Lisbon School of Economics & Management
Universidade de Lisboa

MASTER IN
FINANCE

MASTER´S FINAL WORK
DISSERTATION

ON THE RELATIONSHIP BETWEEN CHANGES IN CONSUMER CONFIDENCE AND STOCK MARKET RETURNS: GLOBAL ANALYSIS

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SUPERVISION:
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ABSTRACT

This study provides new insights on the relationship between changes in global consumer confidence indexes and the performance of stock markets in China, Europe, and USA from 2007 to 2021. Besides the full sample we also look into the pre-pandemic and pandemic subperiods.

Using contemporaneous correlation and Granger causality tests from the full-time period and pre-pandemic sub-period, generally, we find that the stock market returns are positively correlated with changes in consumer confidence indexes. There are significant two-way Granger causal impacts between the two variables in Europe and the United States. For the Chinese stock market, we find that changes in consumer confidence indexes worldwide can Granger cause Chinese stock returns, but not vice versa. Chinese stock returns only assist to predict changes in East Asian consumer confidence index.

For the Covid pandemic sub-period, we find some negative correlations between stock market returns and changes in consumer confidence indexes. For the Chinese stock markets this more evident than for European or United States stock markets. Even so, the returns of the Health Care sector in the United States and Europe alter to be negatively connected with changes in consumer confidence indexes all over the world. Concerning Granger causality results, we find the impact from the stock market returns to the changes in consumer confidence indexes to be stronger during the pandemic sub-period. On the other hand, the causality running from changes in consumer confidence indexes to stock market returns reduced in terms of the number of significant outcomes.

Keywords: Consumer Confidence index; Stock Market Return; Granger Causality test.

JEL Codes: G00; G11; G15.

RESUMO

Este estudo analisa a relação entre alterações nos índices de confiança dos investidores a nível mundial e a performance dos mercados accionista Chinês, Europeu e Norte Americano, entre 2007 e 2021. Para além da amostra global também analisamos separadamente os sub-períodos de pré-pandemia e pandemia.

Utilizando quer a correlação contemporânea, quer testes de causalidade de Granger, de uma maneira geral verificamos que, quer para a totalidade da amostra, quer como para o período pré-pandemia, os retornos do mercado de ações tendem a ser positivamente correlacionados com as mudanças nos índices de confiança do consumidor. É possível identificar impactos significativos, em termos de causalidade de Granger nas duas direcções na Europa e nos Estados Unidos. Para o mercado accionista Chinês, mostra-se que as alterações aos índices de confiança do consumidor em todo o mundo podem ajudar a explicar retornos no mercado de acionista Chinês, mas não vice-versa. De facto, a performance do mercado acionista Chinês apenas ajuda a prever alterações no índice de confiança do consumidor do Leste Asiático.

Já durante a pandemia de Covid, encontramos algumas correlações negativas entre os retornos do mercado de ações e alterações dos índices de confiança dos consumidores. Este efeito bem evidente no caso do mercado acionista Chinês, verifica-se com menos intensidade nos mercados acionistas Europeu e America. Ainda assim, os retornos do setor da Saúde nos Estados Unidos e na Europa passam a estar negativamente relacionados com para as alterações de confiança dos consumidores a nível em todo o mundo. Em relação aos resultados de causalidade de Granger, verificamos um aumento do impacto dos retornos do mercado de ações nas alterações dos índices de confiança do consumidor durante a pandemia. Por outro lado, a causalidade entre as alterações nos índices de confiança dos consumidores e os retornos do mercado de ações reduziu em termos do número de resultados significativos.

Keywords: Indices de confiança do cnosumidor; retorno nos mercados acionistas; teste de causalidade de Granger .

JEL Codes: G00; G11; G15.

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ACKNOWLEDGMENTS

First of all, I would like to express my most sincere thanks to my supervisor, Professor Raquel. I would like to thank her for every time she listened carefully, and for her encouragement and careful knowledge of my work.

Secondly, I would like to thank my parents for their support, and my friend Sichen Dong for helping me with the figures.

1. INTRODUCTION

Previous studies suggest that changes in investor sentiment impact the fluctuations in the stock prices (Lee et al., 1991; Baker and Wurgler, 2006). Moreover, in the consumption-based asset pricing theory, investors' marginal utility is the crucial determinant of asset prices. As consumers are not only the buyers of companies' products that can affect companies' income but also the investors of companies' stocks that determine the demand for the stocks, there are numerous of literature using the consumer confidence as a proxy for investor sentiment, for instance, Qiu and Welch, 2004; Sayim and Rahman, 2013; Schmeling 2009; Solanki and Seetharam, 2014. Furthermore, Suárez and Conde (2020) also point out that using the consumer confidence index for investors' utility helps consumption-based asset pricing models outperform production-based models for various anomaly portfolios.

The definition of consumer confidence is the prospects of consumers toward future economic conditions. Consumers who hold favorable opinions about economic development consume more and save less. Juhro and Iyke (2020) show that the consumer confidence predicts the consumer expenditure with the Indonesian evidence. Meanwhile, Gündüz et al.(2017) note that the consumer confidence has a unidirectional relation with the credit card expenditure based on the data from Turkey. Similarly, Dees and Brinca (2013) elucidate that consumer confidence can predict consumer spending with the evidence for the USA and the euro area.

For the between consumer confidence and the stock market, Jansen and Nahuis (2003) suggest that there are two channels through which the stock market affects the consumer confidence. Firstly, stock price movement can affect the consumer confidence through the traditional wealth effect. Secondly, the stock market contains information for consumers, making it a leading indicator of consumers' judgment. On the other hand, a recent study reveals a separate transmission channel that affects consumers' willingness to invest. Lolić et al.(2017) note that rather than the microeconomic aspects of consumers' financial situations, consumers' assessment of the economic climate is establishing a distinct channel to affect their decision to invest in the stock market after the Great Recession of 2008.

For the existence of imperfect integration across world capital markets, Baker et al.(2009) suggest that cross-border arbitrage by multinationals plays a role in the current investing environment. However, there has been little discussion about the relationship between foreign consumer confidence indexes and the stock market returns. Hence, the first distribution of our study is to investigate whether there are foreign effects from the global change in consumer confidence index to the stock market returns.

Moreover, industry investment is crucial in portfolio management. Chen et al.(2006) justify that the sector-based investment approaches should be emphasized when investing in developed countries. At the same time, Marcelo et al. (2013) also note that industry effects grow in significance for the diversification strategy. But current studies mainly investigate the relationship between the consumer confidence indexes and the general stock market. Therefore, this study explores the relationship between changes in consumer confidence indexes and various industry index returns.

Since 2020, the world has been facing a public health crisis. This is different from previous financial crises, and Teresiene et al.(2021) find that Covid-19 negatively affects the USA and Chinese consumer confidence indexes. Moreover, during the crisis, different psychological mechanisms lead to the emergence of perverse behavioral characteristics of consumers. As shown by Goeji et al.(2015), the financial crisis causes mental distress, leading to increased alcohol consumption. Given the consuming behavior being affected by the crisis, in this setting, investigating what is the relationship between the changes in consumer confidence indexes and stock market returns during the pandemic is the third contribution of our study.

Generally, the first objective of our study is to study the relationships between the global consumer confidence and the global and industry stock market performances in China, Europe, and the USA. The second objective is to investigate the appropriateness of the relationship during the pandemic.

The remainder of this study is organized as follows: Section 2 presents a literature review on this topic, and Section 3 outlines the data and methodology used in this study. Section 4 presents the empirical results. Section 5 contains some concluding remarks.

2. LITERATURE REVIEW

An increasing amount of literature is devoted to the study of the relations between change in consumer confidence indexes (ΔCCIs) and the stock market returns (SMRs). The study by Fisher et al.(2003) finds out that there is a positive and statistically significant relationship between SMRs and ΔCCIs, which shows that consumer confidence drops as stock prices fall. Still, when stock prices decrease, consumers become more positive. Jansen and Nahuis (2003) also state that in nine European countries, out of eleven objects, SMRs and ΔCCIs are positively correlated. Similar results are obtained by Sum (2014) ground on the analysis of monthly data from thirty-one countries by using the ordinary least squares (OLS) regression. It shows that SMRs jump around 4.7% with a one-unit increase in ΔCCI.

Lemmon and Portniaguina (2006) also find that the predictive power of consumer confidence is present only in the most recent 25-year subsample. A recent work by Ciner (2014) suggests that the relation alters with different periods. In the short term, changes in consumer confidence have a positive connection with returns, while in the medium term, the relationship shifts to be negative. Besides, Karnizova and Khan (2015) show that stock market developments affect consumer attitudes and are more relevant to the two components of consumer confidence: opinions about future employment and the current buying conditions.

As for the direction of the relationship, Jansen and Nahuis (2003) indicate that the stock returns can Granger cause consumer confidence at very short horizons, but not vice versa. Similar findings are reported by Şakir and Sevcan (2010) in the case of Turkey and Benazic and Uckar (2018) in the case of Croatia. In contrast, a study by Hsu et al.(2011) demonstrates a two-way causal relationship between the CCI and the stock market index using a panel causality test within 21 countries' data. When detailing the type of change in consumer confidence, the study by Bremmer(2008) suggests that expected changes in consumer confidence do not affect stock prices, while unexpected changes are directly related to changes in stock prices by conducting the Granger causality test. Sum (2012) adds that the stock market risk premiums can immediately respond to the shocks to business and consumer confidence. Specifically, consumer confidence contributes 6% to

the forecast error of stock market risk premiums for the 12-month horizon. As demonstrated by Ciner (2014), higher consumer confidence can drive stock prices to a higher place, and there is also an impact running from stock prices to consumer confidence in reverse causality, which can be seen as a leading indicator for consumer confidence. Moreover, Chen (2015) observes that ΔCCI can significantly benefit Taiwan's hotel stock return (HSR). Distinct from using CCI published officially, Reed (2016) measures consumer sentiment through social networks and reports that consumer confidence affects stock prices.

The impact of change in consumer confidence with divergent fluctuating directions on the stock market is not even. Chen (2011) remarks that asymmetric effects that lack consumer confidence can result in a higher probability of switching to a bear market regime. Indistinguishable results are found from Australian evidence by Akhtar et al.(2011), documenting that the equity market experiences an adverse effect upon announcing terrible sentiment news.

Regarding the link between consumer confidence and investor confidence, Qiu and Welch (2004) state that consumer confidence can be validated as a proxy for investor sentiment for the existing correlation between consumer confidence and investor sentiment. Hence, previous works of literature regarding the relationship between investor sentiment and the stock market can somewhat explain the ΔCCI-SMR relationship. Sayim and Rahman(2013) suggest that a positive investor sentiment tends to increase the Istanbul Stock Exchange (ISE) returns with evidence from the Turkish market. Furthermore, Schmeling(2009) indicates that investor sentiment can negatively forecast aggregate stock market returns by implementing consumer confidence as a proxy for individual investor sentiment based on 18 industrialized countries' data. In addition, Solanki and Seetharam(2014) study investor sentiment measured by the CCI in South Africa and its effect on the Johannesburg Stock Exchange (JSE). The output illustrates investor sentiment Granger-cause changes in the two indexes with a lag of 9 and 12 months, but not vice versa.

Concerning the CCI-SMR relationship under various financial situations. Ferrer et al. (2016) report that the relationship between the stock market and consumer confidence

decreases in Europe when the dot-com bubble ends. Another view is that the investor sentiment can provide the incremental predictability for the stock returns under the extreme market situation noted by Li et al.(2017) by implementing a Quantile Non-causality Test to detect the asymmetric relationship.

3. DATA AND METHODOLOGY

3.1. Data

The consumer confidence index (CCI) is a economic indicator that measures the sentiment and attitude of consumers toward future economic development and its prospects. In this study, we use Consumer Confidence Indexes published by the Organization for Economic Co-operation and Development (OECD), which are released monthly and represent the households' opinions towards the future financial situation in each region. These indexes are based on four dimensions (i) expected financial situation, (ii) sentiment about the general economic situation, (iii) unemployment, and (iv) capability of savings. OECD indexes are standardized at 100 points, with a score above 100 signaling a boost in the consumers' confidence in the future economic situation. In contrast, a score below 100 indicates a pessimistic attitude towards future economic developments, possibly resulting in a tendency to save more and consume less.

This study uses consumer confidences in Australia, Brazil, Chile, China, Colombia, Costa Rica, Japan, Korea, Mexico, New Zealand, the OECD Europe, and the United States. We divide these CCIs into six groups based on geographic location and take the arithmetic mean. Based on this, we obtain CCIs in six regions worldwide. See the evolution of CCIs in the six areas in Figure 1.

The study focuses on the impact of all CCIs on the stock markets of three regions: China, Europe, and the USA.[1] We look at monthly prices for each area at the global and sector stock indexes. The details of the selected samples are shown in Table A1.

[1] For selecting the general and sector stock market index with a monthly frequency, we choose the global and sector CSI 300 price for China, the global and sector STOXX Europe 600 price for Europe, and the global and sector S&P 500 price for the United States, among which eleven industries are selected, comprising Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Materials, Real Estate, Technology, Telecommunications, and Utilities.

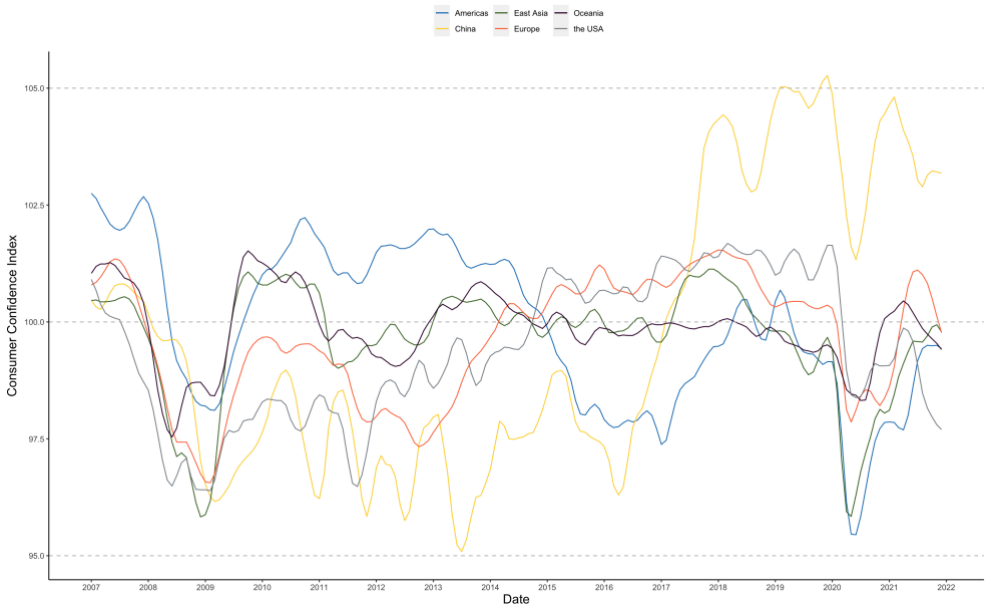


FIGURE 1 – THE EVOLUTION OF CCIS IN THE SIX AREAS.

