2018) who suggest societies need to be transformative when meeting

challenges. Tightness may incline societies toward established norms while also providing social cohesion to enforce collective transformation.

A natural outcome of quickly adopting these norms is the swift control of local COVID-19 outbreaks. Pandemic related variables such as daily COVID-19 cases and deaths are available from OxCGRT. As a channel analysis, we regress pandemic related variables on cultural tightness measures. In these regressions, we add variables to control for the effects of government social distancing measures and vaccine availability. We also control for the effects of other country-level characteristics by adding country fixed effects dummy variables. We assume cultural tightness captures the effect of pandemic related norms adoption on COVID-19 cases and deaths. Consistent with baseline results, we observe that tighter cultures had lower daily COVID-19 cases and deaths.

(Insert Table 10 here)

6. Conclusions

Social context has had an important role in dealing with the collective threat of COVID-19 as meeting this pandemic threat entails a need for strong societal coordination. Examining how cultural tightness conditioned stock markets during COVID-19, we investigate whether cultural tightness, the strength of social norms, provided stock markets with resilience to external shocks.

We consider that intuition offers conflicting expectations regarding this. On the one hand, following from cultural archaeology literature, is that societies best cope with challenges, disaster recovery, and loss when they are culturally comfortable with transformation, with cultural tightness arguably opposed to cultural change. On the other hand, tightness allows for societal cohesion that supports optimism to function in a unified way to confront challenge. We test whether markets, were supported by cultural tightness in times of adversity. In accordance with the latter view, we evidence that stock market volatilities during COVID-19 were significantly lower in countries with ‘tighter’ cultures.

Tight cultures, where social norms are strong and deviance is less likely, have successfully navigate through the COVID-19 pandemic in terms of the number of confirmed cases and deaths (Gelfand et al. 2021). Consistent with Ashraf (2021) and Engelhardt et al. (2021), we evidence that

social context is an important determinant to understand stock market reactions to crisis shocks. In this study, we show that stock markets as the forward-looking barometers of economy consider the beneficial effect of cultural tightness. Specifically, we find that the stock market volatility during COVID-19 was significantly lower in countries with ‘tighter’ cultures.

We infer from our results that markets positively value cultural tightness because new social norms such as maintaining physical distancing, washing hands, wearing facemasks, are more likely to get enforced in tighter cultures. However, one shortcoming of our analysis is that we don’t explicitly conduct channel analysis with these variables because of a lack of data. Future research may investigate whether tighter cultures, as compared loose ones, were quicker in adopting COVID-19 related new social norms.

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Table 1. Variable definitions

Variable	Definition	Data Source
Dependent variable		
Stock market volatility	7-days moving window standard deviation of daily stock market returns. Daily stock market returns are calculated from the main stock market index for each country as $(\text{Index value}_t - \text{Index value}_{t-1} / \text{Index value}_{t-1})$	OECD database
Main independent variables		
Covid-19 confirmed cases	Daily new COVID-19 laboratory confirmed cases for each country	John Hopkins University, Coronavirus Resource Centre (JHU-CRC) website
Tightness	The strength and pervasiveness of social norms, and the difficulty of defying social norms. Higher values of the index represent that the members of a society are more likely to follow social norms, and vice versa.	(Gelfand et al. 2011; Gelfand et al. 2021)
Control variables		
Δ Stringency index	The stringency of government imposed social distancing policies during COVID-19. Composed from eight indicators including restrictions on public transport, closure of international flights, closure of schools, closure of offices, restrictions on public gatherings, restrictions on gathering size, and orders to stay at home. The index is rescaled to vary from 0 to 100, with higher values represent strict measures. We calculate change in stringency index as $(\text{Stringency index}_t - \text{Stringency index}_{t-1})$.	Oxford COVID-19 Government Response Tracker (OxCGRT) database (Hale et al. 2020)
Vaccine index	Equals the sum of vaccine prioritisation, vaccine availability and vaccine financial support indexes. Vaccine prioritisation index captures when the official priority groups plan is published in a country. Vaccine availability index measures that the Covid-19 vaccine is being administered in a country. Its values get the highest, as all individuals above the age 16 are eligible to be vaccinated. Vaccine financial support index represents that the vaccine is government supported, not by the individuals themselves.	
Other cultural variables		
Trust	Categorically coded according to answers to the question “Generally speaking, would you say that most people can be trusted or that you cannot be too careful in dealing with people?” in World Values Surveys. Higher values of the variable imply higher societal trust.	World Values Surveys
Uncertainty avoidance	Uncertainty avoidance dimension of national culture from Hofstede’s frame of national culture. Higher values of this dimension denote that members of a society are more averse to uncertain situations, and among other things take actions to manage the uncertainty. Cultures with lower values of uncertainty avoidance embrace uncertainty situations rather easily without getting panic.	Hofstede (Hofstede et al. 2010)

