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# Consumer Confidence and Stock Markets' Returns

Raquel M. Gaspar \*      Xu Jiaming †

October 2023

## Abstract

This study provides new insights on the relationship between changes in consumer confidence indices worldwide and the performance of European, United States and Chinese stock markets, during the period from 2007 to 2021. We look both into global and industry returns. For the full-time period, we find stock market returns tend to be positively correlated with changes in consumer confidence indices, with significant two-way Granger causal impacts between the two variables for Europe and the United States. For the Chinese stock market we find less pronounced and only one-way impact – changes in consumer confidence indices can Granger explain Chinese stock returns, but not vice versa. In fact, Chinese stock returns only help explaining changes in East Asian consumer confidence index. These results are robust across industries. For the Covid pandemic sub-period, we find some negative correlations between stock market returns and changes in consumer confidence indices. This is particularly evident in China, but it also happens in Europe and United States, at least for some industries, including Health Care. Overall, the connection between the stock market performance and changes in consumer confidence is lower for USA and European stock markets, but it is higher for the Chinese stock market, in terms of the number of significant outcomes.

KEYWORDS: Consumer confidence index, Stock returns, Granger causality

JEL CODES: G00, G11, G15

## 1 Introduction

The stock market and consumer confidence are two essential components of the economy. It is reasonable to assume the two variables influence each other, and this connection has been the focus of research in recent years.

Consumer confidence is an economic indicator that measures the degree of optimism or pessimism that consumers have regarding the overall state of the economy. It is an important indicator of consumer spending habits. Consumer confidence is usually measured using surveys that ask consumers about their

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current financial situation, employment status, and expectations for the future. Consumer confidence indices (CCI) are also widely used to measure investors' sentiment and are released monthly by various organisations. Stock markets are platforms where publicly traded companies' shares are bought and sold. Stock market performance is also usually perceived as an indicator of the overall economic health of a nation, and is influenced by various factors, including corporate earnings, interest rates, inflation, and political events. The stock market is often used as a barometer of economic health, and a strong stock market is typically indicative of a robust economy. Consumer confidence and stock market performance are, thus, interrelated.

In one direction, consumer confidence is a predictor of consumer spending, which is a significant driver of economic growth (Ludvigson, 2004). A decline in consumer spending can lead to decreased corporate earnings, which can negatively impact the stock market. In addition, an increase in consumer confidence can also decrease the level of risk aversion and increase investments in financial markets. Investors' sentiments, e.g. of optimism/pessimism are known to lead to an increase/decrease in the propensity to invest in financial markets (Baker and Wurgler, 2007). In fact, since the Great Recession of 2008 this more direct transmission channel has gained importance (Lolić et al., 2017).

In the other direction, 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.

As presented in Section 2, the existent literature on the interconnection between consumer confidence and stock market performance has mainly focused on domestic and aggregate effects. That is, in understanding the relation between the consumer confidence index of a given region (or country), and their own stock market. However, in an increasingly globalised financial world, there is no reason to believe these relationships cannot be cross-regional, with consumer confidence indices from all over the world affecting (and being affected by) major stock markets performance. On the other hand, there is also no reason to limit the analysis to aggregate stock market performance. Industry-level performances can vary considerably. It could very well be that stock market performance in particular sectors is more related to consumer confidence, both domestically and abroad.

This study contributes to the literature by looking to worldwide consumer confidence indices and analysing their relation to the performance of three major stock markets: USA, Europe and China.

Our data covers the period from 2007 to 2021, which allows also for a subsample analysis of the pandemic period and its impacts in terms of consumer confidence and its relation to stock market performance, of different regions and sectors.

The remainder of this study is organised 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

Numerous studies have examined the relationship between consumer confidence and stock market performance. Most evidence suggest that there is a positive relationship between consumer confidence and stock market performance. However, there are also studies that suggest a weak or even negative relationship. Other factors, such as political instability and macroeconomic conditions, can have a more significant impact on the stock market.

Consumer confidence measures consumers' prospects about current and future economic conditions,

and can be used as an indicator of spending that can increase firm's profits and lead to good stock market performance. Consumers who hold favourable opinions about economic development tend to consume more. [Juhro and lyke \(2020\)](#) show consumer confidence predicts consumer expenditure, in Indonesia. [Gündüz et al. \(2017\)](#) focus on the relation between consumer confidence and credit card expenditure, based on data from Turkey. Similarly, [Dees and Brinca \(2013\)](#) shows consumer confidence can predict consumer spending in the USA and euro area.

Several studies analyse the relationship between consumer confidence and stock market performance. [Lux \(2011\)](#) analyses this relationship in Germany. Similarly, a study by [Kim and Oh \(2009\)](#) focus in Korea and [Khan and Ahmad \(2018\)](#) in Pakistan. These studies found a positive relationship between consumer confidence and stock market performance, and these authors explain this relationship mainly via the spending channel, i.e. an increase in consumer confidence can lead to increased consumer spending, which can have a positive impact on corporate earnings and, in turn, the stock market.

When focusing into the investor's sentiment channel, previous studies suggest changes in investors' sentiment may have an impact in stock prices fluctuations, or vice versa ([Lee et al., 1991](#); [Baker and Wurgler, 2006](#)). In consumption-based asset pricing theory, investors' marginal utility is considered to be a crucial determinant of asset prices, as consumers are both buyers of products (affecting companies' income), and investors (determining the demand for stocks). [Rojo-Suárez and Alonso-Conde \(2020\)](#) points out that using the consumer confidence index for investors' utility helps consumption-based asset pricing models outperform production-based models. [Yang et al. \(2017\)](#), analysing the Korean Stock Market, conclude it contains rich information on investor types and sentiment, confirming that high investor sentiment induces higher stock market returns.

Many other studies use consumers' confidence as a proxy for investors' sentiment. Some examples are [Qiu and Welch \(2004\)](#), [Schmeling \(2009\)](#), [Solanki and Seetharam \(2014\)](#) and [Sayim and Rahman \(2015\)](#).

However, there are also studies that suggest a weak or even negative relationship between consumer confidence and stock market performance. A study by [Goriaev and Levin \(2006\)](#) analyzed the relationship between consumer confidence and stock market performance in Russia. The study found that there was only a weak relationship. The authors suggested that there were other factors, such as political instability, that had a more significant impact on the stock market.

Another study by [Lamoureux and Zhou \(2011\)](#) analysed the relationship between consumer confidence and stock market performance in the United States. The study found that there was a weak relationship between consumer confidence and stock market performance. The authors suggested that while consumer confidence can have an impact on consumer spending, it is not necessarily a strong predictor of the stock market's performance.

[Kim \(2016\)](#), based on the data from ten OECD countries, explores the evidence as to whether a consumer confidence indicator is a leading, coincident, or lagging measurement of economic activity, and examines factors that affect the consumer sentiment index (CSI).

Taking the other direction, i.e. from stock market returns (SMRs) into change in consumer confidence indices ( $\Delta$ CCLs), there has been also an increasing amount of literature. The study by [Fisher and Statman \(2003\)](#) finds out that there is a positive and statistically significant relationship between SMRs and  $\Delta$ CCLs, which shows that consumer confidence drops as stock prices fall, and when stock prices increase, consumers become more positive. [Jansen and Nahuis \(2003\)](#) also state that in nine European countries, out of eleven objects, SMRs and  $\Delta$ CCLs 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  $\Delta$ CCL.

Lemmon and Portniaguina (2006) also find that the predictive power of consumer confidence is present only in the most recent 25-year subsample. 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 Nahujs (2003) indicate that stocks' returns can Granger cause consumer confidence at very short horizons, but not vice versa. Similar findings are reported by Görmüş and Güneş (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  $\Delta$ CCI and SMRs, 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 (2014) 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 increases in CCI can significantly benefit Taiwan's returns in the hospitality sector. 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  $\Delta$ CCI-SMR relationship. Sayim and Rahman (2015) 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 industrialised 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 indices with a lag of 9 and 12 months, but not vice versa.

Concerning the  $\Delta$ 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.

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 indices. Moreover, during the crisis, different psychological mechanisms lead to the emergence of perverse behavioural characteristics of consumers. As shown by [De Goeij 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 indices and stock market returns during the pandemic is the third contribution of our study.

In this paper we explore the  $\Delta$ CCI-SMRs relationships, by performing several two-way Granger causality analysis, between the consumer confidence indices of six world regions (Americas, China, East Asia, USA, Europe, Oceania) and the performance of three major stock markets: USA, Europe and China.

To conclude, let us mention possible confounding factors that may impact the results. These factors can influence both consumer confidence and stock market returns independently, potentially resulting in misleading conclusions. Possible examples of such factor are macroeconomic indicators, corporate earnings, monetary and fiscal policies, market sentiment, sectoral dynamics, currency exchange rates, among others. Although, it is true these variables can affect stock market and consumer sentiment at a domestic level, that is less so when it comes to cross-effects over foreign markets, which is the main focus of this paper. Furthermore Granger causality tests are meant to detect one-to-one causal relationships that are not caused by a third factor.

## 3 Data & Methodology

### 3.1 Data

This study focuses on the period from January 2007 to December 2021. Besides the full-sample analysis, we also look into the pandemic subperiod (from January 2020 onwards). We use Consumer Confidence indices (CCI) published by the Organisation for Economic Co-operation and Development (OECD), which are released monthly and represent households' opinions towards the future financial situation in each region. These indices are based on four dimensions: (i) expected financial situation, (ii) sentiment about the general economic situation, (iii) unemployment, and (iv) capability of savings. OECD indices are standardised at 100 points, with a score above 100 signalling 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. We collect data on CCI for Australia, Brazil, Chile, China, Colombia, Costa Rica, Japan, Korea, Mexico, New Zealand, OECD Europe, and United States. We then grouped them based upon their geographic location and took the CCI arithmetic mean per region. Based on this, we obtain CCIs in six regions worldwide: Americas, East Asia, Oceania, USA, Europe and China. [Figure 1](#) shows the evolution of CCIs in the six areas. From their evolution it is visible the drop in confidence all over the world due to the recession of 2008-2010. Likewise, one can see the drop in confidence at the start of the pandemic. Surprisingly for China confidence levels remained above 100 during the pandemic.

The stock market data on our three major markets – USA, Europe and China – is based upon monthly data from the S&P 500, STOXX Europe 600 and CSI 300 indices, both at global and sector levels. Overall we analyse a total of eleven industries: Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Materials, Real Estate, Technology, Telecommunications, and Utilities. [Figure 2](#) shows the evolution of the stock markets, standardised at 100 at the beginning

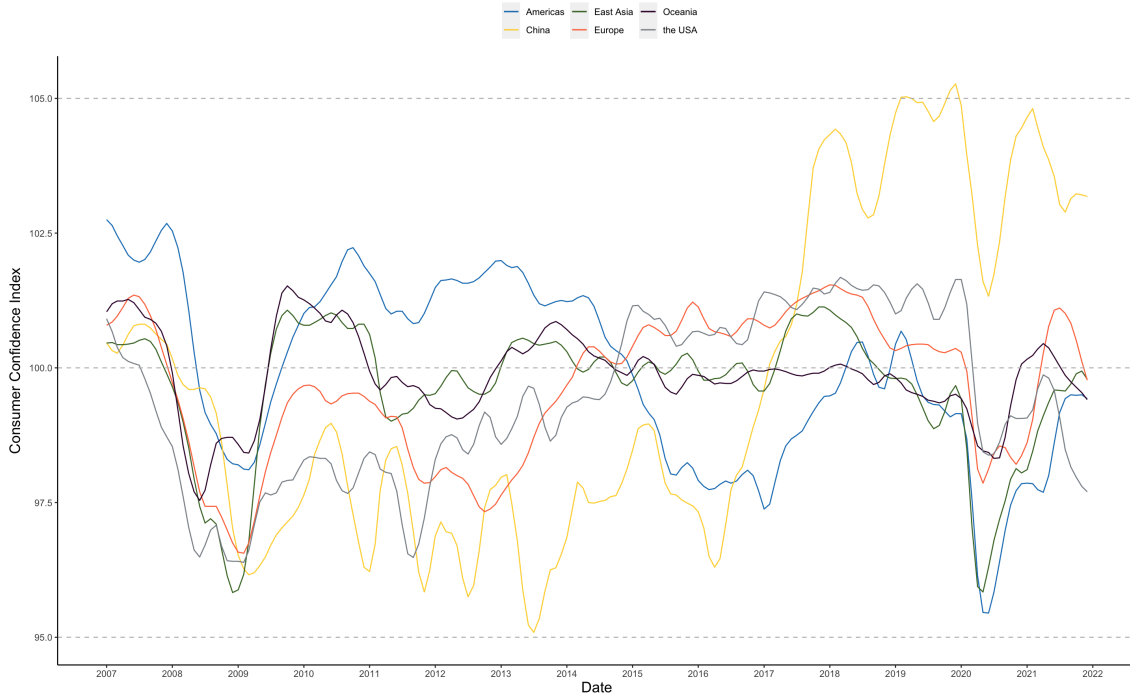


Figure 1: Evolution of Consumer Confidence Indices

of the sample.