In terms of time horizon, we study the sample from full-time, pre-pandemic, and pandemic periods. The full-time period is from January 2007 to December 2021, with 180 raw data observations. The period from January 2007 to December 2019 is conducted as the pre-pandemic research object, with 156 samples for raw data. [2]Then, the period from January 2020 to December 2021 is used as the pandemic research object, with 24 pieces of raw data. See Figure 2 for the historical performance of the index prices of the three regions.

Our key variables are sentiment changes, measured in the first difference in CCIs (ΔCCIs), and stock market returns (SMRs), measured by logarithmic returns. The calculation formulas are as follows:

(1) $$\Delta CCI_t = CCI_t - CCI_{t-1}$$.

(2) $$SMR_t = \ln(P_t) - \ln(P_{t-1})$$.

Consequently, the study contains twelve variables for SMRs and six variables for ΔCCIs, each with 179 observations.

[2] STOXX Europe 600 starts to release the industry indexes of Consumer Discretionary, Consumer Staples, and Energy in September 2010. Therefore, for these three industry indexes, we take the monthly data from September 2010 to December 2019 as the pre-pandemic sample.

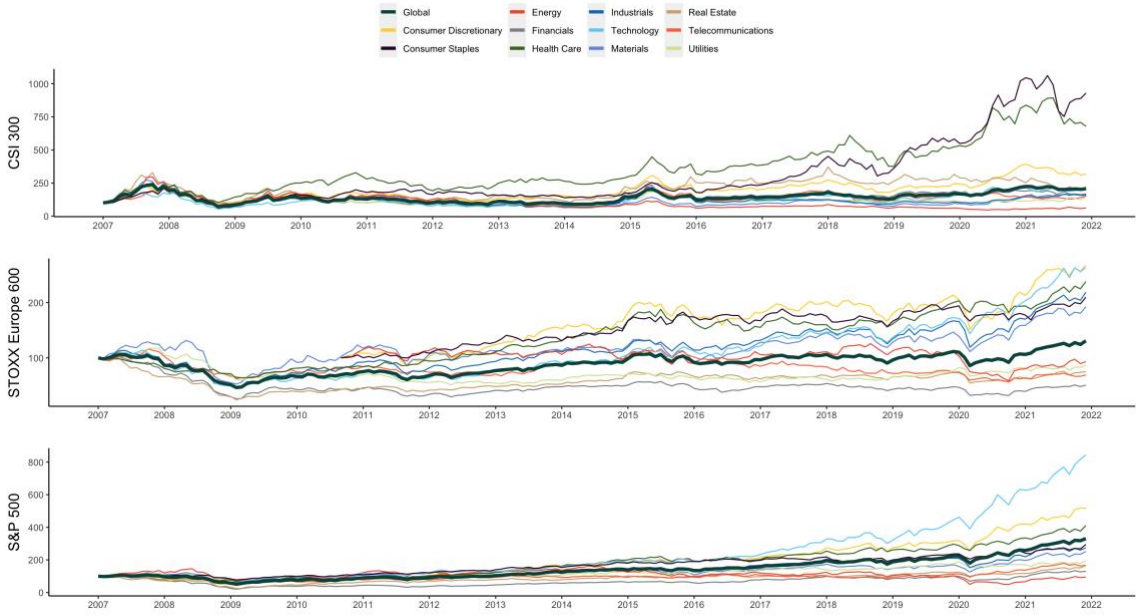


FIGURE 2 –STANDARDIZED EVOLUTION OF STOCK MARKETS.

3.2. Methodology

The methodologies used in this research are contemporaneous correlation and the Granger causality test. The Pearson correlation coefficient is taken to detect the linear relationships for the contemporaneous correlation. However, a non-zero correlation coefficient cannot tell the presence of a causal relationship between two variables. Hence, the two-way Granger causality test proposed by Granger (1988) is used to explore the bidirectional causality. The test is based on the following equations:

(3) $$\Delta CCI_t = \sum_{i=1}^{k} \lambda_i SMR_{t-i} + \sum_{i=1}^{k} \delta_i \Delta CCI_{t-i} + \varepsilon_t$$

(4) $$\Delta SMR_t = \sum_{i=1}^{k} \delta_i SMR_{t-i} + \sum_{i=1}^{k} \lambda_i \Delta CCI_{t-i} + \varepsilon_t$$

where ΔCCI denotes the first difference in consumer confidence index, SMR is the log return of the stock price index, ε is a disturbance, and *k* is the maximum lag orders.

As the Granger causality test requires the time-series data to be stationary, the preliminary examination is the unit root test. We conduct the Augmented Dickey-Fuller and the Philips-Perron tests to determine the stationarity of the sample. The results are exhibited in Table A2-A3. Judging by the marginal significance levels (p-values), we can reject the null hypothesis that there is a unit root.

In the granger causality test, we employ four information criteria, namely, AIC, HQ, SC, and FPE, for lag selection. For the full-time and pre-pandemic period samples, we set the maximum lags of 5, while for the pandemic samples we set the maximum of 3 lags. The results allow us to tell if there are causal relations between ΔCCIs and SMRs during different periods. We follow the principle of the minority obeying the majority. In the case of equivalence, since there is a penalty factor in AIC that avoids over-fitting the model, it is selected as the basis for selection.

We run a one-for-one Granger causality test on ΔCCIs in six economic entities with 36 SMRs in three periods with selecting lags. Consequently, we get 1296 Granger causality test results.

4. EMPIRICAL RESULTS

The relationships between global and industry SMRs and the world's ΔCCIs with selecting lag orders are shown in Tables 1-9. The left columns present the results of the contemporaneous correlation, and the right columns demonstrate the results of the Granger causality test, of which visualization versions are displayed in Figures 3-11.

4.1. Chinese stock market

Table 1 and Figure 3 demonstrate the relations between Chinese SMRs with the global ΔCCIs with a sample span of the full-time period. First of all, the contemporaneous correlation results judging by the t-statistic indicate that at a 90% confidence interval, 68 sets of bivariate data out of 72 are significantly positively correlated. That is to say, the ΔCCIs and China's SMRs fluctuate in the same direction. Based on that, we conduct the Granger causality test to detect causal relationships. As we can see for the causality from the Chinese SMRs to the global ΔCCIs, only the ΔCCI in East Asia is affected by four Chinese SMRs. This shows that East Asian consumers are the investors in the 4 Chinese stock markets, and their income is influenced by the movement of the four SMRs, which thus affect the ΔCCI in East Asia. On the other hand, the four SMRs contain information to judge future economic conditions.

In terms of the other direction, regarding the domestic effect, the Chinese ΔCCI only assists in predicting the future movement of the SMR of the industry Real Estate. This phenomenon is unusual since the industries with high demand elasticity cannot be affected by consumer sentiment. We consider two possibilities to explain this phenomenon. On the one hand, the Chinese market is developing, and the financial performance is not limited to the consumers' response. As shown in Figure 2, the stock prices in the Technology have risen sharper compared to the others. On the other hand, Plíhal (2016) tests the Granger causal relationships between German DAX with macroeconomic indicators to measure market efficiency. Therefore, the results may reveal that the information channel in the stock market is not well-developed.

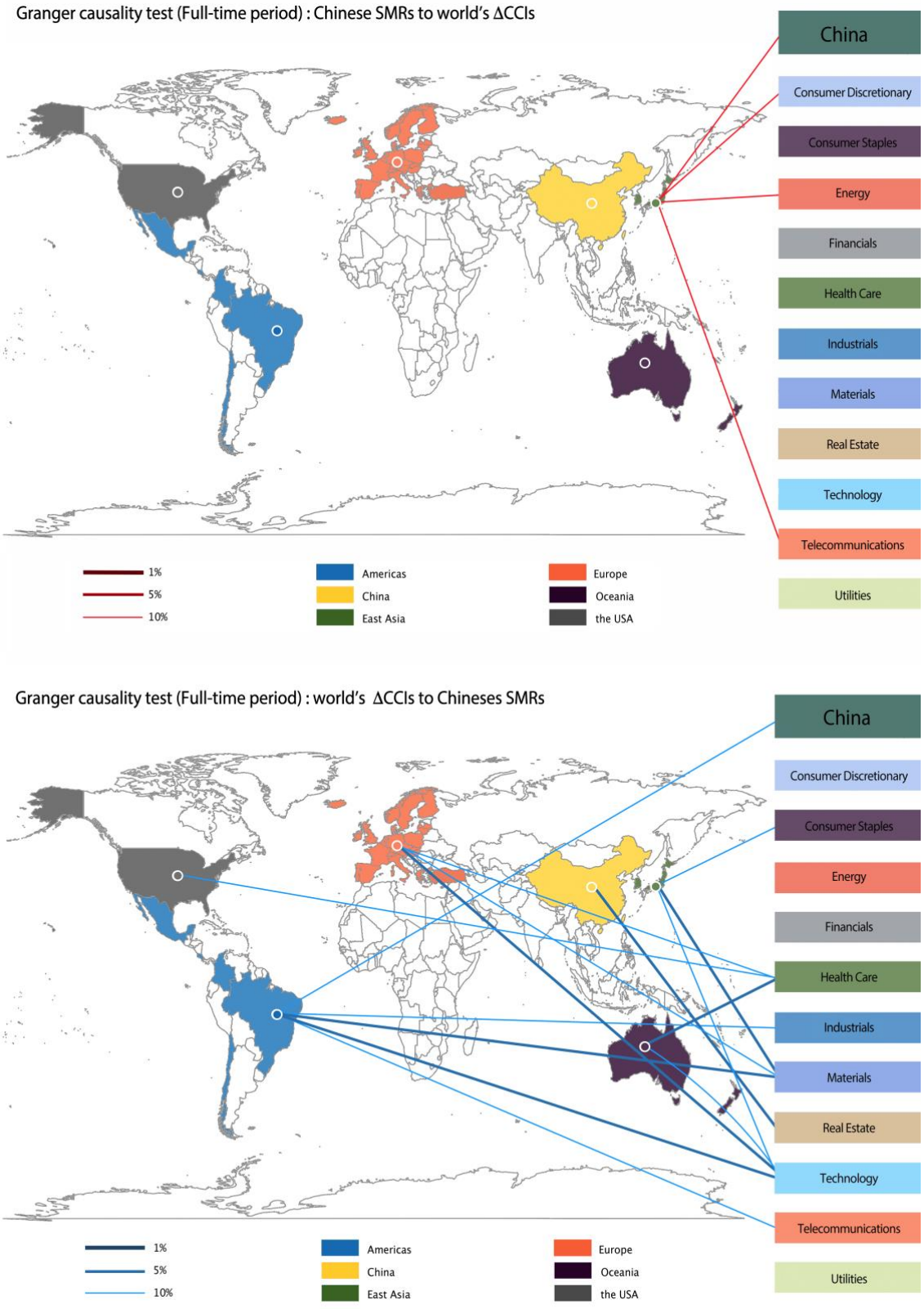
For the foreign causality, the result demonstrates that every global ΔCCIs can cause at least one Chinese SMR. In other words, consumers in these five regions are critical consumers in one or more sectors of the Chinese market. We prefer to think that

TABLE I – RELATION BETWEEN CHINESE GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2021.

China	Contemporaneous correlation						Test for Granger causality (P-values)					
	Estimate						Optimal Lag					
	(*t*-statistic)						R to △CCI					
							△CCI to R					
	Americas	China	East Asia	Europe	Oceania	the USA	Americas	China	East Asia	Europe	Oceania	the USA
CSI 300	0.1635 ***	0.1560 ***	0.2379 ***	0.2383 ***	0.1088 ***	0.0703 ***	4	2	5	4	4	4
	2.2053	2.1009	3.2588	3.2649	1.4561	0.9375	0.8696	0.6908	0.07253 *	0.8418	0.8071	0.5536
							0.095 *	0.3162	0.1108	0.2801	0.7556	0.7909
Consumer Discretionary	0.1937 ***	0.1715 ***	0.2751 ***	0.2726 ***	0.1720***	0.0781 ***	3	2	5	3	4	4
	2.6273	2.3160	3.8062	3.7693	2.3234	1.0427	0.9993	0.8328	0.09197 *	0.5315	0.3662	0.7561
							0.1409	0.1873	0.1046	0.1856	0.3251	0.6225
Consumer Staples	0.1163 ***	0.1015***	0.1492 ***	0.1350 ***	0.0629 ***	-0.0045	4	4	5	4	4	4
	1.5573	1.3570	2.0080	1.8130	0.8388	-0.0595	0.744	0.3881	0.6495	0.9811	0.6959	0.9411
							0.5381	0.6111	0.08517 *	0.6148	0.5588	0.4623
Energy	0.1517 ***	0.1663 ***	0.2467 ***	0.2005 ***	0.0850 ***	0.0478 ***	3	2	5	3	4	4
	2.0420	2.2432	3.3875	2.7229	1.1348	0.6368	0.5152	0.9518	0.0898 *	0.9613	0.6443	0.6343
							0.348	0.3307	0.1038	0.2464	0.6953	0.6
Financials	0.1441 ***	0.1800 ***	0.2330 ***	0.2185 ***	0.1069 ***	0.1102 ***	3	2	4	3	4	4
	1.9368	2.4340	3.1880	2.9790	1.4307	1.4756	0.8673	0.5353	0.2671	0.4906	0.6961	0.5184
							0.3122	0.2039	0.3274	0.3359	0.8754	0.9272
Health Care	0.0823***	-0.0037	0.1465 ***	0.1992 ***	0.0841 ***	-0.0025	3	2	4	3	4	4
	1.0983	-0.0492	1.9701	2.7039	1.1225	-0.0332	0.6163	0.9392	0.3214	0.6235	0.1255	0.47
							0.3801	0.9913	0.4638	0.08482 *	0.04722 **	0.09379 *
Industrials	0.1690 ***	0.1419 ***	0.2003 ***	0.2123 ***	0.0985 ***	0.0532 ***	4	2	5	4	4	4
	2.2816	1.9068	2.7199	2.8907	1.3163	0.7091	0.9388	0.7443	0.1359	0.8532	0.8265	0.65
							0.0616 *	0.3799	0.2613	0.4684	0.4748	0.5028
Materials	0.1932 ***	0.1549 ***	0.2149 ***	0.2296 ***	0.0855 ***	0.0207 ***	4	2	5	4	4	4
	2.6200	2.0860	2.9268	3.1387	1.1413	0.2754	0.9097	0.938	0.2235	0.7012	0.6062	0.1879
							0.01607 **	0.3776	0.04721 **	0.06415 *	0.3762	0.3013
Real Estate	0.1068 ***	0.1277***	0.2087 ***	0.2183 ***	0.0974 ***	0.0942 ***	3	5	4	3	4	3
	1.4290	1.7131	2.8386	2.9759	1.3021	1.2589	0.8844	0.9095	0.3619	0.855	0.7857	0.4567
							0.3613	0.02702 **	0.1289	0.2218	0.8491	0.5051
Technology	0.1864 ***	0.0518 ***	0.2109 ***	0.2332 ***	0.0806 ***	0.0716 ***	3	2	5	3	5	4
	2.5245	0.6904	2.8701	3.1908	1.0758	0.9549	0.3902	0.7383	0.2195	0.4198	0.1418	0.7879
							0.03399 **	0.5749	0.06757 *	0.03701 **	0.0604 *	0.1865
Telecommunications	0.1220 ***	0.0512 ***	0.1447 ***	0.1549 ***	0.0058	0.0405 ***	4	2	5	3	4	4
	1.6347	0.6827	1.9462	2.0862	0.0773	0.5387	0.4847	0.8786	0.06966 *	0.9563	0.1914	0.4123
							0.08088 *	0.8837	0.333	0.3164	0.6268	0.7576
Utilities	0.0973 ***	0.0930 ***	0.1292 ***	0.1401 ***	0.0663 ***	0.0417 ***	5	4	5	5	5	5
	1.3008	1.2429	1.7337	1.8828	0.8839	0.5557	0.5074	0.6926	0.4924	0.936	0.9045	0.2555
							0.4227	0.5245	0.4322	0.8367	0.5407	0.3751

* ** and *** significant at 10% 5% and 1% level.