Table 2. Sample information

This table lists the sample countries, and respective stock market index and the values of three cultural variables: tightness, trust and uncertainty avoidance.

Sr. No.	Country	Stock Market Index	Tightness	Trust	Uncertainty avoidance
1.	Argentina	S&P Merval	1.56	.2319277	86
2.	Australia	S&P/ASX 200	1.9	.5443383	51
3.	Austria	ATX	2.1	.3342756	70
4.	Bangladesh	DSE 30	-	.2353338	60
5.	Belgium	BEL 20	-	.2922149	94
6.	Brazil	Bovespa	1.69	.0657627	76
7.	Canada	S&P/TSX	1.83	.420373	48
8.	Chile	S&P CLX IPSA	1.68	.1277034	86
9.	China	Shanghai	2.05	.6443534	30
10.	Colombia	COLCAP	1.48	.0413058	80
11.	Czech Republic	PX	1.63	.2454545	74
12.	Ecuador	Guayaquil Select	1.82	.0716667	67
13.	Egypt, Arab Rep.	EGX 70	-	.2055154	80
14.	Finland	NQ Finland Financials	1.75	.588	59
15.	France	CAC 40	-	.186747	86
16.	Germany	DAX	2.03	.4523107	65
17.	Greece	Athens General Composite	1.71	.2373225	100
18.	Hungary	Budapest SE	1.46	.2234694	82
19.	Iceland	ICEX Main	1.94	.4108108	50
20.	India	BSE Sensex	2.48	.338972	40
21.	Indonesia	IDX Composite	2.32	.4253521	48
22.	Iraq	ISX Main 60	-	.3197158	85
23.	Ireland	ISEQ Overall	1.8	.359879	35
24.	Israel	TA 35	1.66	.234589	81
25.	Italy	FTSE MIB	1.87	.2917104	75
26.	Jamaica	JSE Market	-	-	13
27.	Japan	Nikkei 225	2.09	.387638	92
28.	Kenya	Kenya NSE 20	2.36	-	50
29.	Korea, Rep.	KOSPI	2.09	.2967309	85
30.	Kuwait	FTSE Coast Kuwait 40	-	.3	80
31.	Lebanon	BLOM Stock	-	.1090573	50
32.	Malaysia	KLCI	2.12	.0853846	36
33.	Mexico	S&P/BMV IPC	1.69	.1242485	82
34.	Morocco	Moroccan All Shares	-	.1253175	68
35.	Namibia	NSX	-	-	45
36.	Netherlands	AEX	1.59	.6741693	53
37.	New Zealand	NZX 50	-	.5677656	49
38.	Nigeria	NSE 30	2.26	.1478113	55
39.	Norway	OSE Benchmark	-	.7416503	50
40.	Pakistan	Karachi 100	-	.2391681	70
41.	Peru	S&P Lima General	1.7	.0827759	87
42.	Philippines	PSEi Composite	-	.0284281	44
43.	Poland	WIG30	1.7	.2275132	93
44.	Portugal	PSI 20	2	.1230769	99
45.	Romania	BET	-	.0712366	90
46.	Russia	MOEX	1.67	.2923404	95
47.	Saudi Arabia	Tadawul All Share	2.4	.5303983	80
48.	Serbia	Belex 15	-	.1528545	92
49.	Singapore	STI Index	2.24	.3851626	8
50.	Slovenia	Blue-Chip SBITOP	-	.2011331	88
51.	South Africa	DJ South Africa	-	.2362653	49
52.	Spain	IBEX 35	1.71	.1951431	86
53.	Sri Lanka	CSE All-Share	2.32	-	45
54.	Sweden	OMXS30	2.2	.6484642	29
55.	Switzerland	SMI	-	.5105307	58
56.	Tanzania	Tanzania All Share	-	.0809353	50
57.	Thailand	SET	2.13	.3257384	64
58.	Turkey	BIST 100	2.17	.1599658	85
59.	Ukraine	PFTS	1.74	.2494654	95
60.	United Kingdom	FTSE 100	1.77	.3043053	35
61.	United States	S&P 500	1.82	.3817277	46
62.	Vietnam	VN	2.19	.5212329	30
	Mean		1.92	.2928768	65.75

Table 3. Summary statistics

This table reports the summary statistics of main variables.