As we want to establish relationships between consumer confidence changes, and the performance (returns) of stock markets, our key variables are the first difference in CCIs ( $\Delta CCI_t$ ), and stock market returns (SMRs), measured by logarithmic returns,

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

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

These series have the added advantage of being stationary<sup>1</sup>.

### 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

<sup>1</sup>Unit root tests for all  $\Delta CCI$  and SMR presente in Tables [A1](#) and [A2](#) of the Appendix



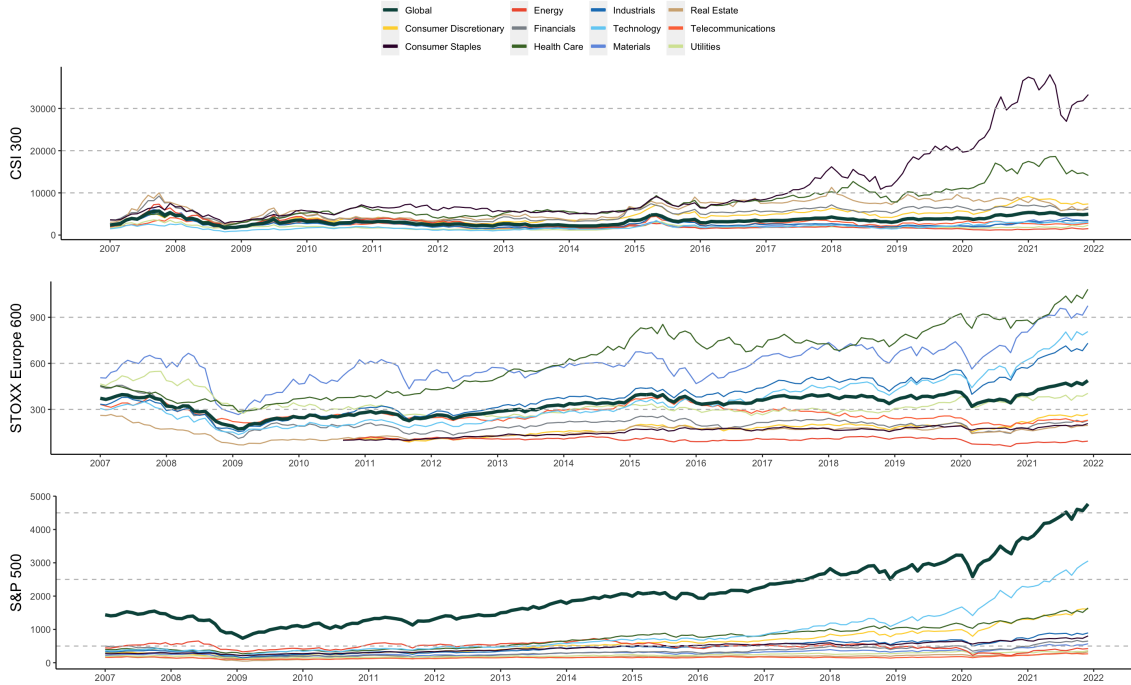


Figure 2: Standardised Evolution of Stock Markets

to explore the bidirectional causality. The test is based on the following equations:

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

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

where  $\epsilon$  is a disturbance, and  $k$  is the maximum lag orders.

In the granger causality test we employ four information criteria, namely AIC, HQ, SC, and FPE, for optimising lag selection. The results allow us to tell if there are causal relations between  $\Delta CCI$ s 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 tests on  $\Delta CCI$ s in six world regions and 36 SMRs for two sample periods. Consequently, we get 864 Granger causality test results.

## 4 Results

To present our results we use multiple tables and figures. Each table presents both contemporaneous correlation results and Granger causality (two-direction) results, for a particular stock market, and

sample period. Figures illustrate the two-way Granger causality results, showing two world diagrams, where we highlight with lines of different thickness the significant results at 10%, 5% and 1%. For each figure we look at

- which stock market returns (SMR) may help explaining changes in the various consumer confidence indices worldwide ( $\Delta CCI$ ): top plots;
- which consumer confidence changes ( $\Delta CCI$ ) may help explaining stock market returns (SMR): bottom plots

For all markets we analyse two sample periods: the full sample, and the pandemic period.

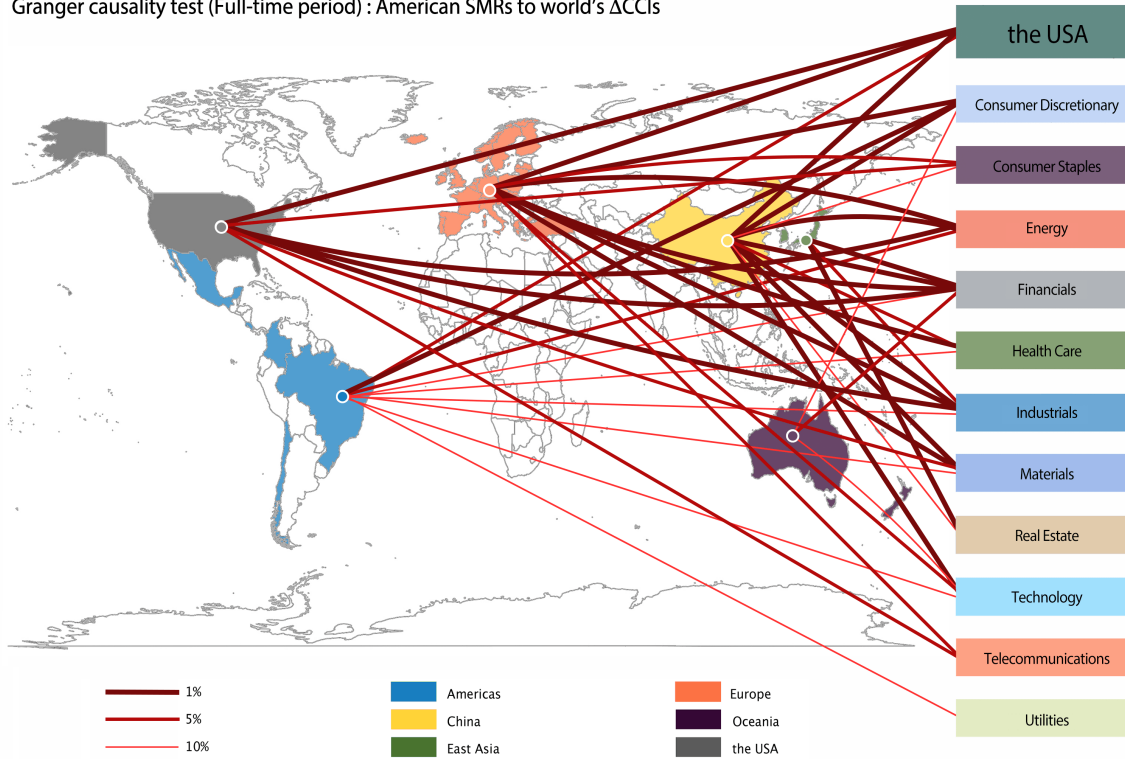
#### 4.1 USA stock market

For the USA stock market, Figures 3 and 4, present the results of the Granger causality analysis, for the full period and for the pandemic period, respectively. The same applies to Tables 1 and 2, where besides the Granger causality results we present the contemporaneous correlation results. Figure 5 also presents the contemporaneous correlations.

From the top plot in Figure 3, it is clear USA stock returns help explaining consumer confidence changes all over the world. The number of significant casual relations is impressive. When looking at the overall USA stock market performance, we find it impacts consumer confidence at home (USA), but also in Europe, China, and with a slight lower significance in the Americas. Interestingly, East Asia consumers seem to be susceptible to USA returns, but only in the financial and real estate sectors. This could be explained by the fact East Asian economies are often closely tied to international financial systems while real estate because has historically been considered safe-haven investments for international investors. Besides this, East Asian economies have experienced periods of rapid economic growth and urbanization, leading to a growing interest in real estate investment both domestically and internationally. Oceania consumers are the less susceptible to USA stock market performance, but they are not immune to the performance of the USA sectors of consumer discretionary and financials. Oceania consumers' reduced susceptibility to overall USA stock market performance can be attributed to economic diversification, geographic factors, and regional economic stability. It is important not to forget Oceania encompasses a diverse range of economies, including Australia and New Zealand, which are more developed and economically stable compared to some other countries in the region. Nonetheless, it could be Oceania's investors are particularly exposed to US financial market and consumer discretionary. In fact, at industry level, USA stock market performance has numerous other impacts in changes in consumer confidence all over the world. The most relevant USA sectors for consumers all over the world are Energy, Financials and Industrials. These sectors serve as vital indicators of economic health, so, not surprisingly collectively shape consumer confidence not only in the USA but also worldwide. In addition to those sectors, European and Chinese consumers react to USA stock performance in almost all other sectors, except for utilities (for both Europe and China) and telecommunications (just for China). This can be attributed to utilities and telecommunications services being often more locally focused.

From the bottom plot of Figure 3, we can see that on the other direction, changes in consumer confidence worldwide have some impact on USA stock market returns, although the number of significant connections is much smaller than in the other direction. One possible explanation is that changes in consumer confidence may take time to translate into tangible changes in investor behavior or corporate performance. Stock market returns often reflect forward-looking expectations, while consumer

Granger causality test (Full-time period) : American SMRs to world's  $\Delta$ CCIs



Granger causality test (Full-time period) : world's  $\Delta$ CCIs to American SMRs