FIGURE 3 – RELATION BETWEEN CHINESE GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2021.



the impact of the foreign ΔCCIs on Chinese SMRs is mainly through the consumption channel. This is because the results in the other direction suggest that foreign ΔCCIs cannot be affected by the Chinese SMRs, which denies the hypothesis that foreign consumers are investors in the Chinese market.

Table 2 and Figure 4 demonstrate the relations between Chinese SMRs with the global ΔCCIs with a sample span of the pre-pandemic period. First of all, 70 bivariate show significant correlations out of 72. Among them, only the SMR of Health Care and the ΔCCI in the USA share a negative correlation. For the outcomes of the Granger causality test, consistent with the results of the full-time period, the causality from SMRs is merely found in the ΔCCI in East Asia. In the opposite direction, no domestic effect on Chinese SMRs is found. In addition, as revealed in Figure 4, the foreign impact on the Chinese stock market is significantly apparent. Especially, the ΔCCI in the Americas can help improve the forecast of 10 Chinese SMRs. This result is consistent with the fact indicated by Ray (2017) that in Latin America, there is a sharp increase in trade with China. Furthermore, Consumer Discretionary, Health Care, Real Estate, and Technology industries are the main spending fields for foreign consumers.

Table 3 and Figure 5 demonstrate the relations between Chinese SMRs with the global ΔCCIs with a sample span of the pandemic period. As displayed from the correlation results, the linear relationships deteriorate; 43 significant correlations with more negative associations surging. The Granger causality test from SMRs to ΔCCIs indicates that the global ΔCCIs exclusive of Europe are affected by at least one Chinese SMR. As for the other direction, similar to the results from the normal period, there is also no domestic causal connection and at least one causality from each of the residual six regions. We can suggest that the Chinese SMRs are treated by more foreign consumers as a guide to future economic development and begin to invest in the Chinese stock market during the pandemic, especially for the consumers in Oceania and the USA. Moreover, the European ΔCCI has one-way Granger effects on seven SMRs, suggesting that European consumers remain the primary consumers for the Chinese product market. Generally, there is one Granger causality from Chinese SMRs to Chinese ΔCCI. For the stock can affect the consumer confidence through wealth channel, we make an assumption that the ownership of the chinses stocks is institutions.

TABLE II – RELATION BETWEEN CHINESE GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIs, 2007-2019.

Contemporaneous correlation							Test for Granger causality (P-values)					
China	Estimate						Optimal Lag					
	(*t*-statistic)						R to △CCI					
							△CCI to R					
	Americas	China	East Asia	Europe	Oceania	the USA	Americas	China	East Asia	Europe	Oceania	the USA
CSI 300	0.2174 ***	0.1507 ***	0.2686 ***	0.3085 ***	0.1092 ***	0.0758 ***	4	2	5	3	4	4
	2.7546	1.8862	3.4485	4.0111	1.3591	0.9401	0.5425	0.5978	0.01007 **	0.7555	0.8978	0.5545
							0.02632 **	0.3579	0.2019	0.06819*	0.4991	0.3381
Consumer Discretionary	0.2413 ***	0.1483 ***	0.2899 ***	0.3602 ***	0.1436 ***	0.0598 ***	3	2	5	3	4	4
	3.0753	1.8547	3.7465	4.7760	1.7955	0.7415	0.6594	0.8136	0.01788 **	0.7301	0.4452	0.7021
							0.0196 **	0.3019	0.06139 *	0.01258 **	0.1354	0.09161*
Consumer Staples	0.2572 ***	0.0897 ***	0.2111 ***	0.2320 ***	0.0744 ***	0.0063	3	2	3	3	4	3
	3.2928	1.1136	2.6714	2.9498	0.9231	0.0779	0.7096	0.5577	0.9287	0.7297	0.7207	0.9853
							0.01054 **	0.2187	0.1354	0.1117	0.326	0.2746
Energy	0.1586 ***	0.1447 ***	0.2610 ***	0.2275 ***	0.0744 ***	0.0361 ***	3	2	5	3	4	3
	1.9867	1.8084	3.3439	2.8896	0.9233	0.4470	0.2249	0.8931	0.001573 ***	0.8119	0.5082	0.4767
							0.2731	0.4268	0.2128	0.1893	0.6543	0.4605
Financials	0.1923 ***	0.1599 ***	0.2580 ***	0.2892 ***	0.1038 ***	0.1077 ***	3	2	5	3	4	3
	2.4239	2.0031	3.3032	3.7375	1.2912	1.3405	0.5142	0.3976	0.01093 **	0.6261	0.8838	0.6537
							0.08773 *	0.3341	0.328	0.118	0.6453	0.3648
Health Care	0.1922 ***	0.0073	0.1965 ***	0.2424 ***	0.1051 ***	*-0.0142 **	3	2	3	3	4	4
	2.4223	0.0908	2.4789	3.0902	1.3076	-0.1762	0.819	0.9705	0.4619	0.6596	0.5416	0.6998
							0.02104 **	0.7784	0.1221	0.0322 **	0.005812 ***	0.01992 **
Industrials	0.1806 ***	0.1391 ***	0.2276 ***	0.2758 ***	0.1026 ***	0.0877 ***	4	2	5	3	4	4
	2.2709	1.7372	2.8914	3.5490	1.2755	1.0886	0.5799	0.6486	0.0175 **	0.7542	0.751	0.6156
							0.06214*	0.3701	0.2238	0.1675	0.4571	0.2304
Materials	0.2063 ***	0.1597 ***	0.2341 ***	0.2710 ***	0.0768 ***	0.0402 ***	4	2	5	4	4	4
	2.6082	2.0012	2.9788	3.4829	0.9534	0.4974	0.4443	0.8181	0.04875 **	0.9815	0.6943	0.4572
							0.05644 *	0.3022	0.1384	0.1088	0.4522	0.2677
Real Estate	0.1728 ***	0.1005 ***	0.2559 ***	0.3229 ***	0.1080 ***	0.0894 ***	3	2	3	3	4	3
	2.1703	1.2496	3.2744	4.2196	1.3433	1.1099	0.7085	0.8073	0.1169	0.7273	0.8251	0.4848
							0.07658 *	0.393	0.03795 **	0.02041 **	0.6217	0.251
Technology	0.2433 ***	0.0798 ***	0.2365 ***	0.2955 ***	0.1001 ***	0.0716 ***	3	2	3	3	5	4
	3.1023	0.9898	3.0108	3.8262	1.2445	0.8874	0.5486	0.7427	0.6345	0.7917	0.1056	0.6863
							0.02439 **	0.6164	0.0772 *	0.01064 **	0.02217 **	0.04353 **
Telecommunications	0.1586 ***	0.0791 ***	0.1783 ***	0.2092 ***	0.0365 ***	0.0469 ***	3	2	3	3	4	3
	1.9871	0.9813	2.2412	2.6461	0.4515	0.5802	0.1331	0.7832	0.5185	0.8768	0.13	0.2917
							0.2122	0.8936	0.236	0.1672	0.4685	0.3768
Utilities	0.1259 ***	0.0799 ***	0.1386 ***	0.1925 ***	0.0828 ***	0.0554 ***	5	2	5	3	5	5
	1.5699	0.9910	1.7309	2.4266	1.0272	0.6865	0.4479	0.3329	0.1016	0.962	0.8264	0.1629
							0.09911 *	0.3458	0.5315	0.4701	0.4147	0.2142

* ** and *** significant at 10% 5% and 1% level.

FIGURE 4 – RELATION BETWEEN CHINESE GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2019.

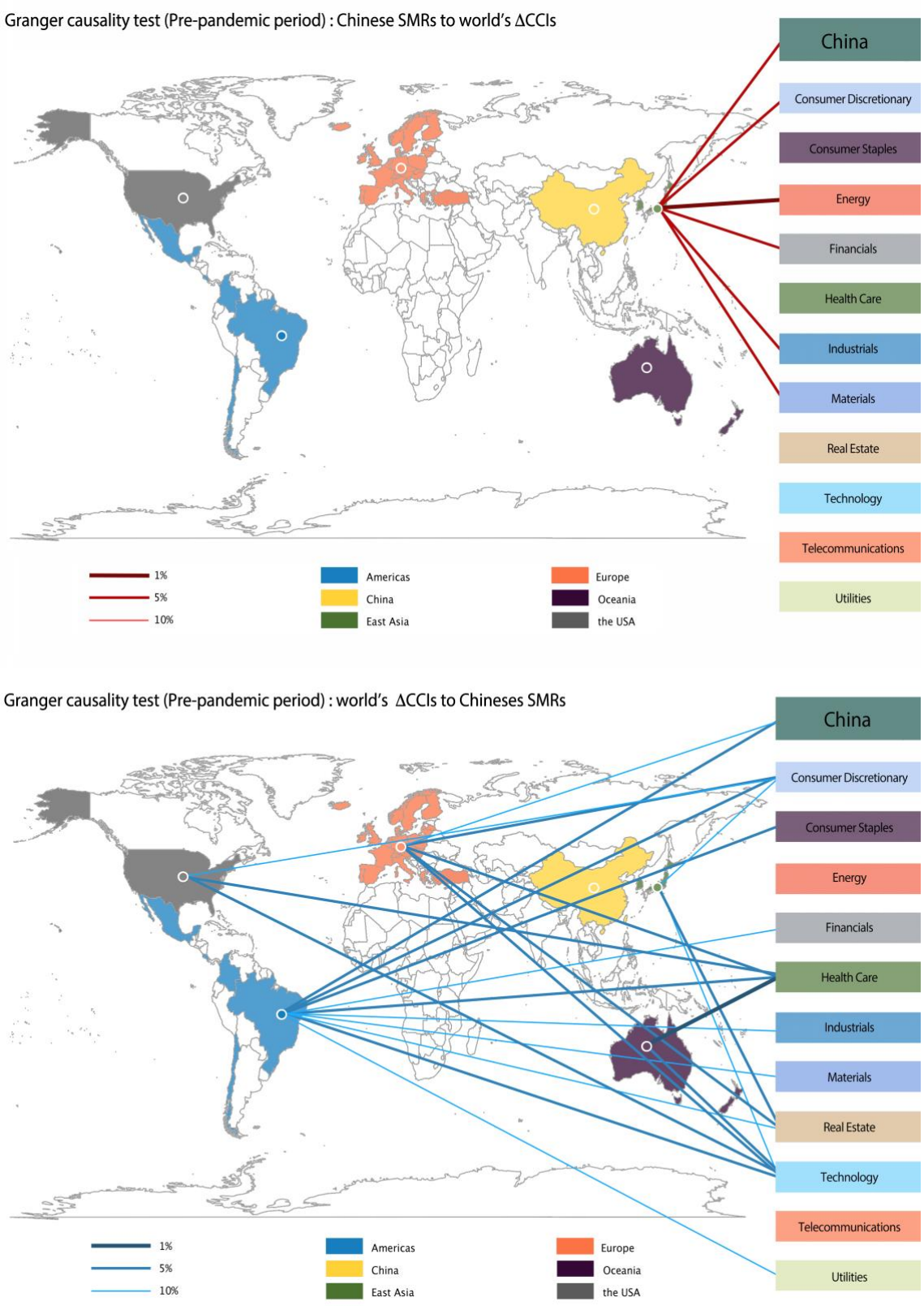
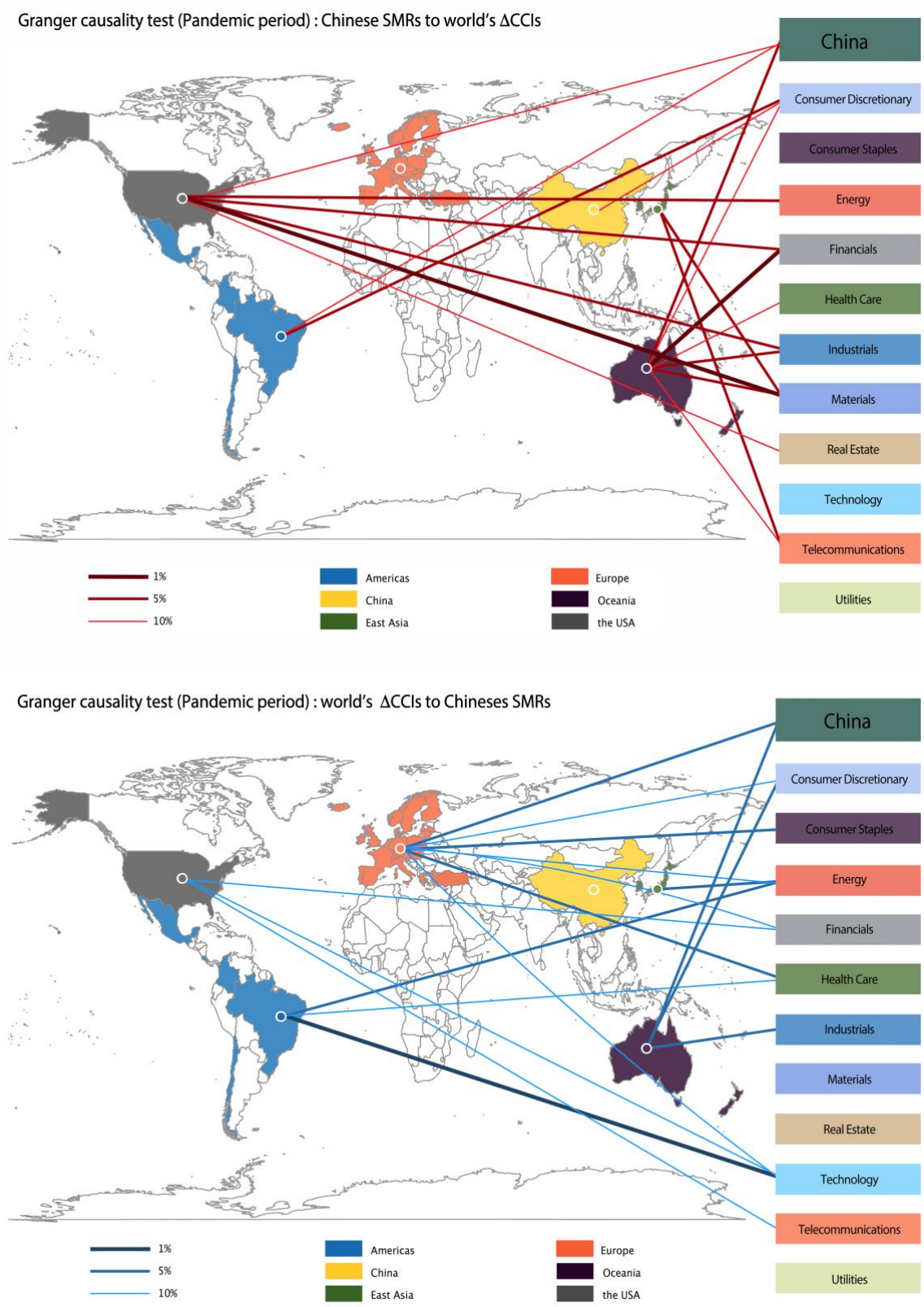


TABLE III – RELATION BETWEEN CHINESE GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIs, 2019-2021.