Variables	Observations	Mean	Standard deviation	Minimum value	Maximum value
Stock market volatility	29,485	1.04	0.68	0	4.60
Tightness	20,206	1.92	0.27	1.46	2.48
Uncertainty avoidance	29,485	65.65	21.84	8	100
Trust	27,566	0.29	0.18	0.03	0.74
Covid-19 confirmed cases	29,485	5.21	11.38	0	64.42
Vaccine	29,485	3.90	4.20	0	10
Δ Stringency index	29,485	0.07	2.58	-50.92	74.08

Table 4. Correlations

This table reports the pairwise Pearson correlations between main variables. * indicates significance level at 5% level.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Stock market volatility	1.00						
(2) Tightness	-0.12*	1.00					
(3) Uncertainty avoidance	0.04*	-0.45*	1.00				
(4) Trust	0.02*	0.35*	-0.46*	1.00			
(5) Covid-19 confirmed cases	-0.02*	-0.05*	-0.00	-0.06*	1.00		
(6) Vaccine	-0.28*	-0.04*	0.05*	0.01	0.19*	1.00	
(7) Δ Stringency index	0.09*	-0.00	0.00	0.00	-0.01	-0.05*	1.00

Table 5. Tightness and market reactions to COVID-19

This table presents the regression results for the moderating effect of cultural variables on the relationship between stock market volatility and COVID-19 outbreaks. Stock market volatility is the dependent variable in all regressions, calculated as the 7-days rolling window standard deviation of daily stock market returns. Interaction terms, Tightness \times COVID-19 confirmed cases, Trust \times COVID-19 confirmed cases, and Uncertainty Avoidance \times Covid-19 confirmed cases, are the explanatory variables of interest. Tightness is the cultural tightness-looseness index of Gelfand et al. (2011). Trust represents the generalized societal trust level measured with the World Values Survey data. Uncertainty Avoidance is represented with Hofstede et al. (2010)'s uncertainty avoidance dimension of national culture. COVID-19 confirmed cases equals the daily new laboratory confirmed cases of COVID-19 in each country. Vaccine index equals the sum of vaccine prioritisation, vaccine availability and vaccine financial support indexes. Δ Stringency index captures the effect of news regarding the imposing or relieving the government social distancing policies on stock market volatility. We estimate panel pooled ordinary least squares (OLS) regressions for the results. We use heteroskedasticity robust standard errors, clustered at country-level. P-values are given in parenthesis. ***, **, * represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Stock market volatility				
	(1)	(2)	(3)	(4)	(5)
Uncertainty Avoidance \times Covid-19 confirmed cases		0.000**			0.000
		(0.023)			(0.328)
Trust \times COVID-19 confirmed cases			-0.019***		-0.007
			(0.000)		(0.445)
Tightness \times COVID-19 confirmed cases				-0.009**	-0.008**
				(0.033)	(0.046)
COVID-19 confirmed cases	0.008**	-0.007*	0.007***	0.017**	0.004
	(0.027)	(0.057)	(0.000)	(0.034)	(0.649)
Vaccine	-0.046***	-0.046***	-0.048***	-0.048***	-0.050***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ Stringency index	0.022***	0.021***	0.022***	0.026***	0.026***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	1.211***	1.208***	1.221***	1.268***	1.291***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Countries	62	62	58	42	40
Observations	29,485	29,485	27,566	20,206	19,257
R-squared	0.087	0.090	0.096	0.095	0.107

Table 6. Tightness and market reactions to COVID-19: Alternate measure of COVID-19