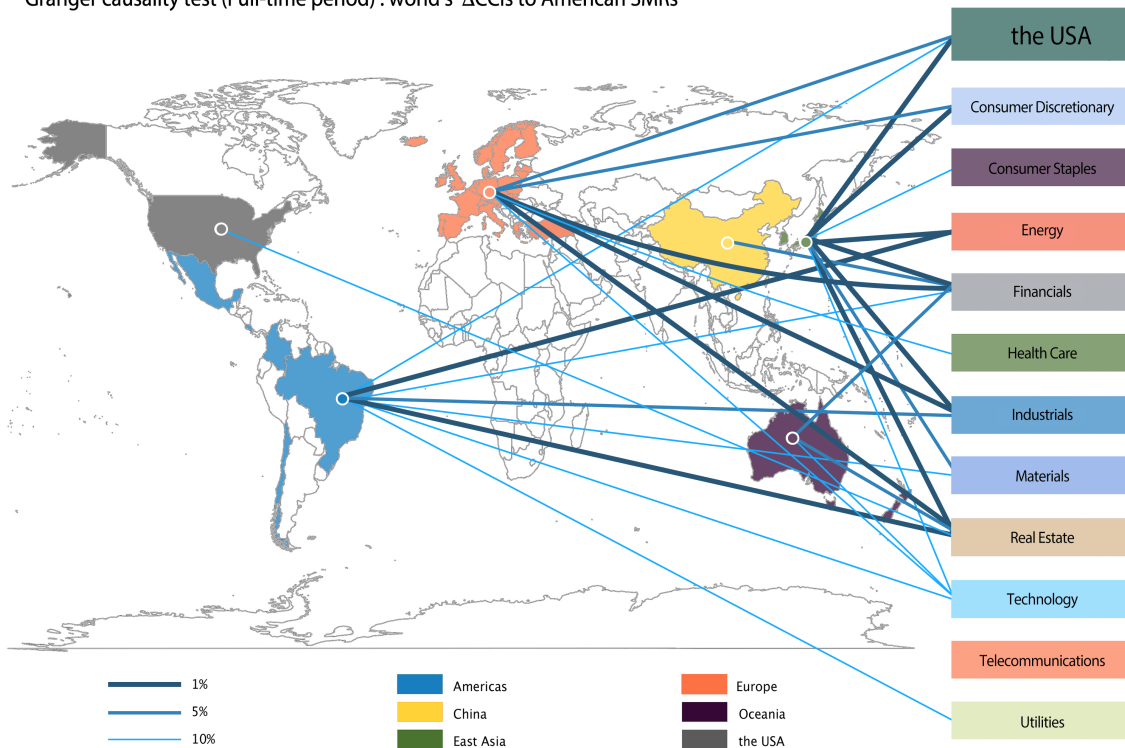
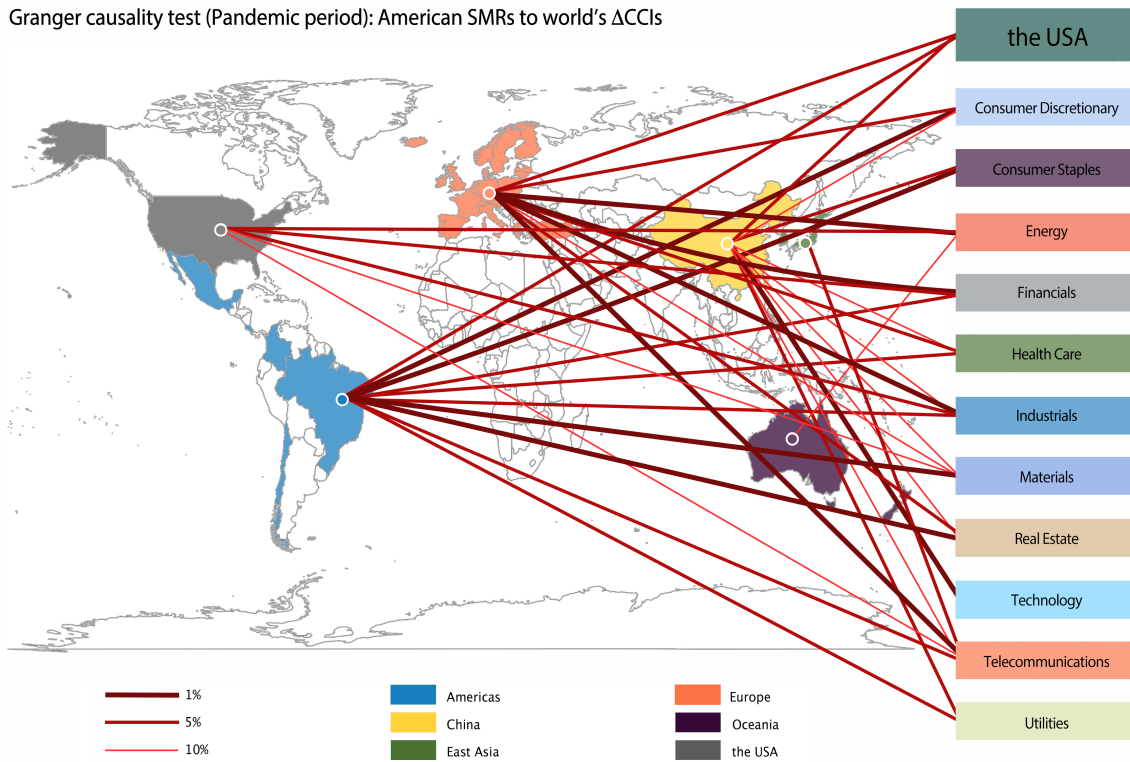


Figure 3: USA stock market returns and world's  $\Delta$ CCI, 2007-2021.

Granger causality test (Pandemic period): American SMRs to world's ΔCCIs



Granger causality test (Pandemic period): world's ΔCCIs to American SMRs

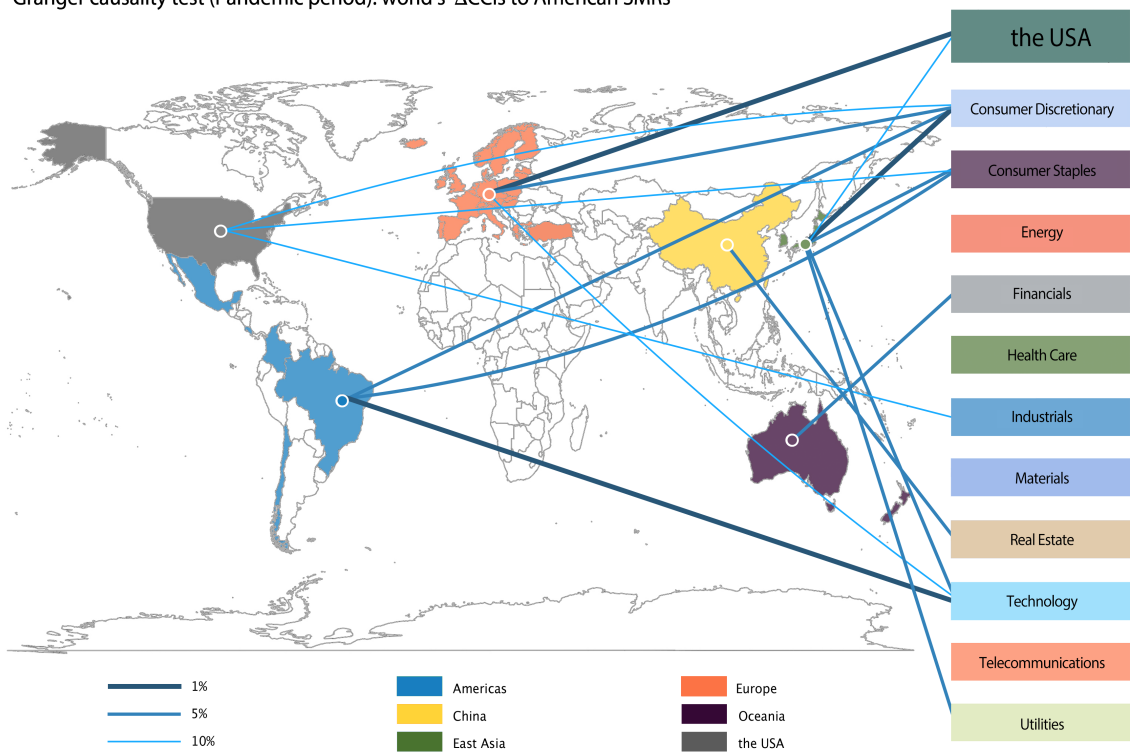


Figure 4: USA stock market returns and world's ΔCCI, pandemic period 2019-2021.

	Contemporaneous Correlation						Two-way Granger Causality					
	Estimate (t-statistic)						Optimal lag					
	Americas	China	East Asia	Europe	Oceania	USA	Americas	China	East Asia	Europe	Oceania	USA
S&P 500	0.1572 *** 2.1181	0.1368 *** 1.8371	0.3009 *** 4.1977	0.2798 *** 3.8777	0.1092 *** 1.4613	0.1902 *** 2.5778	3 0.02575 **	4 0.001715 ***	4 0.335	3 0.0009572 ***	5 0.1177	5 0.001484 ***
Consumer Discretionary	0.1126 *** 1.508	0.0881 *** 1.1772	0.2789 *** 3.8636	0.2322 *** 3.1765	0.0999 *** 1.3353	0.1776 *** 2.4004	4 0.0562 *	4 0.4128	5 0.009039 ***	4 0.01306 **	4 0.1086	4 0.5517
Consumer Staples	0.095 *** 1.2691	0.0629 *** 0.83828	0.1963 *** 2.6636	0.1823 *** 2.4664	0.1120 *** 1.4993	0.1164 *** 1.5586	3 0.1911	2 0.07666 *	4 0.4388	3 0.02823 **	4 0.5604	3 0.03337 **
Energy	0.1042 *** 1.3935	0.089 *** 1.1886	0.2183 *** 2.9763	0.1876 *** 2.5404	0.0191 *** 0.25457	0.0898 *** 1.199	4 0.20265 **	4 0.0003485 ***	5 0.1745	4 0.001016 ***	5 0.2051	5 0.002006 ***
Financials	0.1986 *** 2.6966	0.2277 *** 3.111	0.3941 *** 5.7051	0.3735 *** 5.3561	0.229 *** 3.1299	0.3196 *** 4.4876	3 0.09235 *	4 0.006758 ***	5 0.004192 ***	3 0.0005825 ***	5 0.03235 **	5 0.001687 ***
Health Care	0.0596 *** 0.79461	0.0794 *** 1.0591	0.1208 *** 1.6193	0.1548 *** 2.0844	0.1191 *** 1.5963	0.1292 *** 1.7333	4 0.05618 *	2 0.02756 **	4 1.777e-05 ***	3 0.0008389 ***	4 0.04261 **	4 0.1153
Industrials	0.2073 *** 2.8197	0.1927 *** 2.6125	0.3223 *** 4.5292	0.3157 *** 4.4267	0.1438 *** 1.9336	0.2564 *** 3.5295	3 0.06134 *	4 0.03374 **	4 0.1211	3 0.004409 ***	4 0.6782	5 0.1019
Materials	0.1337 *** 1.7947	0.1696 *** 2.2895	0.2680 *** 3.7008	0.2248 *** 3.0696	0.0598 *** 0.79767	0.1361 *** 1.8281	4 0.023 **	4 0.1639	3 0.001076 ***	3 0.00507 ***	4 0.4301	3 0.2123
Real Estate	0.1583 *** 2.1324	0.1353 *** 1.8174	0.2607 *** 3.5932	0.2297 *** 3.1394	0.0752 *** 1.0033	0.1838 *** 2.4882	4 0.05282 *	4 0.002777 ***	5 0.1373	4 0.006958 ***	5 0.5154	5 0.02061 **
Technology	0.1316 *** 1.7667	0.0893 *** 1.1922	0.2806 *** 3.8897	0.2215 *** 3.0213	0.0435 *** 0.57986	0.1213 *** 1.6263	3 0.08688 *	2 0.002213 ***	4 0.6995	3 0.02899 **	5 0.07902 *	3 0.1206
Telecommunications	0.0524 *** 0.69873	0.0082 0.10967	0.1263 *** 1.6938	0.1578 *** 2.1261	0.0512 *** 0.66269	0.0255 *** 0.33918	4 0.08063 *	4 0.197	4 0.05754 *	3 0.09576 *	4 0.05245 *	4 0.5019
Utilities	0.1292 *** 1.7334	0.0779 *** 1.0399	0.1369 *** 1.8391	0.1012 *** 1.3531	0.0474 *** 0.63095	0.0577 *** 0.76834	3 0.07735 *	2 0.1943	4 0.4457-	3 0.4084	4 0.5511	3 0.1488
							0.0701 *	0.4402	0.1824	0.3169	0.3666	0.5307

Table 1: USA stock market returns and world's ΔCCI, 2007-2021.

\*, \*\*, \*\*\* means significance at 10%, 5% and 1%, respectively.