China	Contemporaneous correlation						Test for Granger causality (P-values)					
	Estimate						Optimal Lag					
	(*t*-statistic)						R to △CCI					
							△CCI to R					
	Americas	China	East Asia	Europe	Oceania	the USA	Americas	China	East Asia	Europe	Oceania	the USA
CSI 300	0.0505	0.2809 ***	0.2594 ***	0.1163**	0.1369 ***	0.1444***	2	3	3	2	3	2
	0.2318	1.3414	1.2309	0.5368	0.6331	0.6686	0.05992 *	0.3804	0.1742	0.5169	0.0275 **	0.08571 *
							0.3563	0.6046	0.116	0.04115 **	0.0344 **	0.4366
Consumer Discretionary	-0.0607	0.2621 ***	0.0954 *	-0.0709	0.0336	0.0762	2	1	3	2	3	2
	-0.2789	1.2445	0.4391	-0.3255	0.1539	0.3502	0.0111 **	0.0677 *	0.2257	0.4886	0.0558 *	0.2063
							0.3591	0.5249	0.5239	0.09998 *	0.0384 **	0.5066
Consumer Staples	0.0384	0.1878 ***	0.1155 **	0.0275	-0.0458	0.0673	2	2	2	3	2	3
	0.1759	0.8760	0.5329	0.1261	-0.2103	0.3091	0.6729	0.9785	0.9137	0.9391	0.1316	0.2928
							0.4308	0.7413	0.6222	0.01684 **	0.5425	0.1449
Energy	0.0562	0.3989 ***	0.2834 ***	0.0591	0.1713***	0.1768 ***	2	2	2	2	2	2
	0.2582	1.9936	1.3544	0.2713	0.7968	0.8230	0.389	0.4485	0.8878	0.5005	0.6219	0.04905 **
							0.03975 **	0.3025	0.04785 **	0.08547 *	0.1717	0.1094
Financials	0.2367 ***	0.1817 ***	0.2121 ***	0.2082 ***	0.1397 ***	0.0400	2	2	2	3	3	3
	1.1163	0.8470	0.9945	0.9754	0.6465	0.1834	0.16	0.965	0.8476	0.2469	0.004367 ***	0.01378 **
							0.8056	0.1588	0.7111	0.09711 *	0.1368	0.05889 *
Health Care	0.0803	-0.0598	0.2316 ***	0.1432 ***	-0.0159	0.1194 **	2	1	3	2	2	2
	0.3692	-0.2746	1.0910	0.6631	-0.0731	0.5512	0.942	0.4145	0.253	0.5863	0.05352 *	0.3254
							0.05358 *	0.2925	0.1413	0.01461 **	0.8038	0.3399
Industrials	*-0.2171 ***	-0.0643	0.0187	0.1358 ***	-0.0273	0.0442	2	1	3	2	3	2
	-1.0194	-0.2952	0.0856	0.6282	-0.1251	0.2025	0.1411	0.1264	0.3879	0.6285	0.04629 **	0.04895 **
							0.4982	0.724	0.2945	0.6776	0.03229 **	0.9867
Materials	0.2281 ***	0.3637 ***	0.3071 ***	0.2237 ***	0.1713 ***	0.1741 ***	2	2	3	2	2	2
	1.0734	1.7890	1.4788	1.0516	0.7968	0.8102	0.5146	0.5056	0.04747 **	0.2355	0.04965 **	0.005134 ***
							0.4574	0.9132	0.4569	0.3145	0.2284	0.6999
Real Estate	0.2758 ***	0.2743 ***	0.1952 ***	0.1104 **	0.0768	-0.0048	2	2	2	2	3	3
	1.3151	1.3069	0.9121	0.5089	0.3528	-0.0221	0.7531	0.6601	0.9605	0.4171	0.3334	0.08906 *
							0.9024	0.3673	0.7737	0.3423	0.6282	0.122
Technology	0.0636	*-0.1792 ***	0.0891	0.0295	*-0.2461 ***	-0.0140	3	3	3	3	3	3
	0.2921	-0.8345	0.4098	0.1354	-1.1636	-0.0642	0.7214	0.3992	0.4481	0.7217	0.1037	0.7959
							0.008077 ***	0.7659	0.1208	0.07688 *	0.2729	0.05477 *
Telecommunications	0.1278 **	0.3986 ***	0.3540 ***	0.0933	0.4133 ***	0.2625 ***	3	3	3	3	3	3
	0.5907	1.9915	1.7347	0.4294	2.0800	1.2466	0.4009	0.2099	0.01915 **	0.4059	0.07409 *	0.9802
							0.1202	0.3083	0.5598	0.6912	0.1177	0.09942 *
Utilities	*-0.2396 ***	0.1643 ***	-0.0318	*-0.0952 *	-0.0079	0.0091	2	2	2	2	2	2
	-1.1310	0.7635	-0.1459	-0.4382	-0.0363	0.0419	0.563	0.8421	0.9344	0.6483	0.8633	0.6216
							0.8125	0.1527	0.5539	0.8652	0.5976	0.4888

* ** and *** significant at 10% 5% and 1% level.

FIGURE 5 – RELATION BETWEEN CHINESE GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2019-2021.



4.2. European stock market

Table 4 and Figure 6 demonstrate the relations between European SMRs with the global ΔCCIs with a sample span of the pandemic period. The correlation test results show that the ΔCCIs and the global SMRs are significantly correlated. Additionally, we can tell that the European SMRs are strongly associated with the global ΔCCIs in terms of the two-way Granger causality when a first glance at the test results. This indicates that the European stock market is a major investment market for global consumers and the European SMRs are an important economic indicator. Apart from this, given that global ΔCCIs can Granger cause 11 SMRs, it illustrates that European companies of diverse sectors, excluding the industry of Health Care, capture a significant global market share.

Table 5 and Figure 7 demonstrate the relations between European SMRs with the global ΔCCIs with a sample span of the pre-pandemic period. Firstly, the two variables are positively correlated except that the ΔCCI in Oceania and SMR in the industry Energy are negatively correlated. Secondly, concerning the Granger causality results, in contrast to the results of the full-time period, we cannot ascertain causality from SMRs to the ΔCCIs in the Americas and the USA. On the other hand, causal connections in the other direction are still significant, similar to the full-time period results.

Table 6 and Figure 8 demonstrate the relations between European SMRs with the global ΔCCIs with a sample span of the pandemic period. 64 bivariate out of 72 are correlated, with four being negatively correlated. Generally, the Granger causalities from the SMRs to the ΔCCIs in the Americas, China, and Europe are still significant, which means the consumers in these regions are also the investors in the European stock market.

Concerning the Granger causality in the other direction, it can be seen that the number of significant causality from ΔCCIs drops. Because all sectors except Health Care and Technology are positively correlated with ΔCCIs and based on previous findings by Teresiene et al. (2021): the negative impact of the pandemic on consumer confidence, which can also be observed in Figure1. This indicates that the European SMRs are not affected by the weakening of CC in each region during the pandemic. Moreover, since SMR in the industry Health Care is negatively correlated and Granger caused by the ΔCCIs in both China and the USA, it indicates the possibility that consumption of industry

TABLE IV – RELATION BETWEEN EUROPEAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIs, 2007-2021.

Europe	Contemporaneous correlation: Estimate (*t*-statistic)						Test for Granger causality (P-values): Optimal Lag					
							R to △CCI					
							△CCI to R					
	Americas	China	East Asia	Europe	Oceania	the USA	Americas	China	East Asia	Europe	Oceania	the USA
STOXX 600	0.2250 ***	0.2173 ***	0.3652 ***	0.3718 ***	0.2151 ***	0.2495 ***	3	4	4	3	5	3
	3.0720	2.9616	5.2191	5.3292	2.9310	3.4271	0.05133 *	0.001205 ***	0.3797	0.0002769 ***	0.0153 **	0.05723 *
							0.01076 **	0.1213	0.001547 ***	0.001059 ***	0.005122 ***	0.07679 *
Consumer Discretionary	0.1922 ***	0.1714 ***	0.3162 ***	0.3142 ***	0.2644 ***	0.2835 ***	4	4	4	3	5	2
	2.2587	2.0067	3.8432	3.8169	3.1618	3.4099	0.01146 **	0.0004646 ***	0.954	0.0001327 ***	0.4848	0.04295 **
							0.1373	0.03354 **	0.008516 ***	0.0226 **	0.01072 **	0.07852 *
Consumer Staples	0.0629 ***	0.0073 ***	0.1661 ***	0.1554 ***	0.0570 ***	0.1061 ***	3	3	4	3	5	3
	0.7272	0.0845	1.9427	1.8137	0.6581	1.2309	0.04072 **	0.7925	0.7153	0.1627	0.3911	0.6093
							0.6402	0.04063 **	0.3548	0.2614	0.217	0.4709
Energy	0.2307 ***	0.1404 ***	0.2601 ***	0.2084 ***	0.1310 ***	0.2021 ***	5	4	5	5	5	2
	2.7347	1.6358	3.1063	2.4572	1.5240	2.3796	0.8875	0.0158 **	0.8484	0.1427	0.05251 *	0.08735 *
							0.0001895 ***	0.5045	2.234e-05 ***	0.02245 **	0.0001247 ***	0.5453
Financials	0.2375 ***	0.2586 ***	0.4194 ***	0.3950 ***	0.2711 ***	0.2932 ***	3	4	5	3	5	5
	3.2530	3.5613	6.1461	5.7209	3.7464	4.0802	0.1342	0.0002099 ***	0.05457 *	3.096e-05 ***	0.0294 **	0.01128 **
							0.007288 ***	0.05577 *	1.912e-05 ***	0.0001693 ***	0.004463 ***	0.2708
Health Care	0.0501 ***	0.0493 ***	0.1007 ***	0.1536 ***	0.1472 ***	0.1156 ***	3	2	4	3	4	3
	0.6671	0.6562	1.3471	2.0683	1.9794	1.5484	0.2913	0.4434	0.2512	0.009825 ***	0.3672	0.7034
							0.9007	0.5728	0.5167	0.2987	0.6104	0.1023
Industrials	0.2309 ***	0.2192 ***	0.3624 ***	0.3647 ***	0.1834 ***	0.2697 ***	3	4	4	3	5	3
	3.1577	2.9894	5.1734	5.2112	2.4819	3.7260	0.01392 **	0.002096 ***	0.3907	0.0006701 ***	0.02815 **	0.039 **
							0.01448 **	0.0561 *	0.002806 ***	0.002595 ***	0.03175 **	0.04955 **
Materials	0.1752 ***	0.2386 ***	0.2790 ***	0.2633 ***	0.0390 ***	0.1569 ***	5	4	5	4	5	3
	2.3672	3.2686	3.8651	3.6315	0.5193	2.1130	0.04874 **	0.001694 ***	0.3201	0.005247 ***	0.1667	0.0218 **
							0.01128 **	0.1792	0.01977 **	0.2916	0.07766 *	0.6817
Real Estate	0.2779 ***	0.1925 ***	0.3714 ***	0.3611 ***	0.2057 ***	0.2524 ***	4	4	5	3	5	5
	3.8481	2.6093	5.3214	5.1518	2.7963	3.4707	0.007513 ***	0.007723 ***	0.05538 *	0.005757 ***	0.01338 **	0.02078 **
							0.002467 ***	0.04992 **	3.176e-05 ***	0.0002667 ***	0.02399 **	0.03634 **
Technology	0.1214 ***	0.1568 ***	0.2785 ***	0.2847 ***	0.1311 ***	0.1887 ***	3	2	4	4	5	3
	1.6265	2.1121	3.8586	3.9511	1.7588	2.5563	0.0602 *	0.00678 ***	0.4133	0.0002457 ***	0.03074 **	0.1516
							0.1184	0.08768 *	0.04196 **	0.0445 **	0.04816 **	0.05598 *
Telecommunications	0.1383 ***	0.0596 ***	0.2108 ***	0.2745 ***	0.2433 ***	0.1020 ***	3	4	5	3	5	5
	1.8575	0.7946	2.8694	3.7985	3.3372	1.3642	0.1018	0.01461 **	0.231	0.04942 **	0.003605 ***	0.01495 **
							0.1992	0.695	0.02115 **	0.000416 ***	0.0003464 ***	0.1824
Utilities	0.1968 ***	0.1405 ***	0.2212 ***	0.2138 ***	0.1377 ***	0.1261 ***	3	2	5	3	5	5
	2.6702	1.8881	3.0170	2.9121	1.8495	1.6909	0.0377 **	0.007472 ***	0.004203 ***	0.001037 ***	0.0004977 ***	0.01445 **
							0.001093 ***	0.07112 *	0.04963 **	0.01206 **	0.01888 **	0.2919

* ** and *** significant at 10% 5% and 1% level.

FIGURE 6 – RELATION BETWEEN EUROPEAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2021.