This table presents the regression results for the moderating effect of cultural tightness on the relationship between stock market volatility and COVID-19 outbreaks. Stock market volatility is the dependent variable in all regressions, calculated as the 7-days rolling window standard deviation of daily stock market returns. Interaction term, Tightness \times COVID-19 confirmed deaths, is the explanatory variable of interest. Tightness is the cultural tightness-looseness index of Gelfand et al. (2011). Covid-19 confirmed deaths equals the daily new confirmed deaths of COVID-19 in each country. Vaccine index equals the sum of vaccine prioritisation, vaccine availability and vaccine financial support indexes. Δ Stringency index captures the effect of news regarding the imposing or relieving the government social distancing policies on stock market volatility. We estimate panel pooled ordinary least squares (OLS) regressions for the results. We use heteroskedasticity robust standard errors, clustered at country-level. P-values are given in parenthesis. ***, **, * represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Stock market volatility	
	(1)	(2)
Tightness \times Covid-19 confirmed deaths		-0.510*** (0.008)
COVID-19 confirmed deaths	0.190** (0.013)	1.063*** (0.005)
Vaccine	-0.046*** (0.000)	-0.048*** (0.000)
Δ Stringency index	0.022*** (0.000)	0.026*** (0.000)
Constant	1.202*** (0.000)	1.258*** (0.000)
Countries	62	42
Observations	29,485	20,206
R-squared	0.090	0.098

Table 7. Tightness and market reactions to COVID-19: Alternate measures of tightness

This table presents the regression results for the moderating effect of cultural tightness on the relationship between stock market volatility and COVID-19 outbreaks. Stock market volatility is the dependent variable in all regressions, calculated as the 7-days rolling window standard deviation of daily stock market returns. Interaction terms, Tightness (Uz) \times COVID-19 confirmed cases and Tightness (Uz) \times COVID-19 confirmed deaths, are the main explanatory variables of interest. Tightness (Uz) is the cultural tightness-looseness index of Uz (2015) where higher values represent loose cultures while lower values tight cultures. COVID-19 confirmed cases equals the daily new laboratory confirmed cases of Covid-19 in each country. COVID-19 confirmed deaths equals the daily new confirmed deaths of COVID-19 in each country. Vaccine index equals the sum of vaccine prioritisation, vaccine availability and vaccine financial support indexes. Δ Stringency index captures the effect of news regarding the imposing or relieving the government social distancing policies on stock market volatility. We estimate panel pooled ordinary least squares (OLS) regressions for the results. We use heteroskedasticity robust standard errors, clustered at country-level. P-values are given in parenthesis. ***, **, * represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Stock market volatility	
	(1)	(2)
Tightness (Uz) \times COVID-19 confirmed cases	0.000 (0.457)	
Tightness (Uz) \times COVID-19 confirmed deaths		0.010** (0.020)
COVID-19 confirmed cases	-0.003 (0.524)	
COVID-19 confirmed deaths		-0.468* (0.066)
Vaccine	-0.049*** (0.000)	-0.048*** (0.000)
Δ Stringency index	0.026*** (0.000)	0.026*** (0.000)
Constant	1.267*** (0.000)	1.253*** (0.000)
Countries	43	43
Observations	20,330	20,330
R-squared	0.098	0.104

Table 8. Tightness and market reactions to COVID-19: Additional control variables

This table presents the regression results for the moderating effect of cultural variables on the relationship between stock market volatility and COVID-19 outbreaks. Stock market volatility is the dependent variable in all regressions, calculated as the 7-days rolling window standard deviation of daily stock market returns. Interaction terms, Tightness \times COVID-19 confirmed cases and Tightness \times COVID-19 confirmed deaths, are the main explanatory variables of interest. Tightness is the cultural tightness-looseness index of Gelfand et al. (2011). COVID-19 confirmed cases equals the daily new laboratory confirmed cases of COVID-19 in each country. COVID-19 confirmed deaths equals the daily new confirmed deaths of COVID-19 in each country. Vaccine index equals the sum of vaccine prioritisation, vaccine availability and vaccine financial support indexes. Δ Stringency index captures the effect of news regarding the imposing or relieving the government social distancing policies on stock market volatility. We estimate panel pooled ordinary least squares (OLS) regressions for the results. We use heteroskedasticity robust standard errors, clustered at country-level. P-values are given in parenthesis. ***, **, * represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Stock market volatility	
	(1)	(2)
Tightness \times COVID-19 confirmed cases	-0.012** (0.033)	
Tightness \times COVID-19 confirmed deaths		-0.646*** (0.006)
COVID-19 confirmed cases	0.024** (0.42)	
COVID-19 confirmed deaths		1.202*** (0.003)
Vaccine	-0.046*** (0.000)	-0.047*** (0.000)
Δ Stringency index	0.047*** (0.000)	0.048*** (0.000)
Stock market volume	-0.001 (0.867)	0.000 (0.949)
Δ Govt. economic support index	0.016*** (0.000)	0.016*** (0.000)
Log (GDP)	0.077** (0.011)	0.063** (0.043)
Democratic accountability	0.043 (0.165)	0.040 (0.173)
Economic freedom	0.001 (0.902)	0.002 (0.851)
Constant	-1.055 (0.207)	-0.743 (0.379)
Countries	42	42
Observations	20,198	20,198
R-squared	0.130	0.130