	Contemporaneous Correlation						Two-way Granger Causality					
	Estimate (t-statistic)						Optimal lag					
	Americas	China	East Asia	Europe	Oceania	USA	Americas	China	East Asia	Europe	Oceania	USA
S&P 500	0.0933 0.42925	0.0945 * 0.43517	0.3561 *** 1.7465	0.1864 *** 0.86946	0.1045 * 0.48171	0.1519 *** 0.70447	2 0.01516 **	2 0.0283 **	3 0.1179	3 0.0354 **	3 0.2293	2 0.109
Consumer Discretionary	-0.0292 -0.13411	0.0391 0.1794	0.2585 *** 1.2261	0.044 0.202	-0.0161 -0.073588	0.0371 0.17028	2 0.008626 ***	3 0.09981 *	3 0.2702	3 0.000699 ***	3 0.1058	2 0.2333
Consumer Staples	0.0922 0.4245	0.0955 * 0.43973	0.2763 *** 1.3175	0.126 ** 0.58211	0.0387 0.17748	0.1622 *** 0.75321	3 0.006379 ***	2 0.01646 **	3 0.1883	3 0.219	3 0.282	3 0.5502
Energy	0.0552 0.25322	0.1418 *** 0.65648	0.3392 *** 1.6525	0.1856 *** 0.86552	0.1883 *** 0.87869	0.1631 *** 0.75777	3 0.1828	1 0.7468	3 0.567	2 0.002969 ***	3 0.05904 *	2 0.04153 **
Financials	0.2474 *** 1.17	0.2891 *** 1.3837	0.5252 *** 2.8286	0.3736 *** 1.8454	0.3514 *** 1.7198	0.3622 *** 1.7808	2 0.01132 **	1 0.5703	2 0.3251	2 0.004265 ***	2 0.4257	2 0.0188 **
Health Care	-0.0976* -0.44925	-0.1021 * -0.47045	0.0175 0.080172	-0.0251 -0.115	-0.0802 -0.36886	-0.1005 * -0.46267	2 0.02939 **	2 0.05067 *	3 0.3344	3 0.04825 **	3 0.5111	2 0.259
Industrials	0.2392 *** 1.1292	0.2603 *** 1.2353	0.5306 *** 2.8686	0.3291 *** 1.5971	0.3234 *** 1.5662	0.388 *** 1.9294	2 0.02573 **	2 0.06952 *	2 0.4012	2 0.006894 ***	3 0.1752	2 0.04804 **
Materials	0.0319 0.14611	0.1281 ** 0.592	0.3438 *** 1.6778	0.1517 *** 0.70317	0.2114 *** 0.99104	0.2169 *** 1.0184	2 0.007288 ***	2 0.06133 *	3 0.1447	3 0.05918 *	3 0.4955	2 0.05486 *
Real Estate	0.1589 *** 0.73743	0.0174 0.079561	0.3938 *** 1.9631	0.2887 *** 1.3817	0.0835 0.38417	0.2444 *** 1.1548	2 0.008195 ***	2 0.0931 *	2 0.4573	2 0.0193 **	2 0.452	2 0.3337
Technology	0.0292 0.13406	-0.0237 -0.10876	0.2377 *** 1.1216	0.0738 0.3393	-0.0633 -0.29055	0.001 0.0045889	3 0.8494	2 0.005992 ***	3 0.1037	3 0.1332	3 0.2229	2 0.3894
Telecommunications	0.0713 0.3275	0.031 0.14205	0.2927 *** 1.403	0.2269 *** 1.0677	0.1073 * 0.49451	0.1119 ** 0.51624	2 0.0096 ***	2 0.2991	3 0.02602 **	2 0.06735 *	2 0.1623	2 0.3852
Utilities	0.1915 *** 0.89435	0.1693 *** 0.78712	0.3711 *** 1.8314	0.1699 *** 0.7901	0.2208 *** 1.0372	0.2603 *** 1.2355	2 0.03902 **	2 0.02659 **	3 0.9112	3 0.1423	3 0.6692	3 0.7261
							0.7164	0.334	0.02969 **	0.8687	0.2741	0.2789

Table 2: USA stock market returns and world's ΔCCI, pandemic period 2019-2021.

\*, \*\*, \*\*\* means significance at 10%, 5% and 1%, respectively.

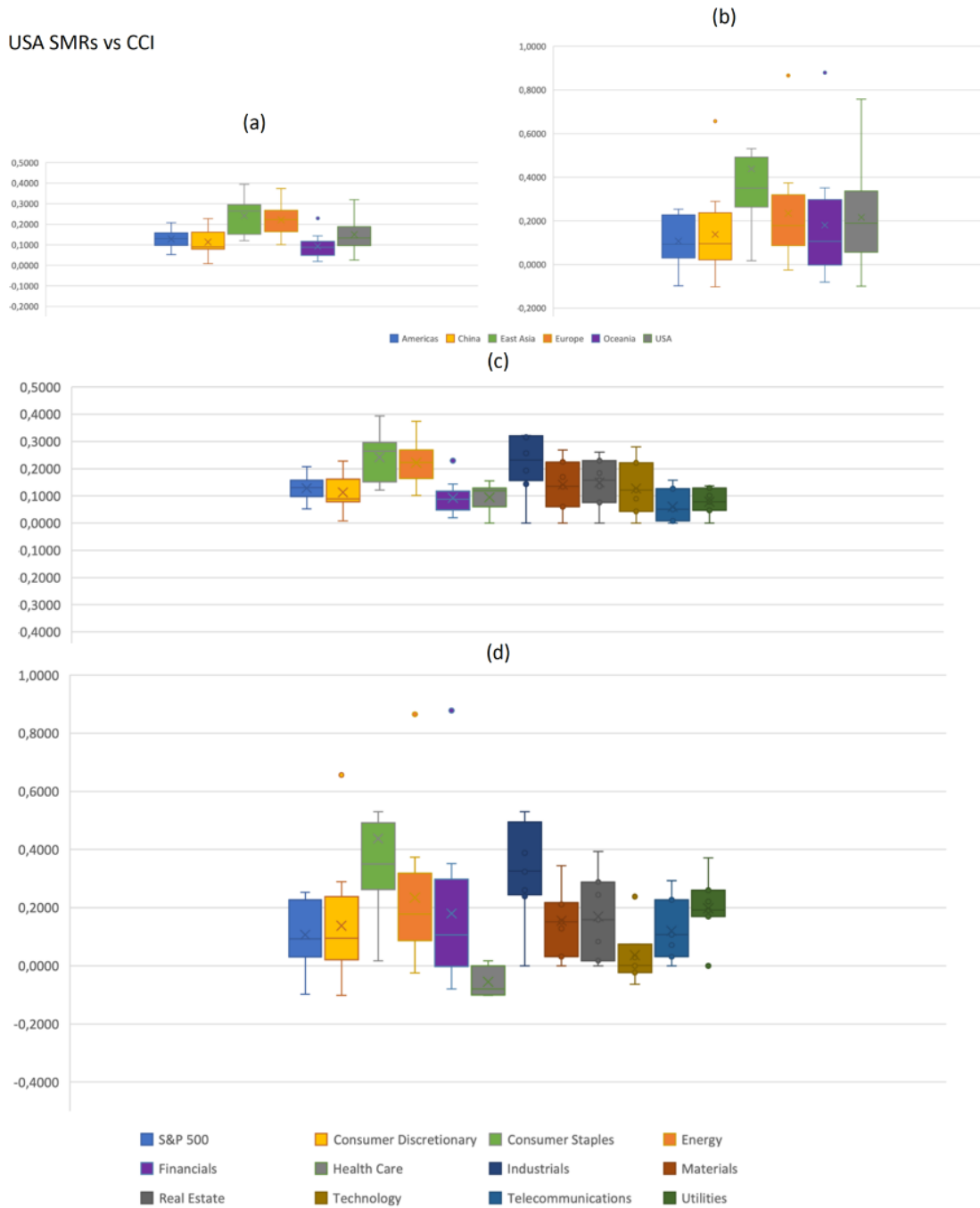


Figure 5: Dispersion of correlations between USA SMRs and  $\Delta CCI$ . Per region, across sectors (a) full-sample (b) pandemic period. Per sector, across regions (c) full-sample (d) pandemic period.

confidence reflect more immediate changes in sentiment. Surprisingly, it is not the home consumer confidence changes that impacts the most the USA stock returns. In fact, domestic changes in consumer confidence seem to impact only the returns in the sector of real estate (and only 10% significance level). Given USA stock market development and openness, with investors from all over the world exposed to its stocks, it is perhaps true that domestic investors have a relatively lower weight. The same argument would follow for investors from any other world region, but surprising, changes in foreign consumer confidence seems to explain better the USA stock returns. Indeed, Europe's confidence index seems to affect USA returns not only overall, but in particular in the industries of financial, industrial, and real estate (1% significance level). China, and Oceania consumer confidence levels impacts not the overall US stock returns, but some specific industries. China  $\Delta CCI$  impacts only returns in the financial sector (at 5% confidence level), while Oceania's  $\Delta CCI$  impacts financials and real estate returns (at 5% significance) and technology returns (at 10% significance). The  $\Delta CCI$  of the Americas have a mild impact in the overall returns of the USA stock market (10% significance) with stronger effects in the sectors of energy and real estate (significance of 1%). East Asia consumer confidence has highly significant effects (at 1% significance) on the overall USA stock market returns, but also on many specific sectors, such as consumer discretionary, energy, financials, industrials, and real estate. East Asia is a major hub for manufacturing and technology industries, with local consumer confidence playing a crucial role in the global supply chain. It would be interesting to explore the connection between the share of foreign holding in USA stock markets, to foreign consumer confidence impact on the same markets.

From Figure 4, and when compared to Figure 3, one can conclude that there was a decrease of significant relations both in the direction  $SMR \Rightarrow \Delta CCI$  (upper plot) and  $SMR \Leftarrow \Delta CCI$  (lower plot), during the pandemic. The COVID-19 pandemic introduced unique and unprecedented challenges to global economies and financial markets, which may explain the observed reduction in the connections between stock market returns and consumer confidence in both directions during this period. From a methodological view it matters to emphasize we also have less data to work with, which by definition, may lead to lesser number of significant Ganger causalities.

Interestingly, the returns of the S&P500 index present no relation to changes in the USA consumer confidence. The relations that are significant are fewer and less significant, but returns in the sectors of energy, financials, industrials, and telecommunications impact (at 5% and 10% significance) the CCI in USA. The pandemic-induced volatility and uncertainty in these sectors directly affected consumers' perceptions of economic stability, job security, and their ability to meet financial goals, thus influencing consumer confidence. However, as before (in the full period analysis), it is abroad that the USA returns have stronger relations to changes in  $\Delta CCI$ . In fact, the number of significant connections to the America's  $\Delta CCI$  increased and became more significant in the crisis period. The number of significant connections between USA stock returns and European  $\Delta CCI$  is similar to the full sample period, however the industries with higher significance change, with European consumers particularly worried about the performance in the sectors of energy, financials, industrials, and telecommunications, sectors essential for remote work and communication during lockdowns. Chinese consumers, as well as Oceania's and East Asia consumers confidence was considerably less exposed to USA stock performance during the pandemic.

When looking at the other direction,  $\Delta CCI \Rightarrow SMR$ , we observe the number of significant relations decreases during the pandemic. The pandemic caused sudden and severe economic shocks, including widespread lockdowns, business closures, and disruptions to supply chains. These shocks had a direct and immediate impact on corporate revenues and earnings, which are primary drivers of stock market returns. The depth and nature of these shocks may have reduced the influence of consumer confidence. Still, we were able to identify a few exceptions. The influence of European consumers' confidence in

the USA stock market increased in significance overall, but decreased for specific industries. The same applies to  $\Delta CCI$ s of other regions being particularly evident the fact that East Asia  $\Delta CCI$  impacts much less USA stock returns.

In summary, during the pandemic we observe a decrease of the number of significant relations from both directions, however, the decrease is much less pronounced for  $SMRs \Rightarrow \Delta CCI$  than for  $\Delta CCI \Rightarrow SMR$ .

In terms of contemporaneous correlations we observe positive and highly significant correlations between  $\Delta CCI$  and  $SMRs$  in the full sample, while we also witness a decrease in the number of significant correlations during the pandemic, with much more correlations close to zero and/or negative, as is the case of the health sector. Figure 5 show the dispersion of correlations per region and per sector for the USA stock market. Looking at it we can also see the main effect of the pandemic on correlations is the fact they became much less concentrated. In the full sample, correlations range from close to zero to 0.4, while in the pandemic they widen from negative to values of 0.6 or higher. Note the scales of correlations for the full-sample and the pandemic periods is not the same.

## 4.2 European stock market

For the European stock market, Figures 6 and 7 present the Granger causality results for the full sample and the pandemic period, respectively. Tables 5 and 4 present both the Granger causality results and the contemporaneous correlation results, while Figure 11 visually present the contemporaneous correlations.

European stock returns, both at an aggregate level and industry level, have numerous impacts on consumer confidence levels all over the world. See top plot of Figure 6. In terms of the number of significant relations, there are more for European  $SMRs$  than for USA  $SMRs$ . Which is to be expected as Europe is traditionally more open to other world regions, including those in Asia and Americas.