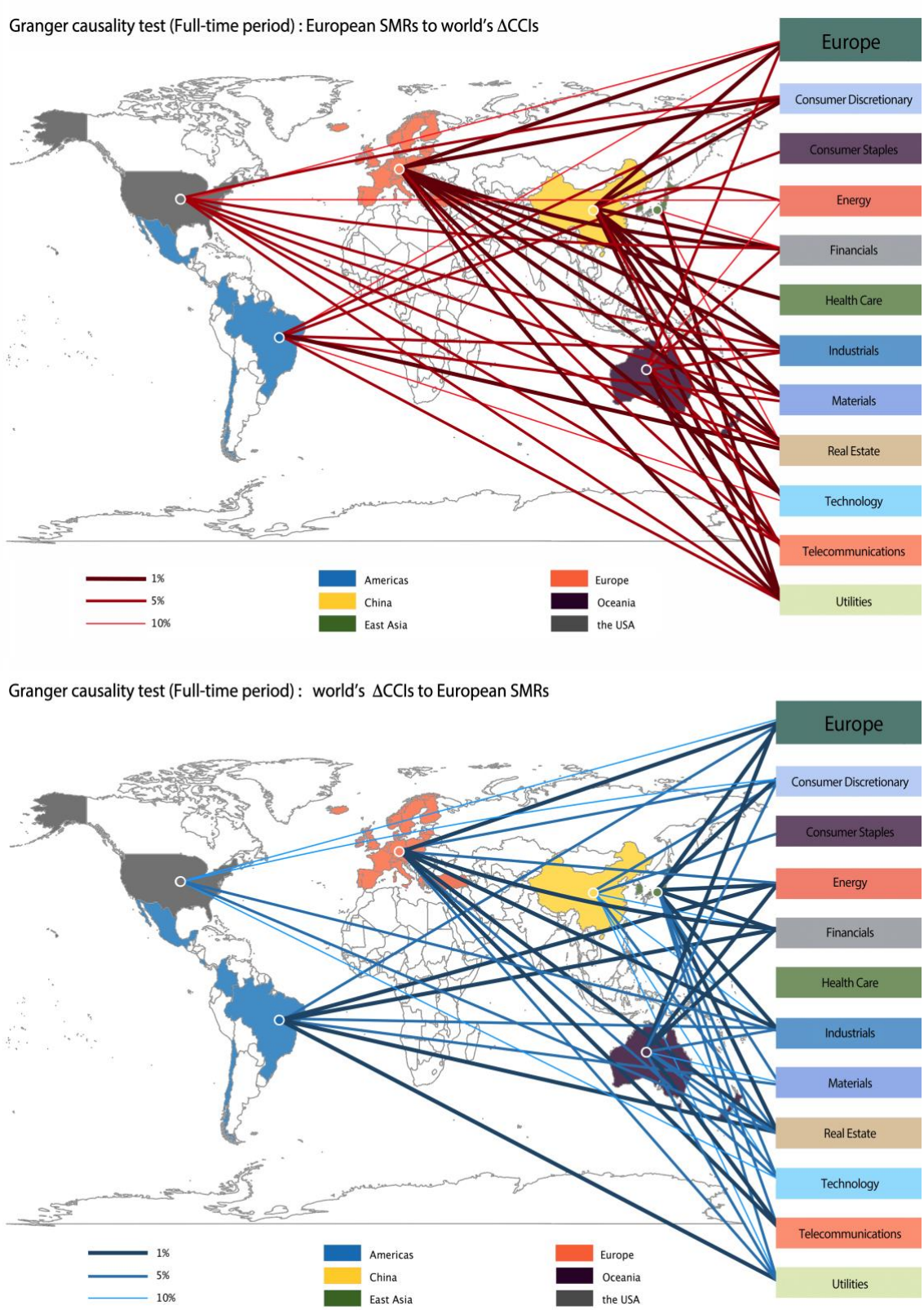


TABLE V – RELATION BETWEEN EUROPEAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2019.

Europe	Contemporaneous correlation						Test for Granger causality (P-values)					
	Estimate						Optimal Lag					
	(*t*-statistic)						R to △CCI					
							△CCI to R					
	Americas	China	East Asia	Europe	Oceania	the USA	Americas	China	East Asia	Europe	Oceania	the USA
STOXX 600	0.2376 ***	0.2374 ***	0.3344 ***	0.4262 ***	0.2044 ***	0.2654 ***	3	4	3	3	5	3
	3.0258	3.0229	4.3897	5.8268	2.5824	3.4049	0.7012	0.04094 **	0.004317 ***	0.0354 **	0.03609 **	0.4181
							0.03843 **	0.117	0.007238 ***	4.848e-05 ***	0.01958 **	0.009104 ***
Consumer Discretionary	0.1565 ***	0.1387 ***	0.1431 ***	0.3484 ***	0.1747 ***	0.2562 ***	3	4	3	3	2	2
	1.6545	1.4617	1.5092	3.8809	1.8520	2.7666	0.6592	0.0134 **	0.3465	0.2496	0.571	0.5174
							0.1256	0.03753 **	0.3135	8.848e-05 ***	0.2162	0.02183 **
Consumer Staples	0.0891 ***	0.0046 ***	0.1302 ***	0.1688 ***	0.0801 ***	0.0827 ***	3	4	3	3	2	3
	0.9335	0.0483	1.3709	1.7876	0.8390	0.8666	0.1997	0.4815	0.8672	0.9639	0.2623	0.4911
							0.481	0.02129 **	0.5012	0.02111 **	0.4397	0.2389
Energy	0.2086 ***	0.0415 ***	0.0688 ***	0.1506 ***	*-0.0429 ***	0.1657 ***	4	4	3	3	5	2
	2.2267	0.4336	0.7202	1.5901	-0.4485	1.7541	0.3068	0.3689	0.01674 **	0.4319	0.3029	0.7798
							0.01824 **	0.4335	0.9773	0.4437	0.1105	0.3864
Financials	0.2186 ***	0.2619 ***	0.3816 ***	0.4357 ***	0.2484 ***	0.2952 ***	3	4	3	3	5	3
	2.7704	3.3567	5.1071	5.9872	3.1713	3.8221	0.8581	0.0175 **	0.002147 ***	0.02174 **	0.133	0.404
							0.1042	0.09769 *	0.0006434 ***	3.954e-05 ***	0.03106 **	0.02742 **
Health Care	0.1067 ***	0.1094 ***	0.1401 ***	0.2380 ***	0.2168 ***	0.2069 ***	3	2	3	3	4	3
	1.3280	1.3615	1.7508	3.0312	2.7463	2.6158	0.9322	0.3458	0.02693 **	0.204	0.9189	0.8604
							0.564	0.343	0.5499	0.05225 *	0.1804	0.0285 **
Industrials	0.2123 ***	0.2288 ***	0.2985 ***	0.3945 ***	0.1566 ***	0.2715 ***	3	4	3	3	4	3
	2.6874	2.9072	3.8693	5.3106	1.9607	3.4899	0.4368	0.05365 *	0.01263 **	0.1996	0.09819 *	0.4197
							0.03198 **	0.09946 *	0.003254 ***	0.0001913 ***	0.1443	0.003502 ***
Materials	0.2055 ***	0.2626 ***	0.2628 ***	0.2964 ***	0.0054 ***	0.1707 ***	3	4	3	3	4	3
	2.5970	3.3663	3.3696	3.8382	0.0662	2.1427	0.5486	0.01516 **	0.0185 **	0.2393	0.1958	0.1502
							0.00131 ***	0.2009	0.03962 **	0.01994 **	0.06819 *	0.4796
Real Estate	0.2446 ***	0.2052 ***	0.3218 ***	0.3814 ***	0.1886 ***	0.2373 ***	3	4	3	3	5	3
	3.1206	2.5937	4.2039	5.1040	2.3755	3.0209	0.521	0.1658	0.0131 **	0.8251	0.08307 *	0.8693
							0.01096 **	0.1182	6.948e-05 ***	4.495e-06 ***	0.06716 *	0.003618 ***
Technology	0.1656 ***	0.2209 ***	0.3054 ***	0.3423 ***	0.1591 ***	0.2713 ***	3	2	3	3	5	3
	2.0765	2.8015	3.9665	4.5068	1.9937	3.4865	0.5564	0.01879 **	0.000463 ***	0.005194 ***	0.05296 *	0.3504
							0.1717	0.05336 *	0.02997 **	0.0042 ***	0.01753 **	0.007033 ***
Telecommunications	0.1386 ***	0.0600 ***	0.1503 ***	0.2821 ***	0.2327 ***	0.0482 ***	3	2	3	3	5	3
	1.7313	0.7439	1.8801	3.6375	2.9599	0.5968	0.5915	0.1963	0.8178	0.06294 *	0.01891 **	0.3109
							0.4492	0.8003	0.04137 **	0.001011 ***	0.005285 ***	0.2276
Utilities	0.1946 ***	0.1680 ***	0.1523 ***	0.2297 ***	0.1065 ***	0.0864 ***	3	3	5	3	5	3
	2.4545	2.1081	1.9064	2.9192	1.3252	1.0731	0.5343	0.1235	0.001188 ***	0.1234	0.01394 **	0.3926
							0.03891 **	0.1304	0.05746 *	0.01486 **	0.04617 **	0.05394 *

* ** and *** significant at 10% 5% and 1% level.

FIGURE 7 – RELATION BETWEEN EUROPEAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2019.

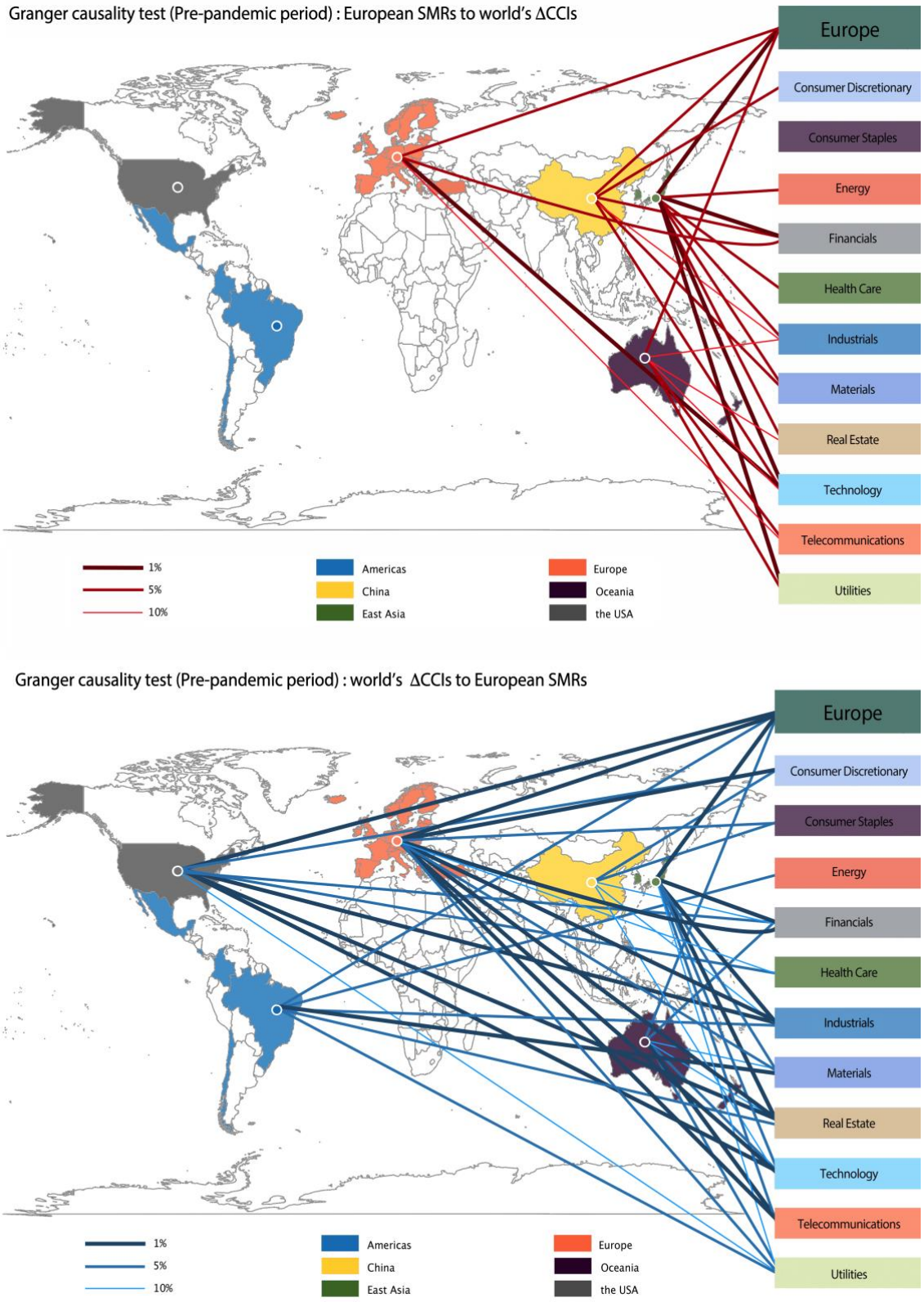
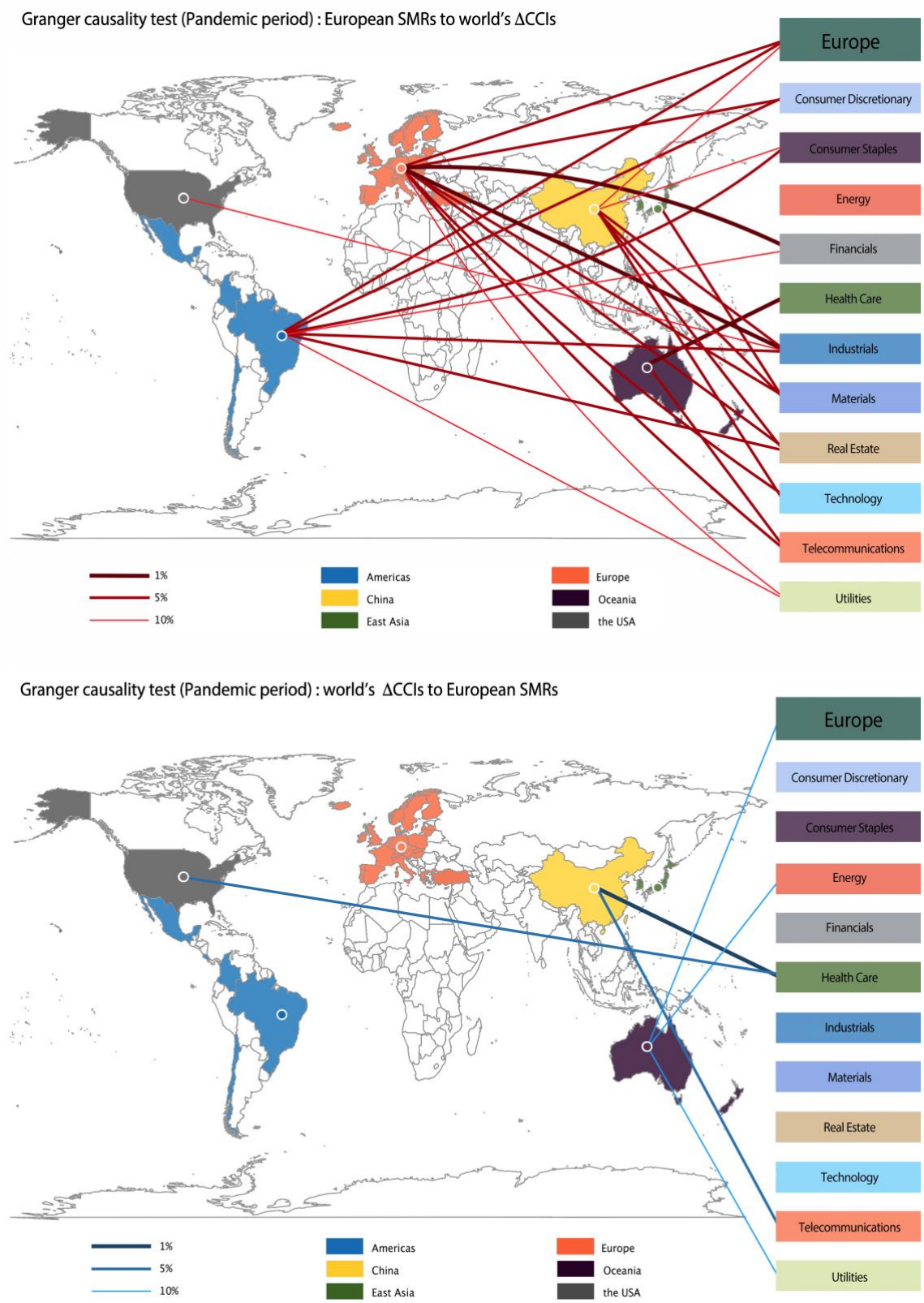