Table 9. Tightness and market reactions to social distancing policies

This table presents the regression results for the moderating effect of cultural tightness on the relationship between stock market volatility and the COVID-19 cases and social distancing policies. Stock market volatility is the dependent variable, calculated as the 7-days rolling window standard deviation of daily stock market returns. The interaction term, Tightness \times Δ Stringency index, is the main explanatory variable of interest. Tightness is the cultural tightness-looseness index of Gelfand et al. (2011). COVID-19 confirmed cases equals the daily new laboratory confirmed cases of COVID-19 in each country. Vaccine index equals the sum of vaccine prioritisation, vaccine availability and vaccine financial support indexes. Δ Stringency index captures the effect of news regarding the imposing or relieving the government social distancing policies on stock market volatility. We estimate panel pooled ordinary least squares (OLS) regressions for the results. We use heteroskedasticity robust standard errors, clustered at country-level. P-values are given in parenthesis. ***, **, * represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	Stock market volatility (1)
Tightness \times COVID-19 confirmed cases	-0.009** (0.032)
Tightness \times Δ Stringency index	-0.019 (0.102)
COVID-19 confirmed cases	0.017** (0.034)
Vaccine	-0.048*** (0.000)
Δ Stringency index	0.062*** (0.007)
Constant	1.268*** (0.000)
Countries	42
Observations	20,206
R-squared	0.095

Table 10. Tightness and market reactions to COVID-19: Channel analysis

This table presents the regression results for the channel analysis. Daily COVID-19 confirmed cases and COVID-19 confirmed deaths are the dependent variables in Models 1, 2 and 3, 4, respectively. COVID-19 confirmed cases equals the daily new laboratory confirmed cases of COVID-19 in each country. COVID-19 confirmed deaths equals the daily new confirmed deaths of COVID each country. Tightness is the cultural tightness-looseness index of Gelfand et al. (2011) where higher values represent higher cultural tightness and lower values cultural looseness. Tightness (Uz) is the cultural tightness-looseness index of Uz (2015) where higher values represent loose cultures while lower values tight cultures. Vaccine index equals the sum of vaccine prioritisation, vaccine availability and vaccine financial support indexes. Stringency index represents the extent of government enforced social distancing policies in a country. Country FE are country dummy variables. We estimate panel pooled ordinary least squares (OLS) regressions for the results with heteroskedasticity robust standard errors, clustered at country-level. P-values are given in parenthesis. ***, **, * represent statistical significance at 1%, 5%, and 10% levels, respectively.

Variables	COVID-19 confirmed cases		COVID-19 confirmed deaths	
	(1)	(2)	(3)	(4)
Tightness	-7.905*** (0.000)		-0.184*** (0.000)	
Tightness (Uz)		0.128*** (0.000)		0.003*** (0.000)
Vaccine	0.544*** (0.000)	0.552*** (0.000)	0.006*** (0.004)	0.006*** (0.008)
Stringency index	0.088*** (0.000)	0.081*** (0.000)	0.003*** (0.000)	0.003*** (0.000)
Country FE	Yes	Yes	Yes	Yes
Constant	12.685*** (0.000)	-8.765*** (0.000)	0.259*** (0.000)	-0.239*** (0.000)
Countries	42	43	42	43
Observations	20,206	20,330	20,206	20,330
R-squared	0.568	0.543	0.574	0.536