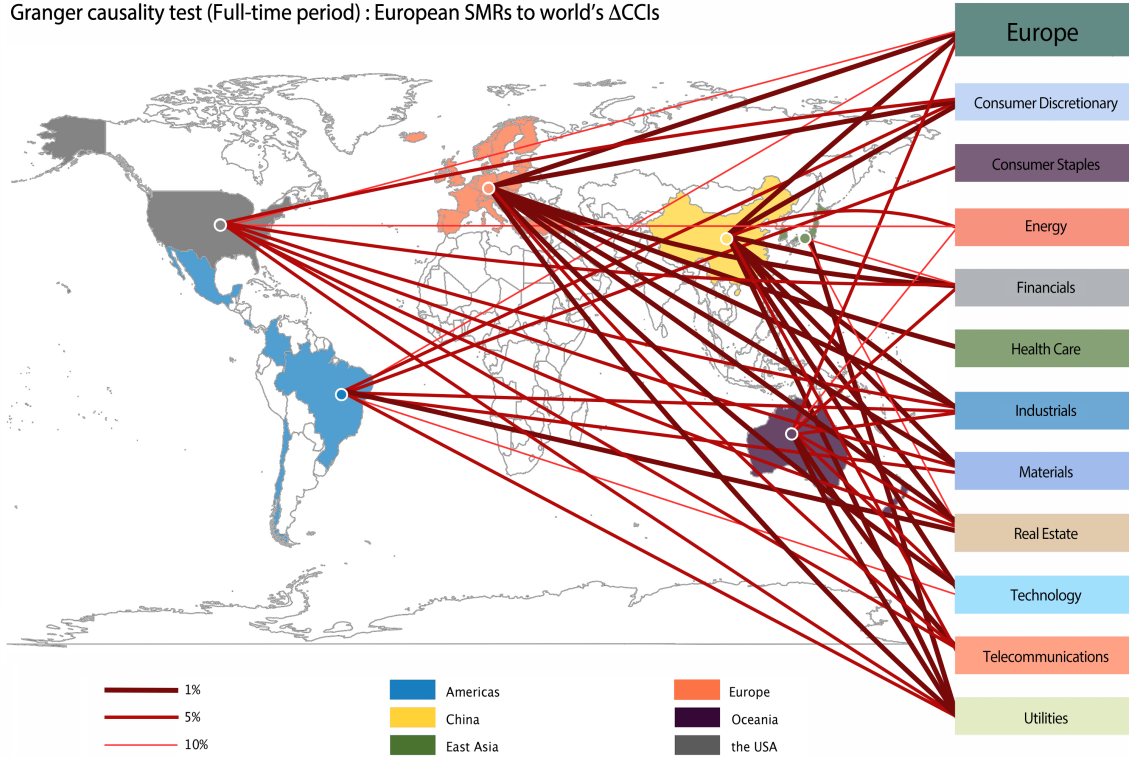
It is worth noticing, however, that the overall European stock market performance seems to be less important for USA consumers, then USA stock performance is for European investors (lower levels of significance), compare Figures 3 to Figure 6. The USA has a significant impact on the global economy due to its size, economic strength, and role as a major global trading partner. Changes in the USA economy and stock market can have a substantial influence on international markets, including Europe. This interconnectedness means that European investors may closely monitor USA stock performance as it can affect their own economies.

European stock market seem to be as relevant as USA stock market for Chinese consumers. On the other hand, the Americas consumer confidence seem to be more exposed to the performance of the real state sectors in Europe than in the USA. East Asia consumers' confidence, as before, is the least affected by European stock market performance, presenting reactions only to utilities, and to a lesser extent, real state sectors.

On the other direction, differently than the USA case, changes in the consumer confidence worldwide have strong casual relationships with European market performance, both at the aggregate and industry levels. Besides a domestic strong effect in terms of European consumer confidence, consumer confidence indices worldwide have also significant impacts in European stock performance. Taking into account the number and significance of connections, the changes in foreign consumer confidence that impact mostly European stocks are those in East Asia, Oceania, and the Americas. Less pronounced is the impact of consumer confidence in the USA or China. This pattern suggests that individuals from around the world, are also investors in the European stock market, affecting its performance through their confidence levels.



Granger causality test (Full-time period) : European SMRs to world's  $\Delta$ CCIs



Granger causality test (Full-time period) : world's  $\Delta$ CCIs to European SMRs

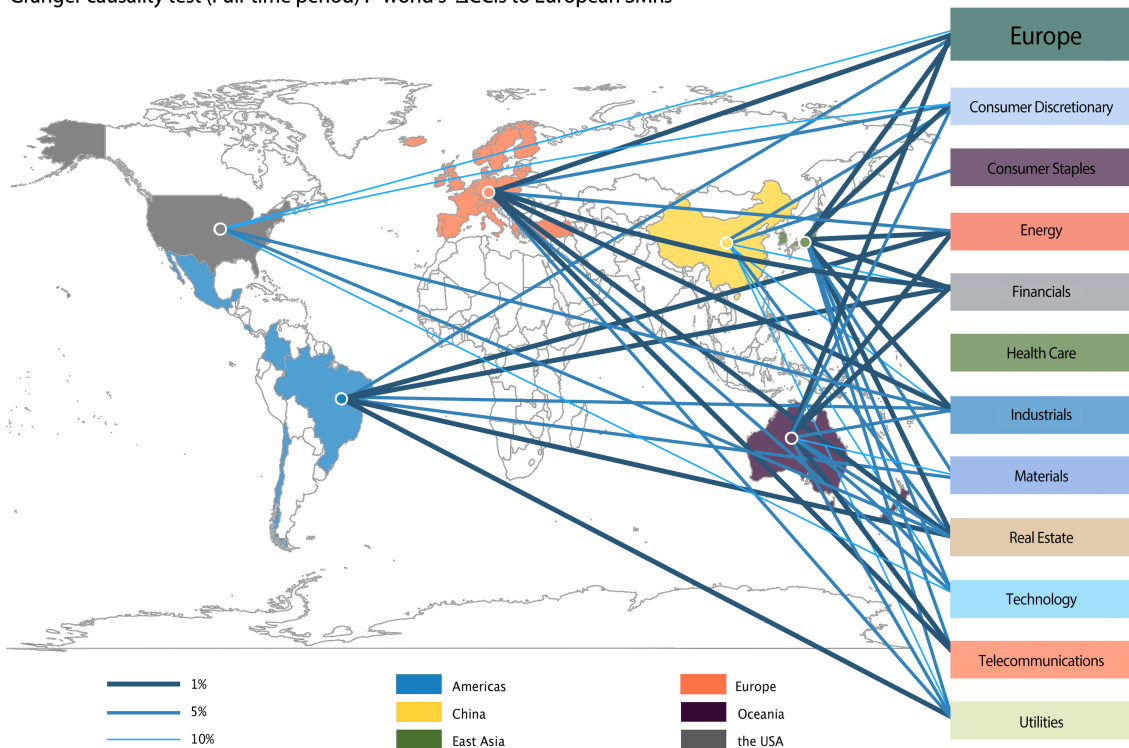
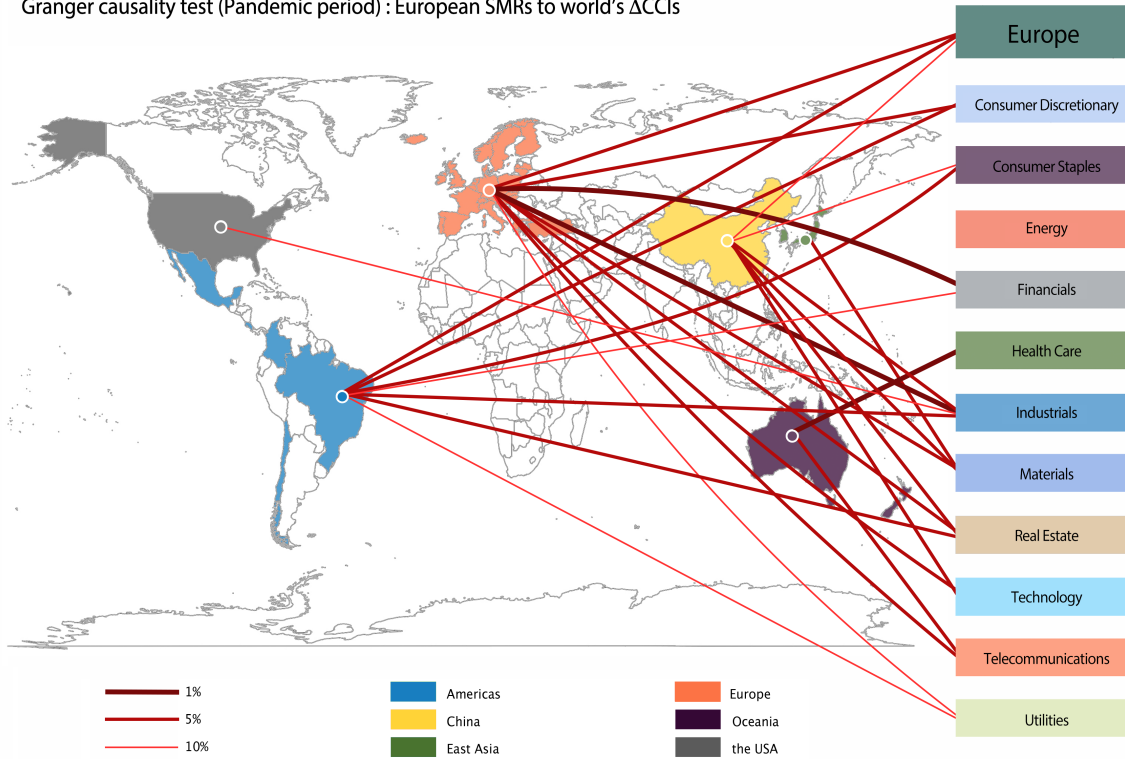


Figure 6: European stock market returns and world's  $\Delta$ CCI, 2007-2021.

Granger causality test (Pandemic period) : European SMRs to world's  $\Delta$ CCIs



Granger causality test (Pandemic period) : world's  $\Delta$ CCIs to European SMRs

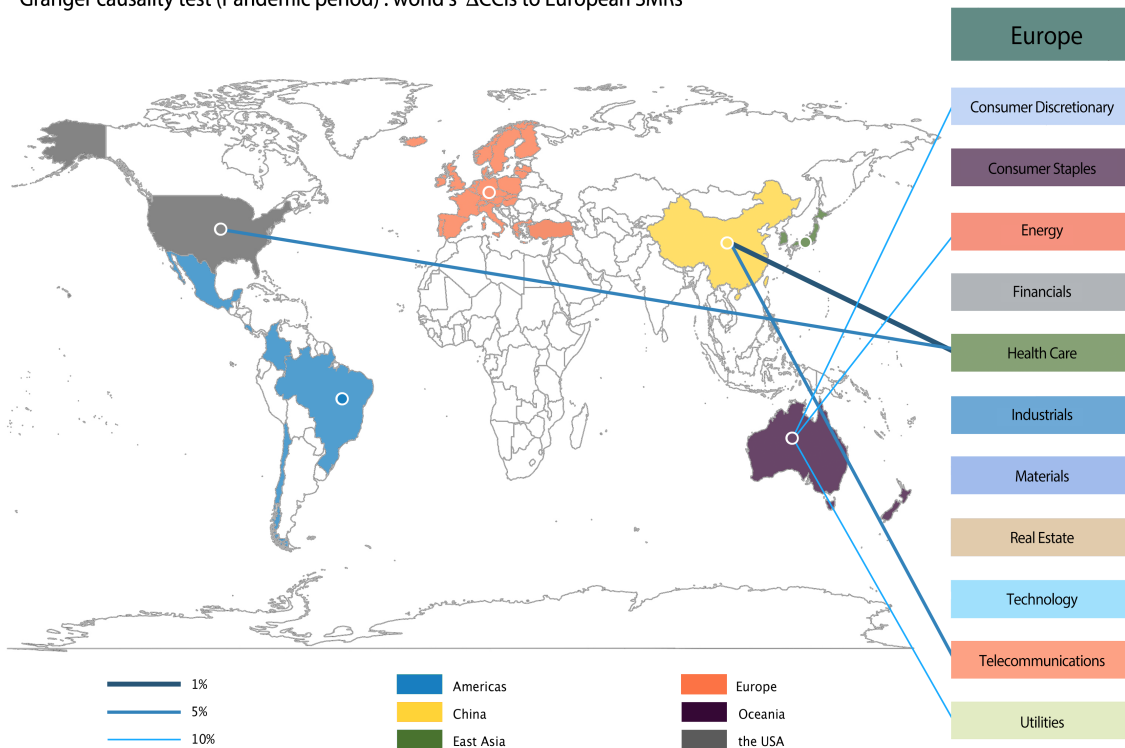


Figure 7: European stock market returns and world's  $\Delta$ CCI, pandemic period 2019-2021.