TABLE VI – RELATION BETWEEN EUROPEAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIs, 2019-2021

Europe	Contemporaneous correlation						Test for Granger causality (P-values)					
	Estimate						Optimal Lag					
	(*t*-statistic)						R to △CCI					
							△CCI to R					
	Americas	China	East Asia	Europe	Oceania	the USA	Americas	China	East Asia	Europe	Oceania	the USA
STOXX 600	0.2210 ***	0.1594 ***	0.4627 ***	0.3049 ***	0.2523 ***	0.2861 ***	2	2	2	2	3	2
	1.0385	0.7398	2.3920	1.4671	1.1949	1.3683	0.04219 **	0.08889 *	0.4957	0.01041 **	0.1419	0.1644
							0.9669	0.3509	0.6635	0.4787	0.1305	0.8095
Consumer Discretionary	0.2459 ***	0.2591 ***	0.5036 ***	0.3219 ***	0.3839 ***	0.3992 ***	2	2	2	2	2	2
	1.1626	1.2293	2.6712	1.5582	1.9055	1.9950	0.02343 **	0.1111	0.4452	0.01216 **	0.137	0.1037
							0.9765	0.2314	0.5311	0.6973	0.07509 *	0.1404
Consumer Staples	0.0446	0.0073	0.2560 ***	0.1748 ***	0.0294	0.1488 ***	2	2	2	2	3	2
	0.2045	0.0334	1.2137	0.8134	0.1348	0.6898	0.01689 **	0.08895 *	0.4043	0.5441	0.2162	0.6742
							0.6418	0.1622	0.999	0.9229	0.7033	0.9587
Energy	0.2707 ***	0.3297 ***	0.4244 ***	0.2636 ***	0.3261 ***	0.2535 ***	2	2	2	2	2	2
	1.2887	1.6003	2.1479	1.2521	1.5809	1.2008	0.4903	0.7137	0.7002	0.1893	0.6921	0.2736
							0.3784	0.4251	0.7145	0.9819	0.05962 *	0.543
Financials	0.3023 ***	0.2650 ***	0.5383 ***	0.3582 ***	0.3555 ***	0.3654 ***	2	1	2	2	2	2
	1.4532	1.2592	2.9269	1.7583	1.7429	1.7986	0.08535 *	0.5476	0.8927	0.006597 ***	0.4579	0.1046
							0.8709	0.1315	0.4812	0.6987	0.1008	0.6644
Health Care	-0.0793	*-0.2018 ***	0.0116	-0.0188	*-0.1579 ***	*-0.1432 ***	2	2	2	2	3	2
	-0.3646	-0.9441	0.0530	-0.0862	-0.7326	-0.6631	0.102	0.1581	0.6401	0.1772	0.009359 ***	0.5794
							0.2924	0.002225 ***	0.1134	0.313	0.2809	0.04761 **
Industrials	0.2923 ***	0.2078 ***	0.5389 ***	0.3496 ***	0.2832 ***	0.3515 ***	2	2	2	2	3	2
	1.4005	0.9737	2.9319	1.7097	1.3533	1.7207	0.02086 **	0.03736 **	0.2716	0.001077 ***	0.1001	0.07593 *
							0.527	0.7294	0.3919	0.2938	0.4177	0.6942
Materials	0.1397 ***	0.1307 **	0.3915 ***	0.2610 ***	0.2114 ***	0.2345 ***	2	2	3	2	3	2
	0.6465	0.6040	1.9499	1.2389	0.9911	1.1054	0.2288	0.03235 **	0.03374 **	0.02565 **	0.439	0.1509
							0.4476	0.6803	0.7146	0.1145	0.4835	0.8936
Real Estate	0.3850 ***	0.1622 ***	0.5326 ***	0.3662 ***	0.2773 ***	0.3439 ***	2	2	2	2	2	2
	1.9117	0.7535	2.8840	1.8034	1.3226	1.6781	0.01633 **	0.02883 **	0.5882	0.01085 **	0.5119	0.2874
							0.3514	0.3988	0.2338	0.5123	0.4447	0.3701
Technology	0.0250	*-0.1010 *	0.2385 ***	0.2112 ***	*-0.0059 ***	0.0412	2	2	2	2	3	2
	0.1147	-0.4652	1.1255	0.9903	-0.0270	0.1891	0.2031	0.03667 **	0.2668	0.04218 **	0.2632	0.3827
							0.2761	0.1382	0.3268	0.1612	0.3872	0.4885
Telecommunications	0.1588 ***	0.0582	0.3863 ***	0.2957 ***	0.2882 ***	0.2760 ***	2	2	2	2	3	2
	0.7373	0.2673	1.9193	1.4185	1.3794	1.3157	0.1696	0.2292	0.8471	0.03545 **	0.01913 **	0.2491
							0.7538	0.03373 **	0.9768	0.9906	0.3158	0.5244
Utilities	0.2226 ***	0.1057 *	0.4305 ***	0.2213 ***	0.2773 ***	0.2829 ***	2	3	3	2	3	3
	1.0464	0.4872	2.1859	1.0398	1.3227	1.3514	0.08589 *	0.107	0.3647	0.05369 *	0.1026	0.793
							0.6598	0.1734	0.131	0.2665	0.08864 *	0.6434

* ** and *** significant at 10% 5% and 1% level.

FIGURE 8 – RELATION BETWEEN EUROPEAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2019-2021.



Health Care increases in both regions during the pandemic, even though CC decreases. Or Chinese and U.S. consumers are bullish on the European SMR in the industry of Health Care and therefore invest more.

4.3. American stock market

Table 7 and Figure 9 demonstrate the relations between American SMRs with the global ΔCCIs with a sample span of the full-time period. During the full-time period, the test shows that American SMRs are positively correlated with the global ΔCCIs. As displayed in Figure 9, the Granger causality from the SMRs to global ΔCCIs is significant. This demonstrates that the S&P 500 is a crucial indicator of future economic forecasts for global consumers and an investment index preferred by international investors, which coincides with the finding by Comincioli (1996); S&P 500 is a leading indicator and helps to predict the future economy. For the granger causality in the other direction, the ΔCCIs in China and the USA can only Granger cause one SMR. Other than that, ΔCCIs in different regions can improve predictive power for American SMRs.

Table 8 and Figure 10 demonstrate the relations between American SMRs with the global ΔCCIs with a sample span of the pre-pandemic period. Concerning the correlation test, similar to the results of the full-time period, all of the 72 bivariates have linear relationships. Moreover, two negative relations appear ΔCCI in Oceania with the SMR of industry Energy, ΔCCI in the USA with the SMR of industry Utilities. As presented, we cannot observe any causal effect from the American SMRs to the ΔCCI in the Americas. Moreover, the ΔCCIs in Europe and the USA can only be affected by one SMR. On the other side, the ΔCCIs s in the Americas, Europe, and the USA significantly

TABLE VII – RELATION BETWEEN AMERICAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2021

	Contemporaneous correlation						Test for Granger causality (P-values)					
	Estimate						Optimal Lag					
the USA	(*t*-statistic)						R to △CCI					
							△CCI to R					
	Americas	China	East Asia	Europe	Oceania	the USA	Americas	China	East Asia	Europe	Oceania	the USA
S&P 500	0.1572 ***	0.1368 ***	0.3009 ***	0.2798 ***	0.1092 ***	0.1902 ***	3	4	4	3	5	5
	2.1181	1.8371	4.1977	3.8777	1.4613	2.5778	0.02575 **	0.001715 ***	0.335	0.0009572 ***	0.1177	0.001484 ***
							0.0562 *	0.4128	0.009039 ***	0.01306 **	0.1086	0.5517
Consumer Discretionary	0.1126 ***	0.0881 ***	0.2789 ***	0.2322 ***	0.0999 ***	0.1776 ***	4	4	5	4	4	4
	1.5080	1.1772	3.8636	3.1765	1.3353	2.4004	0.000608 ***	0.005926 ***	0.3093	0.006445 ***	0.07286 *	0.1429
							0.1766	0.3083	0.001614 ***	0.01138 **	0.4765	0.172
Consumer Staples	0.095 ***	0.0629 ***	0.1963 ***	0.1823 ***	0.1120 ***	0.1164 ***	3	2	4	3	4	3
	1.2691	0.8383	2.6636	2.4664	1.4993	1.5586	0.1911	0.07666 *	0.4388	0.02823 **	0.5604	0.03337 **
							0.5704	0.4146	0.09998 *	0.184	0.6027	0.7271
Energy	0.1042 ***	0.089 ***	0.2183 ***	0.1876 ***	0.0191 ***	0.0898 ***	4	4	5	4	5	5
	1.3935	1.1886	2.9763	2.5404	0.2546	1.1990	0.02065 **	0.0003485 ***	0.1745	0.001016 ***	0.2051	0.002006 ***
							0.0002797 ***	0.4928	8.18e-05 ***	0.1626	0.1049	0.6773
Financials	0.1986 ***	0.2277 ***	0.3941 ***	0.3735 ***	0.229 ***	0.3196 ***	3	4	5	3	5	3
	2.6966	3.1110	5.7051	5.3561	3.1299	4.4876	0.09235 *	0.006758 ***	0.004192 ***	0.0005825 ***	0.03235 **	0.001687 ***
							0.05618 *	0.02756 **	1.777e-05 ***	0.0008389 ***	0.04261 **	0.1153
Health Care	0.0596 ***	0.0794 ***	0.1208 ***	0.1548 ***	0.1191 ***	0.1292 ***	4	2	4	3	4	4
	0.7946	1.0591	1.6193	2.0844	1.5963	1.7333	0.06134 *	0.03374 **	0.1211	0.004409 ***	0.6782	0.1019
							0.1858	0.59	0.15	0.09471 *	0.3248	0.4095
Industrials	0.2073 ***	0.1927 ***	0.3223 ***	0.3157 ***	0.1438 ***	0.2564 ***	3	4	4	3	4	5
	2.8197	2.6125	4.5292	4.4267	1.9336	3.5295	0.08851 *	0.001425 ***	0.04141 **	0.0007891 ***	0.1715	0.001991 ***
							0.023 **	0.1639	0.001076 ***	0.00507 ***	0.4301	0.2123
Materials	0.1337 ***	0.1696 ***	0.2680 ***	0.2248 ***	0.0598 ***	0.1361 ***	4	4	4	3	4	3
	1.7947	2.2895	3.7008	3.0696	0.7977	1.8281	0.05282 *	0.002777 ***	0.1373	0.006958 ***	0.5154	0.02061 **
							0.07501 *	0.2333	0.04167 **	0.1256	0.1596	0.8006
Real Estate	0.1583 ***	0.1353 ***	0.2607 ***	0.2297 ***	0.0752 ***	0.1838 ***	4	4	5	4	5	5
	2.1324	1.8174	3.5932	3.1394	1.0033	2.4882	0.1906	0.05162 *	0.001254 ***	0.2168	0.1237	0.1902
							0.001338 ***	0.5049	0.0004127 ***	0.00117 ***	0.02722 **	0.07424 *
Technology	0.1316 ***	0.0893 ***	0.2806 ***	0.2215 ***	0.0435 ***	0.1213 ***	3	2	4	3	5	3
	1.7667	1.1922	3.8897	3.0213	0.5799	1.6263	0.08688 *	0.002213 ***	0.6995	0.02899 **	0.07902 *	0.1206
							0.08063 *	0.197	0.05754 *	0.09576 *	0.05245 *	0.5019
Telecommunications	0.0524 ***	0.0082	0.1263 ***	0.1578 ***	0.0512 ***	0.0255 ***	3	4	4	3	4	3
	0.6987	0.1097	1.6938	2.1261	0.6827	0.3392	0.2739	0.2925	0.9204	0.03606 **	0.131	0.01787 **
							0.5701	0.3862	0.8192	0.3198	0.9397	0.5002
Utilities	0.1292 ***	0.0779 ***	0.1369 ***	0.1012 ***	0.0474 ***	0.0577 ***	3	2	4	3	4	3
	1.7334	1.0399	1.8391	1.3531	0.6310	0.7683	0.07735 *	0.1943	0.4457	0.4084	0.5511	0.1488
							0.0701 *	0.4402	0.1824	0.3169	0.3666	0.5307

* ** and *** significant at 10% 5% and 1% level.

FIGURE 9 – RELATION BETWEEN AMERICAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2021.