	Contemporaneous Correlation						Two-way Granger Causality					
	Estimate (t-statistic)						Optimal lag SMR = <sub>l</sub> ΔCCI (p-values) ΔCCI = <sub>l</sub> SMR (p-values)					
	Americas	China	East Asia	Europe	Oceania	USA	Americas	China	East Asia	Europe	Oceania	USA
STOXX 600	0.2250 *** 3.0720	0.2173 *** 2.9616	0.3652 *** 5.2191	0.3718 *** 5.3292	0.2151 *** 2.9310	0.2495 *** 3.4271	0.05133 * 0.10176 **	0.001205 *** 0.1213	0.3797 0.001547 ***	0.0002769 *** 0.001059 ***	0.0153 ** 0.005122 ***	0.05723 * 0.07679 * 2
Consumer Discretionary	0.1922 *** 2.2587	0.1714 *** 2.0067	0.3162 *** 3.8432	0.3142 *** 3.8169	0.2644 *** 3.1618	0.2835 *** 3.4099	0.01146 ** 0.1373	0.0004646 *** 0.03354 **	0.954 0.008516 ***	0.0001327 *** 0.0226 **	0.4848 0.01072 **	0.04295 ** 0.07852 * 3
Consumer Staples	0.0629 *** 0.7272	0.0073 *** 0.0845	0.1661 *** 1.9427	0.1554 *** 1.8137	0.0570 *** 0.6581	0.1061 *** 1.2309	0.04072 ** 0.6402	0.7925 0.4063 **	0.7153 0.3548	0.1627 0.2614	0.3911 0.217	0.6093 0.4709 2
Energy	0.2307 *** 2.7347	0.1404 *** 1.6358	0.2601 *** 3.1063	0.2084 *** 2.4572	0.1310 *** 1.5240	0.2021 *** 2.3796	0.8875 0.0001895 ***	0.0158 ** 0.5045	0.8484 2.234e-05 ***	0.1427 0.02245 **	0.05251 * 0.0001247 ***	0.08735 * 0.5453 5
Financials	0.2375 *** 3.2530	0.2586 *** 3.5613	0.4194 *** 6.1461	0.3950 *** 5.7209	0.2711 *** 3.7464	0.2932 *** 4.0802	0.1342 0.007288 ***	0.0002099 *** 0.05577 *	0.05457 * 1.912e-05 ***	3.096e-05 *** 0.0001693 ***	0.0294 ** 0.004463 ***	0.01128 ** 0.2708 3
Health Care	0.0501 *** 0.6671	0.0493 *** 0.6562	0.1007 *** 1.3471	0.1536 *** 2.0683	0.1472 *** 1.9794	0.1156 *** 1.5484	0.2913 0.9007	0.4434 0.5728	0.2512 0.5167	0.009825 *** 0.2987	0.3672 0.6104	0.7034 0.1023 5
Industrials	0.2309 *** 3.1577	0.2192 *** 2.9894	0.3624 *** 5.1734	0.3647 *** 5.2112	0.1834 *** 2.4819	0.2697 *** 3.7260	0.01392 ** 0.01448 **	0.002096 *** 0.0561 *	0.3907 0.002806 ***	0.0006701 *** 0.002595 ***	0.02815 ** 0.03175 **	0.039 ** 0.04955 ** 3
Materials	0.1752 *** 2.3672	0.2386 *** 3.2686	0.2790 *** 3.8651	0.2633 *** 3.6315	0.0390 *** 0.5193	0.1569 *** 2.1130	0.04874 ** 0.01128 **	0.001694 *** 0.1792	0.3201 0.01977 **	0.005247 *** 0.2916	0.1667 0.07766 *	0.0218 ** 0.6817 5
Real Estate	0.2779 *** 3.8481	0.1925 *** 2.6093	0.3714 *** 5.3214	0.3611 *** 5.1518	0.2057 *** 2.7963	0.2524 *** 3.4707	0.007513 *** 0.002467 ***	0.007723 *** 0.04992 **	0.05538 * 3.176e-05 ***	0.005757 *** 0.0002667 ***	0.01338 ** 0.02399 **	0.02078 ** 0.03634 ** 5
Technology	0.1214 *** 1.6265	0.1568 *** 2.1121	0.2785 *** 3.8586	0.2847 *** 3.9511	0.1311 *** 1.7588	0.1887 *** 2.5563	0.0602 * 0.1184	0.00678 *** 0.08768 *	0.4133 0.04196 **	0.0002457 *** 0.0445 **	0.03074 ** 0.04816 **	0.1516 0.05598 * 5
Telecommunications	0.1383 *** 1.8575	0.0596 *** 0.7946	0.2108 *** 2.8694	0.2745 *** 3.7985	0.2433 *** 3.3372	0.1020 *** 1.3642	0.1018 0.1992	0.01461 ** 0.695	0.231 0.02115 **	0.04942 ** 0.000416 ***	0.003605 *** 0.0003464 ***	0.01495 ** 0.1824 5
Utilities	0.1968 *** 2.6702	0.1405 *** 1.8881	0.2212 *** 3.0170	0.2138 *** 2.9121	0.1377 *** 1.8495	0.1261 *** 1.6909	0.0377 ** 0.001093 ***	0.007472 *** 0.07112 *	0.004203 *** 0.04963 **	0.001037 *** 0.01206 **	0.0004977 *** 0.01888 **	0.01445 ** 0.2919 5

Table 3: European stock market returns and world's ΔCCI, 2007-2021.

\*, \*\*, \*\*\* means significance at 10%, 5% and 1%, respectively.

	Contemporaneous Correlation						Two-way Granger Causality					
	Estimate (t-statistic)						Optimal lag SMR = <sub>l</sub> ΔCCI (p-values) ΔCCI = <sub>l</sub> SMR (p-values)					
	Americas	China	East Asia	Europe	Oceania	USA	Americas	China	East Asia	Europe	Oceania	USA
STOXX 600	0.2210 *** 1.0385	0.1594 *** 0.73978	0.4627 *** 2.392	0.3049 *** 1.4671	0.2523 *** 1.1949	0.2861 *** 1.3683	0.04219 ** 0.9669	0.08889 * 0.3509	0.4957 0.6635	0.01041 ** 0.4787	0.1419 0.1305	0.1644 0.8095 2
Consumer Discretionary	0.2459 *** 1.1626	0.2591 *** 1.2293	0.5036 *** 2.6712	0.3219 *** 1.5582	0.3839 *** 1.9055	0.3992 *** 1.995	0.02343 ** 0.9765	0.1111 0.2314	0.4452 0.5311	0.01216 ** 0.6973	0.137 0.07509 *	0.1037 0.1404 2
Consumer Staples	0.0446 0.20446	0.0073 0.03335	0.2560 *** 1.2137	0.1748 *** 0.81335	0.0294 0.1348	0.1488 *** 0.6898	0.01689 ** 0.6418	0.08895 * 0.1622	0.4043 0.999	0.5441 0.9229	0.2162 0.7033	0.6742 0.9587 3
Energy	0.2707 *** 1.2887	0.3297 *** 1.6003	0.4244 *** 2.1479	0.2636 *** 1.2521	0.3261 *** 1.5809	0.2535 *** 1.2008	0.4903 0.3784	0.7137 0.4251	0.7002 0.7145	0.1893 0.9819	0.6921 0.05962 *	0.3399 0.1508 2
Financials	0.3023 *** 1.4532	0.2650 *** 1.2592	0.5383 *** 2.9269	0.3582 *** 1.7583	0.3555 *** 1.7429	0.3654 *** 1.7986	0.08535 * 0.8709	0.5476 0.1315	0.8927 0.4812	0.006597 *** 0.1772	0.4579 0.1008	0.1046 0.6644 2
Health Care	-0.0793 -0.36455	-0.2018 *** -0.94414	0.0116 0.052987	-0.0188 -0.086184	-0.1579 *** -0.73255	-0.1432 *** -0.66306	0.102 0.2924	0.1581 0.002225 ***	0.6401 0.1134	0.1772 0.313	0.009359 *** 0.2809	0.5794 0.04761 ** 3
Industrials	0.2923 *** 1.4005	0.2078 *** 0.97368	0.5389 *** 2.9319	0.3496 *** 1.7097	0.2832 *** 1.3533	0.3515 *** 1.7207	0.02086 ** 0.527	0.03736 ** 0.7294	0.2716 0.3919	0.001077 *** 0.2938	0.1001 0.4177	0.07593 * 0.6942 2
Materials	0.1397 *** 0.64648	0.1307 ** 0.60399	0.3915 *** 1.9499	0.2610 *** 1.2389	0.2114 *** 0.99113	0.2345 *** 1.1054	0.2288 0.4476	0.03235 ** 0.6803	0.03374 ** 0.7146	0.02565 ** 0.1145	0.439 0.4835	0.1509 0.8936 2
Real Estate	0.3850 *** 1.9117	0.1622 *** 0.75347	0.5326 *** 2.884	0.3662 *** 1.8034	0.2773 *** 1.3226	0.3439 *** 1.6781	0.01633 ** 0.3514	0.02883 ** 0.3988	0.5882 0.2338	0.01085 ** 0.5123	0.5119 0.4447	0.2874 0.3701 2
Technology	0.025 0.11469	-0.1010 * -0.46521	0.2385 *** 1.1255	0.2112 *** 0.99032	-0.0059 *** -0.027043	0.0412 0.18906	0.2031 0.2761	0.03667 ** 0.1382	0.2668 0.3268	0.04218 ** 0.1612	0.2632 0.3872	0.3827 0.4885 2
Telecommunications	0.1588 *** 0.73727	0.0582 0.26731	0.3863 *** 1.9193	0.2957 *** 1.4185	0.2882 *** 1.3794	0.2760 *** 1.3157	0.2 0.7538	0.2292 0.03373 **	0.8471 0.9768	0.03545 ** 0.9906	0.01913 ** 0.3158	0.2491 0.5244 3
Utilities	0.2226 *** 1.0464	0.1057 * 0.48716	0.4305 *** 2.1859	0.2213 *** 1.0398	0.2773 *** 1.3227	0.2829 *** 1.3514	0.08589 * 0.6598	0.107 0.1734	0.3647 0.131	0.05369 * 0.2665	0.1026 0.08864 *	0.793 0.6434 5

Table 4: European stock market returns and world's ΔCCI, pandemic period 2019-2021.

\*, \*\*, \*\*\* means significance at 10%, 5% and 1%, respectively.

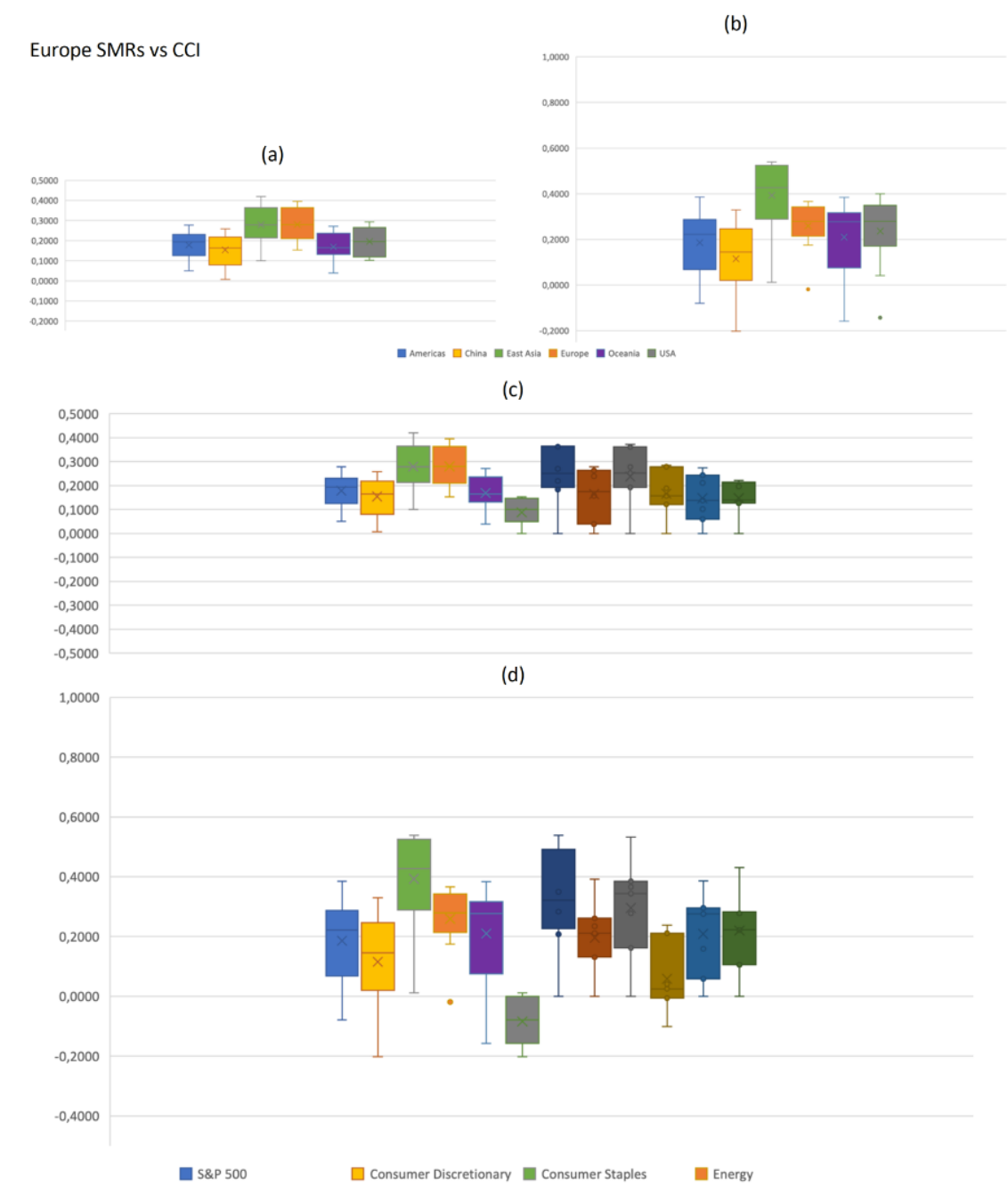


Figure 8: Dispersion of correlations between European SMRs and  $\Delta CCI$ . Per region, across sectors (a) full-sample (b) pandemic period. Per sector, across regions (c) full-sample (d) pandemic period.

Figure 7 and Table 4 present the relations between European SMRs with the global  $\Delta$ CCIs during the pandemic period. Similarly to what we see for the USA SMRs, we can tell that the European SMRs are strongly associated with the worldwide  $\Delta$ CCIs mainly in one-way direction: from stock market performance to consumer confidence indices.

During the pandemic there are only a few significant connections, from worldwide consumer confidence to European stock market performance, that compares in a drastic way with the full sample panorama. Among the few significant relations, the most interesting is the effect that Chinese consumer confidence and USA consumer confidence had in European health care returns. In addition, the Chinese consumer confidence also affect the returns of European telecommunications, which is also understandable during the pandemic. Europe, Americas and East Asia consumer confidence has no impact on European stock market performance. Oceania's consumer confidence changes only slightly impacts European returns in the sectors of consumer discretionary, energy, and utilities.

Both the USA and European results show world consumers worldwide see the performance on stock markets – both at an aggregate or sector level – as leading indicators that helps to predict the future economy (SMR= $\Rightarrow$   $\Delta$ CCI). Interestingly, consumers from different regions may be more susceptible to the performance of different industries. In addition, and except during the pandemic, there seems to be an investment effect with variations in consumer confidence impacting stock market returns ( $\Delta$ CCI= $\Rightarrow$ SMR).

In terms of the contemporaneous correlations, results show highly significant positive values for the full sample and a wider range of correlation values during the pandemic. Similarly to what we saw in the USA stock market, also in Europe we witness negative correlations for the health sector. Nonetheless, the number and strength of significance is considerably larger when compared to the USA equivalent correlations.

### 4.3 Chinese stock market

For the Chinese stock market, Figures 9 and 10 present the Granger causality results for the full sample and pandemic period, respectively. Tables 5 and 6 present both the Granger causality results and the contemporaneous correlation results. Figure 11 presents a visualisation of the correlation analysis.

Both the USA and European images show a very high level of influence of stock market performance on consumer confidence changes all over the world, which contrasts drastically with Figure 9, top plot. It clearly shows stock performance in Chinese markets, both globally and at industry levels, cannot explain changes in consumer confidence in Europe, USA, Americas, Oceania, or even at a domestic level. Although with the lowest significant level, it seems East Asia consumers' confidence somehow depend on the overall performance of the Chinese stock market. This suggests that East Asian consumers may be investors in Chinese stock markets, and their income is influenced by overall performance of the Chinese market, in particular in the sectors of consumer discretionary, energy, and telecommunications.

Not surprisingly, the number of significative connections between changes in consumer confidence worldwide and Chinese market performance are also small, and sporadically occurring mainly at the industry level. Still, Chinese stock performance seems to depend more on the consumer confidence of European, Americas, and Oceania than on its own domestic confidence. Changes in the Chinese consumer confidence seems to affect only the real estate performance. As for the case of USA and European stock markets, the influence of USA consumer confidence in Chinese stock markets is minor.

Regarding the domestic effect, the Chinese  $\Delta$ CCI only assists in predicting the future movement of the SMR of the real estate sector. In fact, the Chinese stock market is still developing, and its financial performance is not as exposed to consumers' response. For the foreign causality, the results

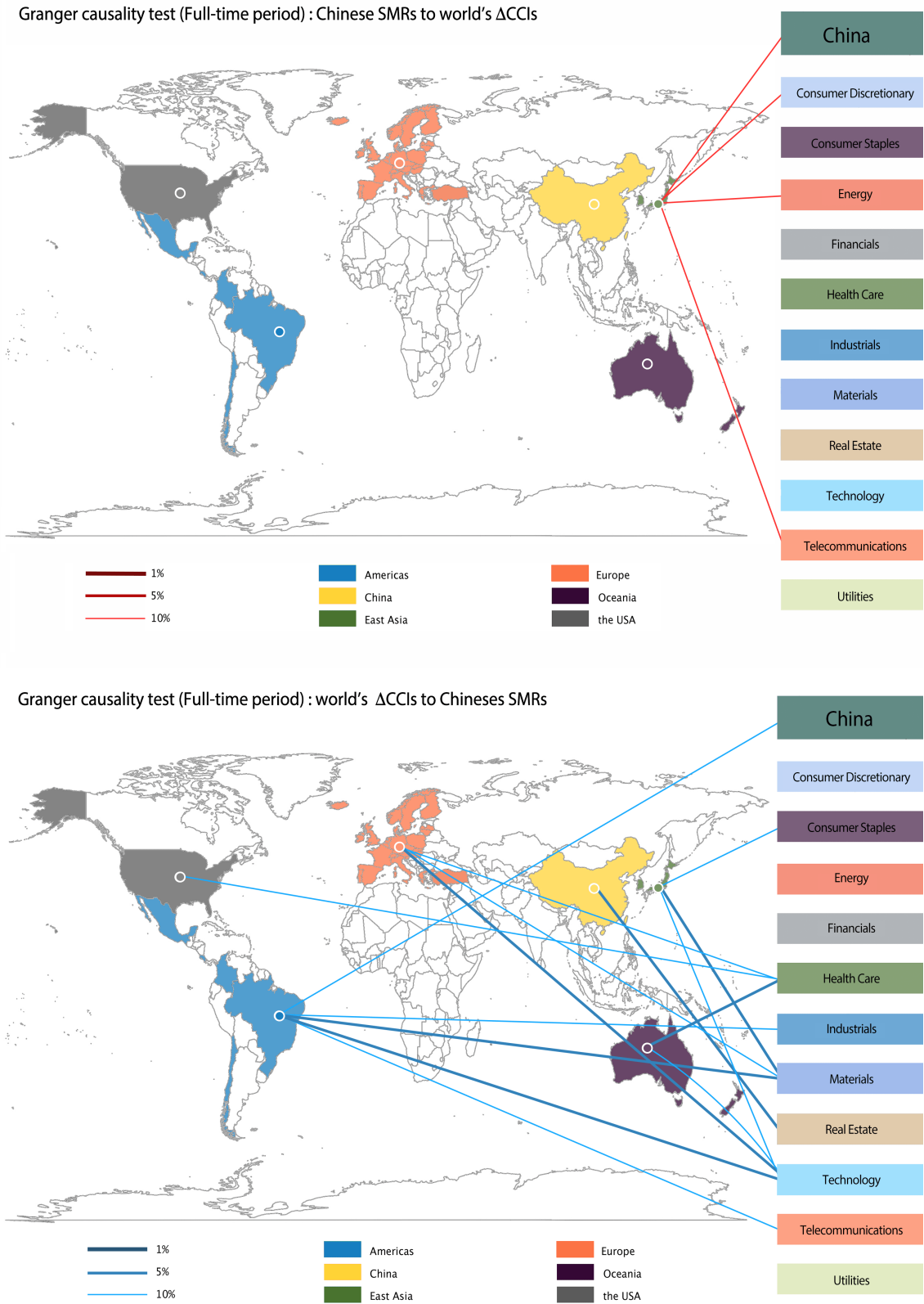


Figure 9: Chinese stock market returns and world's  $\Delta$ CCI, 2007-2021.