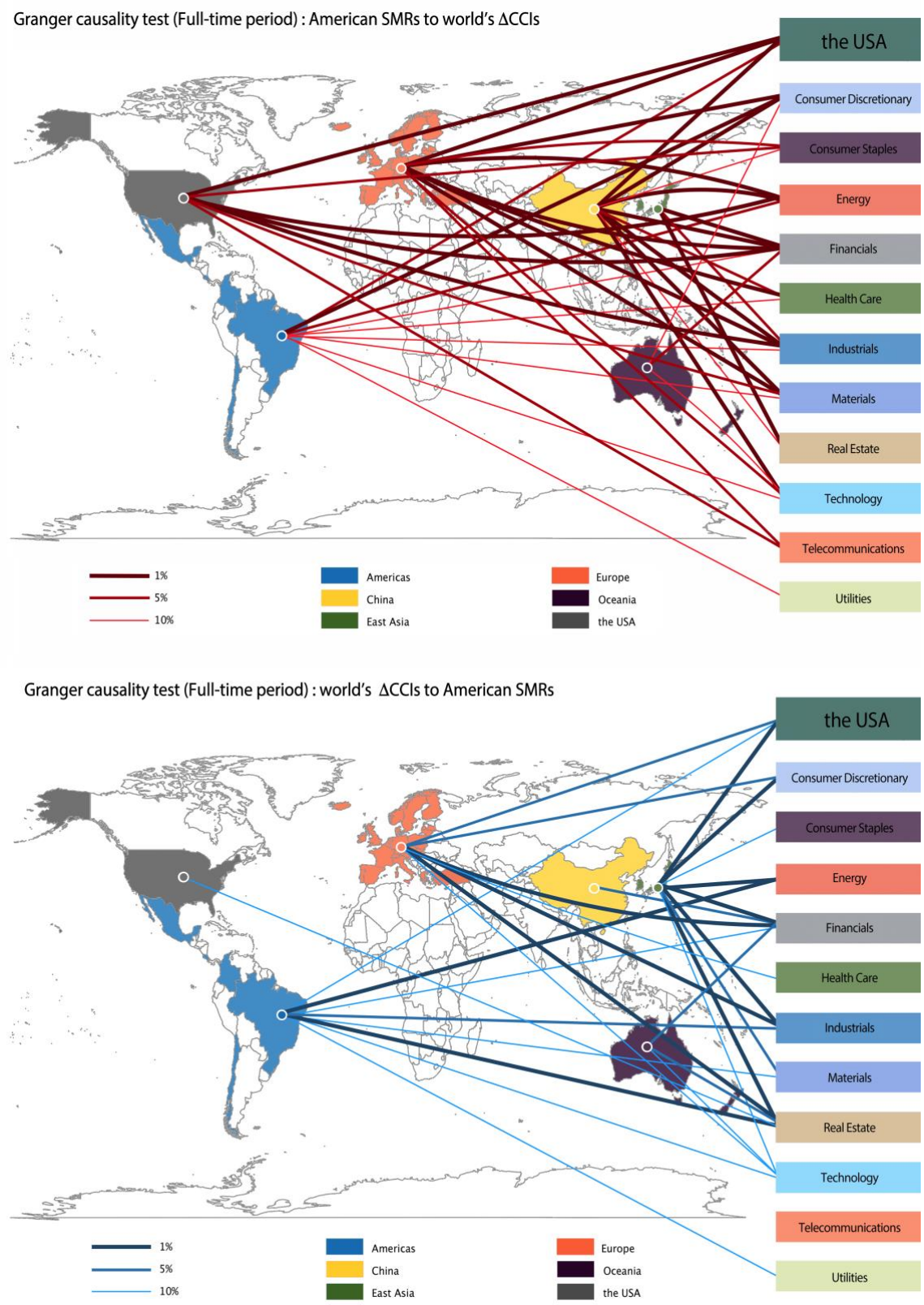
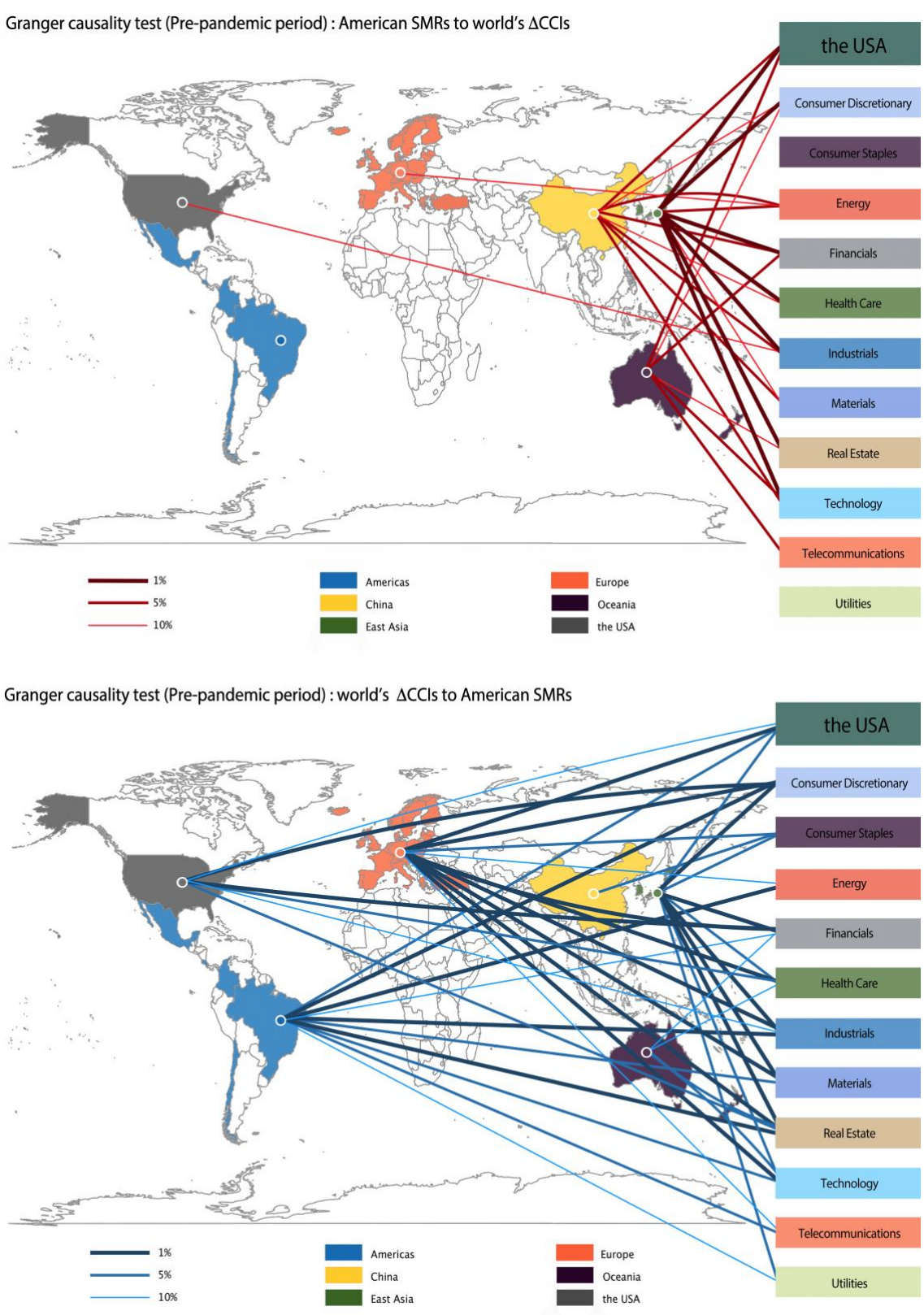


TABLE VIII – RELATION BETWEEN AMERICAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2019.

	Contemporaneous correlation						Test for Granger causality (P-values)					
	Estimate						Optimal Lag					
the USA	(*t*-statistic)						R to △CCI					
							△CCI to R					
	Americas	China	East Asia	Europe	Oceania	the USA	Americas	China	East Asia	Europe	Oceania	the USA
S&P 500	0.1922 ***	0.1574 ***	0.2864 ***	0.3442 ***	0.1087 ***	0.2411 ***	3	2	5	3	5	3
	2.4222	1.9714	3.6970	4.5343	1.3531	3.0723	0.7558	0.01306 **	0.0002306 ***	0.2349	0.04962 **	0.272
							0.01254 **	0.3538	0.01163 **	6.65e-05 ***	0.1288	0.06192 *
Consumer Discretionary	0.1808 ***	0.1101 ***	0.2958 ***	0.337 ***	0.1277 ***	0.2611 ***	3	4	3	3	4	3
	2.2744	1.3708	3.8305	4.4281	1.5921	3.3456	0.1967	0.08378 *	0.008916 ***	0.5265	0.07514 *	0.5032
							0.007858 ***	0.5581	0.0002775 ***	6.065e-06 ***	0.1351	0.005259 ***
Consumer Staples	0.0989 ***	0.0582 ***	0.1651 ***	0.2202 ***	0.1309 ***	0.1168 ***	3	3	3	3	3	3
	1.2296	0.7213	2.0702	2.7927	1.6338	1.4543	0.9499	0.4102	0.1508	0.1728	0.1515	0.3297
							0.3897	0.02239 **	0.03241 **	0.01562 **	0.2845	0.2935
Energy	0.1466 ***	0.0603 ***	0.1212 ***	0.1875 ***	*-0.06 ***	0.0561 ***	4	4	3	3	4	3
	1.8333	0.7471	1.5101	2.3614	-0.7431	0.6949	0.207	0.03987 **	0.01306 **	0.08458 *	0.2893	0.5019
							0.003448 ***	0.7198	0.1169	0.06061 *	0.5243	0.9113
Financials	0.1926 ***	0.22 ***	0.3645 ***	0.4052 ***	0.2009 ***	0.3427 ***	3	2	5	3	5	3
	2.4273	2.7894	4.8419	5.4827	2.5363	4.5126	0.7941	0.01114 **	6.475e-06 ***	0.1413	0.02117 **	0.323
							0.05921 *	0.1147	9.471e-05 ***	5.622e-06 ***	0.08518 *	0.005428 ***
Health Care	0.1264 ***	0.1211 ***	0.1571 ***	0.2421 ***	0.1611 ***	0.2279 ***	3	2	5	3	4	3
	1.5761	1.5087	1.9673	3.0866	2.0189	2.8947	0.6332	0.08277 *	0.0002634 ***	0.2438	0.6035	0.4353
							0.2833	0.6173	0.03855 **	0.001356 ***	0.08273 *	0.03167 **
Industrials	0.2023 ***	0.1808 ***	0.2448 ***	0.3288 ***	0.0969 ***	0.2363 ***	3	4	3	3	4	5
	2.5555	2.2743	3.1232	4.3066	1.2045	3.0074	0.6272	0.02043 **	0.00015 ***	0.1299	0.1113	0.06046 *
							0.009898 ***	0.3763	0.0005457 ***	5.99e-05 ***	0.4255	0.0853 *
Materials	0.1825 ***	0.1831 ***	0.2487 ***	0.276 ***	0.0232 ***	0.1504 ***	3	4	3	3	4	3
	2.2961	2.3040	3.1755	3.5513	0.2872	1.8823	0.7723	0.02199 **	0.09141 *	0.494	0.299	0.2852
							0.02897 **	0.3469	0.006001 ***	0.0009095 ***	0.1263	0.7126
Real Estate	0.1772 ***	0.163 ***	0.2525 ***	0.2467 ***	0.0746 ***	0.203 ***	3	4	5	3	5	3
	2.2277	2.0434	3.2276	3.1484	0.9251	2.5643	0.9131	0.1694	5.314e-06 ***	0.7201	0.0665 *	0.8922
							0.0003615 ***	0.4966	0.0001279 ***	1.617e-05 ***	0.01339 **	0.01841 **
Technology	0.1789 ***	0.1296 ***	0.3133 ***	0.3062 ***	0.0668 ***	0.1965 ***	3	2	5	3	5	3
	2.2486	1.6166	4.0814	3.9786	0.8287	2.4790	0.6798	0.01349 **	0.0007775 ***	0.5235	0.04842 **	0.2371
							0.02642 **	0.3744	0.01767 **	0.001885 ***	0.0365 **	0.1806
Telecommunications	0.0404 ***	0.0153 **	0.0613 ***	0.1423 ***	0.0357 ***	0.0322 ***	3	3	3	3	5	3
	0.4995	0.1890	0.7591	1.7780	0.4423	0.3982	0.595	0.3315	0.5473	0.3608	0.0415 **	0.2694
							0.04823 **	0.2256	0.1058	0.06387 *	0.6401	0.1072
Utilities	0.105 ***	0.0636 ***	0.0477 ***	0.075 ***	0.0043	*-0.0203 ***	3	2	3	3	4	3
	1.3061	0.7886	0.5905	0.9302	0.0527	-0.2507	0.4829	0.4877	0.8159	0.3816	0.6365	0.1909
							0.05734 *	0.706	0.04563 **	0.1333	0.444	0.4033

* ** and *** significant at 10% 5% and 1% level.

FIGURE 10 – RELATION BETWEEN AMERICAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2007-2019.



improve the predictability of more than half of the twelve American SMRs. This unidirectional Granger causality may indicate that the U.S. stock market is not the central area of investment but the main field of consumption for consumers in these three regions. As a result, these consumers influence the stock performance through the company's financial fundamentals.

In contrast, ΔCCIs in China and Australia are affected by more than half of the American SMRs but have a Granger causal effect on only one and three SMRs. This outcome indicates that ΔCCIs in China and Oceania view the U.S. SMR as an essential predictive tool and that past performance of the stock market impacts their sentiment, but not vice versa. At the same time, we consider that consumers in these two regions are investors in the U.S. stock market. Therefore, yield volatility affects their wealth due to the one-way effect of U.S. stock market performance on them. However, their proportion of the overall U.S. investors and consumers is insufficient to affect the intrinsic value of stocks and premiums. Meanwhile, the ΔCCIs in East Asia produces two-way Granger causalities with more than half of the SMRs. This suggests that East Asian consumers are both consumers and investors of the various sectors in the American markets.

Table 9 and Figure 10 demonstrate the relations between American SMRs with the global ΔCCIs with a sample span of the pandemic period. During the pandemic, similar to the results for China and Europe, the significance of the linear correlation between ΔCCI and SMRs decreases. Fifty bivariate linear correlations exist. Significant negative correlations with the ΔCCIs in the Americas, China, and the U.S. emerge in the Health Care sector. Based on the decline as mentioned above in CC during the pandemic, this suggests that the SMR in the industry of Health Care rises during the pandemic. With the nature of the crisis being a public health crisis, consumer demand for healthcare increases, and investors are bullish on the sector, leading to increased investment. As Nymberg et al.(2022) find, remote health care needs rise remarkably during the pandemic in Sweden.

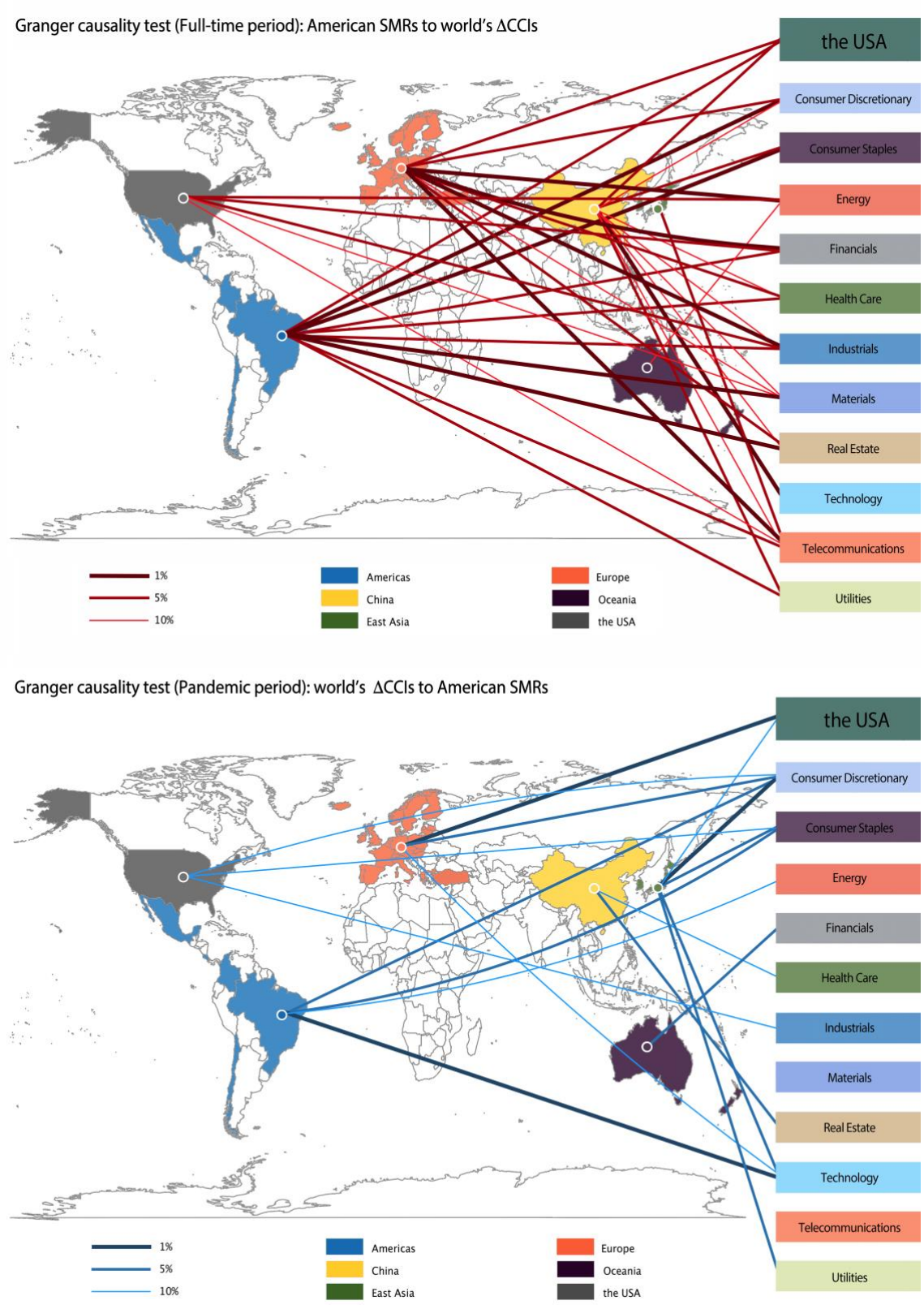
The results of Granger causality reveal that the performance of SMRs in the USA during the pandemic affects the world consumer confidence. In particular, the SMR of the Telecommunication industry has a Granger causal impact on the ΔCCIs of all five regions except Oceania.

TABLE IX – RELATION BETWEEN AMERICAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIs, 2019-2021.

Contemporaneous correlation							Test for Granger causality (P-values)					
the USA	Estimate						Optimal Lag					
	(*t*-statistic)						R to △CCI					
							△CCI to R					
	Americas	China	East Asia	Europe	Oceania	the USA	Americas	China	East Asia	Europe	Oceania	the USA
S&P 500	0.0933	0.0945 *	0.3561 ***	0.1864 ***	0.1045 *	0.1519 ***	2	2	3	3	3	2
	0.4293	0.4352	1.7465	0.8695	0.4817	0.7045	0.01516 **	0.0283 **	0.1179	0.0354 **	0.2293	0.109
							0.1435	0.8118	0.05196 *	0.000699 ***	0.3254	0.6613
Consumer Discretionary	-0.0292	0.0391	0.2585 ***	0.0440	-0.0161	0.0371	2	3	3	3	3	2
	-0.1341	0.1794	1.2261	0.2020	-0.0736	0.1703	0.008626 ***	0.09981 *	0.2702	0.04941 **	0.1058	0.2333
							0.0144 **	0.2023	0.003011 ***	0.02051 **	0.247	0.05211 *
Consumer Staples	0.0922	0.0955 *	0.2763 ***	0.126 **	0.0387	0.1622 ***	3	2	3	3	3	3
	0.4245	0.4397	1.3175	0.5821	0.1775	0.7532	0.006379 ***	0.01646 **	0.1883	0.219	0.282	0.5502
							0.03581 **	0.9511	0.01693 **	0.213	0.3299	0.06192 *
Energy	0.0552	0.1418 ***	0.3392 ***	0.1856 ***	0.1883 ***	0.1631 ***	3	1	3	2	3	2
	0.2532	0.6565	1.6525	0.8655	0.8787	0.7578	0.1828	0.7468	0.567	0.002969 ***	0.05904 *	0.04153 **
							0.08287 *	0.3143	0.2778	0.902	0.2914	0.3811
Financials	0.2474 ***	0.2891 ***	0.5252 ***	0.3736 ***	0.3514 ***	0.3622 ***	2	1	2	2	2	2
	1.1700	1.3837	2.8286	1.8454	1.7198	1.7808	0.01132 **	0.5703	0.3251	0.004265 ***	0.4257	0.0188 **
							0.6581	0.1842	0.694	0.4204	0.03499 **	0.3063
Health Care	*-0.0976 *	*-0.1021 *	0.0175	-0.0251	-0.0802	*-0.1005 *	2	2	3	2	3	2
	-0.4493	-0.4705	0.0802	-0.1150	-0.3689	-0.4627	0.02939 **	0.05067 *	0.3344	0.04825 **	0.5111	0.259
							0.3745	0.06579 *	0.2239	0.8053	0.229	0.4397
Industrials	0.2392 ***	0.2603 ***	0.5306 ***	0.3291 ***	0.3234 ***	0.388 ***	2	2	2	2	3	2
	1.1292	1.2353	2.8686	1.5971	1.5662	1.9294	0.02573 **	0.06952 *	0.4012	0.006894 ***	0.1752	0.04804 **
							0.7072	0.6429	0.1572	0.244	0.4709	0.0541 *
Materials	0.0319	0.1281 **	0.3438 ***	0.1517 ***	0.2114 ***	0.2169 ***	2	2	3	3	2	2
	0.1461	0.5920	1.6778	0.7032	0.9910	1.0184	0.007288 ***	0.06133 *	0.1447	0.05918 *	0.4955	0.05486 *
							0.2329	0.8817	0.3861	0.3015	0.5591	0.438
Real Estate	0.1589 ***	0.0174	0.3938 ***	0.2887 ***	0.0835	0.2444 ***	2	2	2	3	2	2
	0.7374	0.0796	1.9631	1.3817	0.3842	1.1548	0.008195 ***	0.0931 *	0.4573	0.0193 **	0.452	0.3337
							0.6315	0.0438 **	0.977	0.6259	0.713	0.9492
Technology	0.0292	-0.0237	0.2377 ***	0.0738	-0.0633	0.0010	3	2	3	3	3	2
	0.1341	-0.1088	1.1216	0.3393	-0.2906	0.0046	0.8494	0.005992 ***	0.1037	0.1332	0.2229	0.3894
							0.0096 ***	0.2991	0.02602 **	0.06735 *	0.1623	0.3852
Telecommunications	0.0713	0.0310	0.2927 ***	0.2269 ***	0.1073 *	0.1119 **	2	2	3	2	2	2
	0.3275	0.1421	1.4030	1.0677	0.4945	0.5162	0.02643 **	0.06889 *	0.04653 **	0.007189 ***	0.4317	0.05943 *
							0.4237	0.6754	0.6126	0.1428	0.6806	0.9301
Utilities	0.1915 ***	0.1693 ***	0.3711 ***	0.1699 ***	0.2208 ***	0.2603 ***	2	2	3	3	2	3
	0.8944	0.7871	1.8314	0.7901	1.0372	1.2355	0.03902 **	0.02659 **	0.9112	0.1423	0.6692	0.7261
							0.7164	0.334	0.02969 **	0.8687	0.2741	0.2789

* ** and *** significant at 10% 5% and 1% level.

FIGURE 11 – RELATION BETWEEN AMERICAN GLOBAL AND SECTOR STOCK RETURNS WITH THE WORLD'S ΔCCIS, 2019-2021.



Regarding the results in the other direction, there are Granger causal relationships from the global ΔCCIs to at least one SMRs. Among them, the SMRs of Consumer Discretionary, Consumer Staples, and Technology can be predicted by ΔCCIs of more than three regions.

5. CONCLUSION

Previous studies show that consumer confidence index and the stock market performance are positively correlated and have a two-way Granger causal relationship, e.g. Hsu et al.(2011). Ferrer et al. (2016) show that the relationship between consumer confidence and stock market is no longer appropriate during financial crisis. Previous studies mainly focus on the performance of general stock market. Chen et al.(2006) justify that the sector-based investment approaches should be emphasized when investing in developed countries. Thus, the objective of the study is to investigate the relationships between global and sector stock market performance with the consumer confidence changes during different period.

This study examines the relationship between global changes in the consumer confidence indexes and twelve global and sector performance of Chinese, European, and American stock markets from 2007 to 2021. For the stock market performance, we look into global and sector stock index returns. For the time span, we divide the full time span into pre-pandemic and pandemic periods.

By using contemporaneous correlation and Granger causality tests, the two variables are positively correlated and we can detect two-way Granger causal relationships in Europe and the Unites State during full-time, pre-pandemic periods, which is contrary to the research by Salhin et al.(2016) that finds no evidence that consumer confidence can impact the UK's five sectorial or aggregate stock market returns. For the Chinese results, we only find the Granger causality from the changes in consumer confidence worldwide to Chinese stock market returns, but not vice versa.

During the pandemic period, the result show that there are less significant outcomes and there are some negative correlations. For the Chinese stock markets this more evident than for European or United States stock markets. Even so, the returns of the Health Care sector in the United States and Europe alter to be negatively connected with changes in consumer confidence indexes all over the world. For the Granger causality test, we suggest that generally, the Granger impact from the SMRs to the changes in consumer confidence is more substantial during the pandemic period. The causality running from changes in consumer confidence to stock market returns loses its appropriateness

regarding the number of significant outcomes. This finding may indicate that during the pandemic, consumers may pay more attention to the stock market and are more sensitive to the fluctuations of the market returns.

Surprisingly, we only discover one Granger causality from the change in consumer confidence in China to Chinese market performance in the Real Estate industry. Three possible explanation are the developing stage of the market, market inefficiency. Furthermore, we only notice one Granger causality from Chinese stock market returns of industry Consumer Discretionary to Chinese consumer confidence change. Suppose we assume that the movement of stock market returns directly influences the individuals' financial status. Then the absence of the Granger causality from Chinese stock market returns could result from the fact that the stock ownership in China is mainly institutions.

In addition, there is a large amount of significant two-way Granger causality between the changes in consumer confidence in East Asia and stock market returns, which indicates that consumers in East Asia are both consumers and investors in Chinese, European, and American markets. This also demonstrates that East Asian countries are significant importers. Suzuki (2017) states that the American and European exports to Japan increase and that Japan is operating a trade deficit with the EU.

The limitation of our study is that we only study the stock market in China, Europe and the US, and the data is only focused on the period 2007 to 2021. Future research could be extended to other financial markets and study the relationship during other periods. Chinese stocks ownership the relationship between consumer confidence index and stock market performance for the representation of the country's trade status can be future research directions as well.

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APPENDICES

TABLE AI – SELECTING STOCK INDEXES

	China	Europe	the USA
Global Index	CSI 300	STOXX Europe 600	S&P 500
Consumer Discretionary	CSI 300 Consumer Discretionary (000911)	STOXX Europe 600 Industry Consumer Discretionary (S600CDP)	S&P 500 Consumer Discretionary(SPLRCD)
Consumer Staples	CSI 300 Consumer Staples (000912)	STOXX Europe 600 Industry Consumer Staples (S600CSP)	S&P 500 Consumer Staples(SPLRCS)
Energy	CSI 300 Energy (000908)	STOXX Europe 600 Industry Energy (S600EP)	S&P 500 Energy(SPNY)
Financials	CSI 300 Financials (000914)	STOXX Europe 600 Financials(SXFINP)	S&P 500 Financials(SPSY)
Health Care	CSI 300 Health Care (000913)	STOXX Europe 600 Health Care (SXDP)	S&P 500 Health Care (SPXHC)
Industrials	CSI 300 Industrials (000910)	STOXX Europe 600 Industrials (SXIDUP)	S&P 500 Industrials(SPLRCI)
Materials	CSI 300 Materials (000909)	STOXX Europe 600 Basic Materials (SXBSCGR)	S&P 500 Materials(SPLRCM)
Real Estate	CSI 300 Real Estate (000952)	STOXX Europe 600 Real Estate (SX86GR)	S&P 500 Real Estate(SPLRCREC)
Technology	CSI 300 Information (000915)	STOXX Europe 600 Technology (SX8GR)	S&P 500 Information Technology(SPLRCT)
Telecommunications	CSI 300 Telecommunication (000916)	STOXX Europe 600 Telecommunications	S&P 500 Communication Services (SPLRCL)
Utilities	CSI 300 Utilities (000917)	STOXX Europe 600 Utilities	S&P 500 Utilities (SPLRCU)

TABLE AII – UNIT ROOT TEST FOR CCIS

	Augmented Dickey-Fuller Test Lag order = 5		Phillips-Perron Test Truncation lag parameter = 4	
	Dickey-Fuller	p-value	Dickey-Fuller Z(alpha)	p-value
Americas	-4.3461	0.01	-42.56	0.01
China	-5.8094	0.01	-51.891	0.01
East Asia	-4.2482	0.01	-43.943	0.01
Europe	-3.8238	0.01936	-36.35	0.01
Oceania	-4.5233	0.01	-43.373	0.01
the USA	-4.3864	0.01	-50.841	0.01

TABLE AIII– UNIT ROOT TEST FOR SMRS

UNIT ROOT TEST FOR CHINESE STOCK INDEXES

	Augmented Dickey-Fuller Test		Phillips-Perron Test	
	Lag order = 5		Truncation lag parameter = 4	
	Dickey-Fuller	p-value	Dickey-Fuller Z(alpha)	p-value
CSI 300	-5.4085	0.01	-176.34	0.01
Consumer Discretionary	-6.0558	0.01	-173.36	0.01
Consumer Staples	-6.0234	0.01	-183.97	0.01
Energy	-5.8798	0.01	-183.1	0.01
Financials	-5.363	0.01	-168.89	0.01
Health Care	-5.5605	0.01	-188.24	0.01
Industrials	-5.2713	0.01	-180.07	0.01
Materials	-5.2066	0.01	-179	0.01
Real Estate	-5.9984	0.01	-191.43	0.01
Technology	-5.3161	0.01	-168.73	0.01
Telecommunications	-5.1527	0.01	-199.8	0.01
Utilities	-4.507	0.01	-203.48	0.01

UNIT ROOT TEST FOR EUROPEAN STOCK INDEXES

	Augmented Dickey-Fuller Test		Philips-Peron test	
	Lag order = 5		Truncation lag parameter = 4	
	Dickey-Fuller	p-value	Dickey-Fuller Z(alpha)	p-value
STOXX 600	-5.3154	0.01	-155.78	0.01
Consumer Discretionary	-4.9079	0.01	-124.85	0.01
Consumer Staples	-6.0545	0.01	-129.52	0.01
Energy	-4.896	0.01	-121.28	0.01
Financials	-5.543	0.01	-147.78	0.01
Health Care	-5.5201	0.01	-194.28	0.01
Industrials	-5.7429	0.01	-149.46	0.01
Materials	-6.0132	0.01	-141.72	0.01
Real Estate	-5.244	0.01	-157.99	0.01
Technology	-6.5039	0.01	-162.41	0.01
Telecommunications	-4.9074	0.01	-188.77	0.01
Utilities	-5.5114	0.01	-167.74	0.01

UNIT ROOT TEST FOR AMERICAN STOCK INDEXES

	Augmented Dickey-Fuller Test		Phillips-Perron Test	
	Lag order = 5		Truncation lag parameter = 4	
	Dickey-Fuller	p-value	Dickey-Fuller Z(alpha)	p-value
S&P 500	-5.8629	0.01	-164.03	0.01
Consumer Discretionary	-6.1953	0.01	-172.05	0.01
Consumer Staples	-6.5183	0.01	-166.15	0.01
Energy	-5.2288	0.01	-182.02	0.01
Financials	-5.9858	0.01	-149.66	0.01
Health Care	-5.8735	0.01	-173.71	0.01
Industrials	-5.6816	0.01	-171.07	0.01
Materials	-6.2616	0.01	-170.23	0.01
Real Estate	-5.7393	0.01	-158.99	0.01
Technology	-6.4683	0.01	-162.91	0.01
Telecommunications	-5.6226	0.01	-180.87	0.01
Utilities	-5.6039	0.01	-172.5	0.01