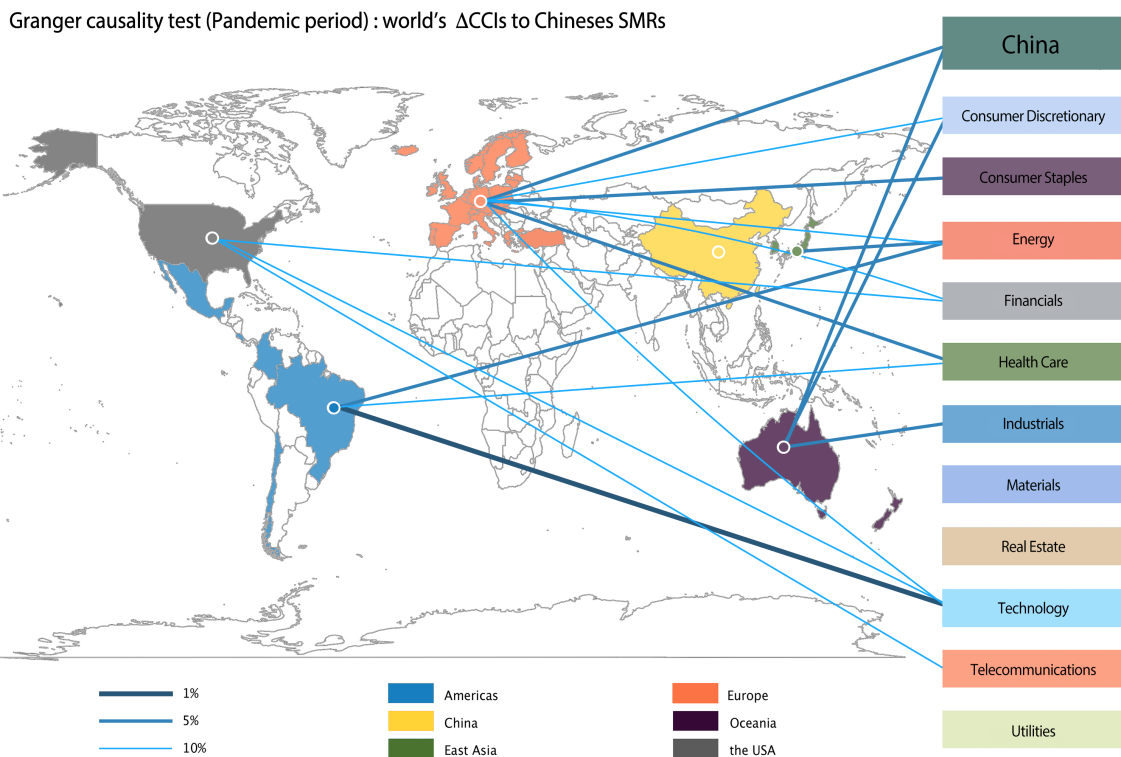
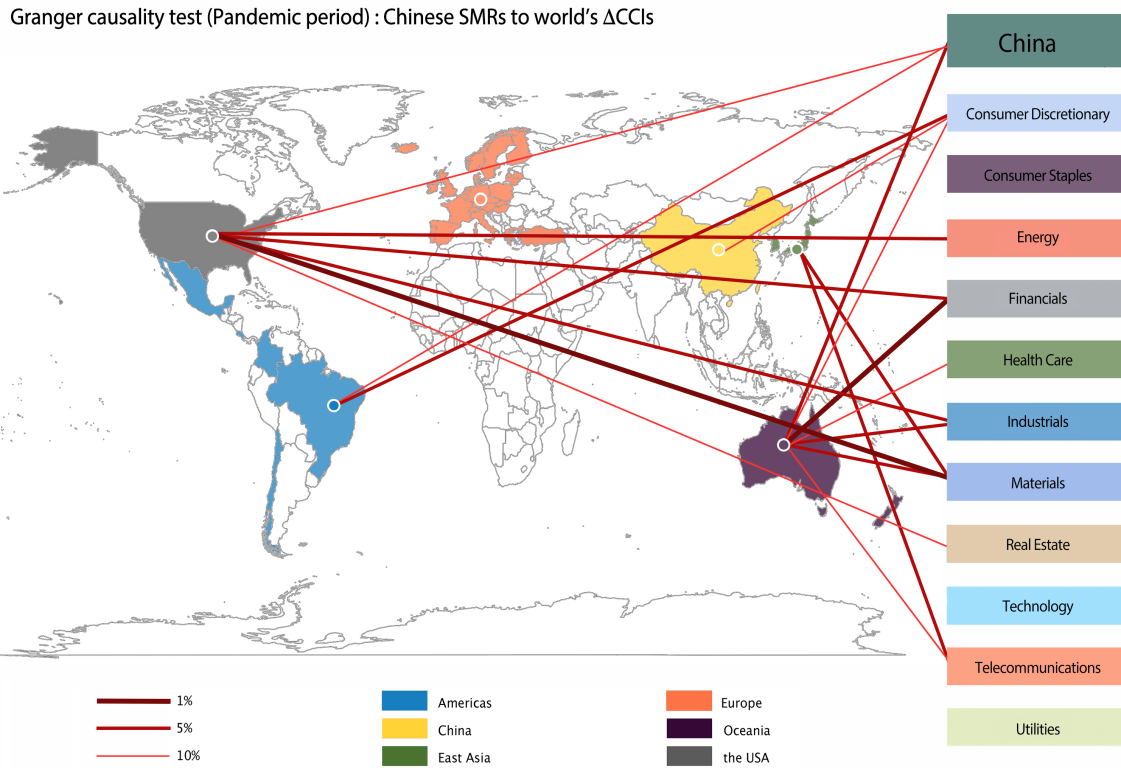


Figure 10: Chinese stock market returns and world's  $\Delta$ CCI, pandemic period 2019-2021.

	Contemporaneous Correlation						Two-way Granger Causality					
	Estimate (t-statistic)						Optimal lag SMR = $\Delta CCI$ (p-values) $\Delta CCI = \Delta CCI$ SMR (p-values)					
	Americas	China	East Asia	Europe	Oceania	USA	Americas	China	East Asia	Europe	Oceania	USA
CSI 300	0.1635 *** 2.2053	0.1560 *** 2.1009	0.2379 *** 3.2588	0.2383 *** 3.2649	0.1088 *** 1.4561	0.0703 *** 0.93746	4 0.8696	2 0.6908	5 0.07253 *	4 0.8418	4 0.8071	4 0.5536
Consumer Discretionary	0.1937 *** 2.6273	0.1715 *** 2.316	0.2751 *** 3.8062	0.2726 *** 3.7693	0.1720 *** 2.3234	0.0781 *** 1.0427	3 0.9993	2 0.8328	5 0.09197 *	3 0.5315	4 0.3662	4 0.7561
Consumer Staples	0.1163 *** 1.5573	0.1015 *** 1.357	0.1492 *** 2.008	0.1350 *** 1.813	0.0629 *** 0.83882	-0.0045 -0.059469	4 0.744	4 0.3881	5 0.6495	4 0.9811	4 0.6959	4 0.9411
Energy	0.1517 *** 2.042	0.1663 *** 2.2432	0.2467 *** 3.3875	0.2005 *** 2.7229	0.0850 *** 1.1348	0.0478 *** 0.63681	3 0.5381	2 0.6111	5 0.08517 *	3 0.6148	4 0.5588	4 0.4623
Financials	0.1441 *** 1.9368	0.1800 *** 2.434	0.2330 *** 3.188	0.2185 *** 2.979	0.1069 *** 1.4307	0.1102 *** 1.4756	3 0.8673	2 0.5353	4 0.2671	3 0.4906	4 0.6961	4 0.5184
Health Care	0.0823 *** 1.0983	-0.0037 -0.049242	0.1465 *** 1.9701	0.1992 *** 2.7039	0.0841 *** 1.1225	-0.0025 -0.033175	3 0.6163	2 0.9392	4 0.3214	3 0.6235	4 0.1255	4 0.47
Industrials	0.1690 *** 2.2816	0.1419 *** 1.9068	0.2003 *** 2.7199	0.2123 *** 2.8907	0.0985 *** 1.3163	0.0532 *** 0.70908	4 0.9388	2 0.7443	5 0.1359	4 0.8532	4 0.8265	4 0.65
Materials	0.1932 *** 2.62	0.1549 *** 2.086	0.2149 *** 2.9268	0.2296 *** 3.1387	0.0855 *** 1.1413	0.0207 *** 0.27542	4 0.9097	2 0.938	5 0.2235	4 0.7012	4 0.6062	4 0.1879
Real Estate	0.1068 *** 1.429	0.1277 *** 1.7131	0.2087 *** 2.8386	0.2183 *** 2.9759	0.0974 *** 1.3021	0.0942 *** 1.2589	3 0.8844	5 0.9095	4 0.3619	3 0.855	4 0.7857	4 0.4567
Technology	0.1864 *** 2.5245	0.0518 *** 0.6904	0.2109 *** 2.8701	0.2332 *** 3.1908	0.0806 *** 1.0758	0.0716 *** 0.95493	3 0.3613	2 0.02702 **	5 0.1289	3 0.2218	4 0.8491	4 0.5051
Telecommunications	0.1220 *** 1.6347	0.0512 *** 0.68272	0.1447 *** 1.9462	0.1549 *** 2.0862	0.0058 0.077257	0.0405 *** 0.5387	3 0.4847	2 0.8786	5 0.06966 *	4 0.9563	4 0.1914	4 0.4123
Utilities	0.0973 *** 1.3008	0.0930 *** 1.2429	0.1292 *** 1.7337	0.1401 *** 1.8828	0.0663 *** 0.88389	0.0417 *** 0.55574	5 0.5074	4 0.6926	5 0.4924	5 0.936	5 0.9045	5 0.2555
							4 0.4227	2 0.5245	4 0.4322	3 0.8367	4 0.5407	4 0.3751

Table 5: Chinese stock market returns and world's  $\Delta CCI$ , 2007-2021.

\*, \*\*, \*\*\* means significance at 10%, 5% and 1%, respectively.

	Contemporaneous Correlation						Two-way Granger Causality					
	Estimate (t-statistic)						Optimal lag SMR = $\Delta CCI$ (p-values) $\Delta CCI = \Delta CCI$ SMR (p-values)					
	Americas	China	East Asia	Europe	Oceania	USA	Americas	China	East Asia	Europe	Oceania	USA
CSI 300	0.0505 0.23176	0.2809 *** 1.3414	0.2594 *** 1.2309	0.1163 ** 0.53675	0.1369 *** 0.6331	0.1444 *** 0.66857	2 0.05992 *	3 0.3804	3 0.1742	2 0.5169	3 0.0275 **	2 0.08571 *
Consumer Discretionary	0.1278 ** 0.59073	0.3986 *** 1.9915	0.3540 *** 1.7347	0.09328968 0.42938	0.4133 *** 2.08	0.2625 *** 1.2466	3 0.0111 **	2 0.0677 *	2 0.2257	3 0.4886	2 0.0558 *	2 0.2063
Consumer Staples	-0.2396 *** -1.131	0.1643 *** 0.76351	-0.0318 -0.1459	-0.0952 * -0.43816	-0.007924516 -0.036316	0.009147591 0.041921	2 0.6729	2 0.9785	2 0.9137	2 0.9391	2 0.1316	3 0.2928
Energy	0.2281 *** 1.0734	0.3637 *** 1.789	0.3071 *** 1.4788	0.2237 *** 1.0516	0.1713 *** 0.79677	0.1741 *** 0.81017	2 0.39075 **	2 0.4485	2 0.8878	2 0.5005	2 0.6219	2 0.04905 **
Financials	0.0562484 0.25817	0.3989 *** 1.9936	0.2834 *** 1.3544	0.05909012 0.27126	0.1713 *** 0.79677	0.1768 *** 0.82297	2 0.16	2 0.965	2 0.8476	3 0.2469	3 0.004367 ***	3 0.01378 **
Health Care	-0.2171 *** -1.0194	-0.06428161 -0.29519	0.01866961 0.08557	0.1358 *** 0.62821	-0.02727786 -0.12505	0.04415248 0.20253	2 0.942	1 0.4145	3 0.253	2 0.5863	2 0.05352 *	2 0.3254
Industrials	0.2758 *** 1.3151	0.2743 *** 1.3069	0.1952 *** 0.91211	0.1104 *** 0.50891	0.07675905 0.3528	-0.004826638 -0.022119	2 0.1411	1 0.1264	3 0.3879	2 0.6285	2 0.04629 **	2 0.04895 **
Materials	0.2367 *** 1.1163	0.1817 *** 0.84696	0.2121 *** 0.99447	0.2082 *** 0.97537	0.1397 *** 0.64651	0.03998541 0.18338	2 0.5146	2 0.5056	3 0.04747 **	2 0.2355	2 0.04965 **	2 0.005134 ***
Real Estate	-0.0607 -0.27885	0.2621 *** 1.2445	0.09538215 0.4391	-0.0708591 -0.32554	0.03356852 0.15392	0.07618977 0.35016	2 0.7531	2 0.6601	2 0.9605	2 0.4171	3 0.3334	3 0.08906 *
Technology	0.0803 0.36922	-0.0598 -0.27455	0.2316 *** 1.091	0.1432 *** 0.66306	-0.0159 -0.073087	0.1194 ** 0.55117	3 0.7214	3 0.3992	3 0.4481	3 0.7217	3 0.1037	3 0.7959
Telecommunications	0.0636 0.29207	-0.1792 *** -0.83453	0.0891 0.40979	0.0295 0.13539	-0.2461 *** -1.1636	-0.014 -0.064239	3 0.1202	3 0.3083	3 0.01915 **	3 0.4059	3 0.07409 *	3 0.9802
Utilities	0.0384 0.17593	0.1878 *** 0.87601	0.1155 ** 0.53288	0.0275 0.1261	-0.0458 -0.21027	0.0673 0.30909	2 0.563	2 0.8421	2 0.5598	2 0.6912	2 0.1177	2 0.09942 *
							3 0.8125	3 0.1527	3 0.5539	3 0.8652	3 0.5976	3 0.4888

Table 6: Chinese stock market returns and world's  $\Delta CCI$ , pandemic period 2009-2021.

\*, \*\*, \*\*\* means significance at 10%, 5% and 1%, respectively.



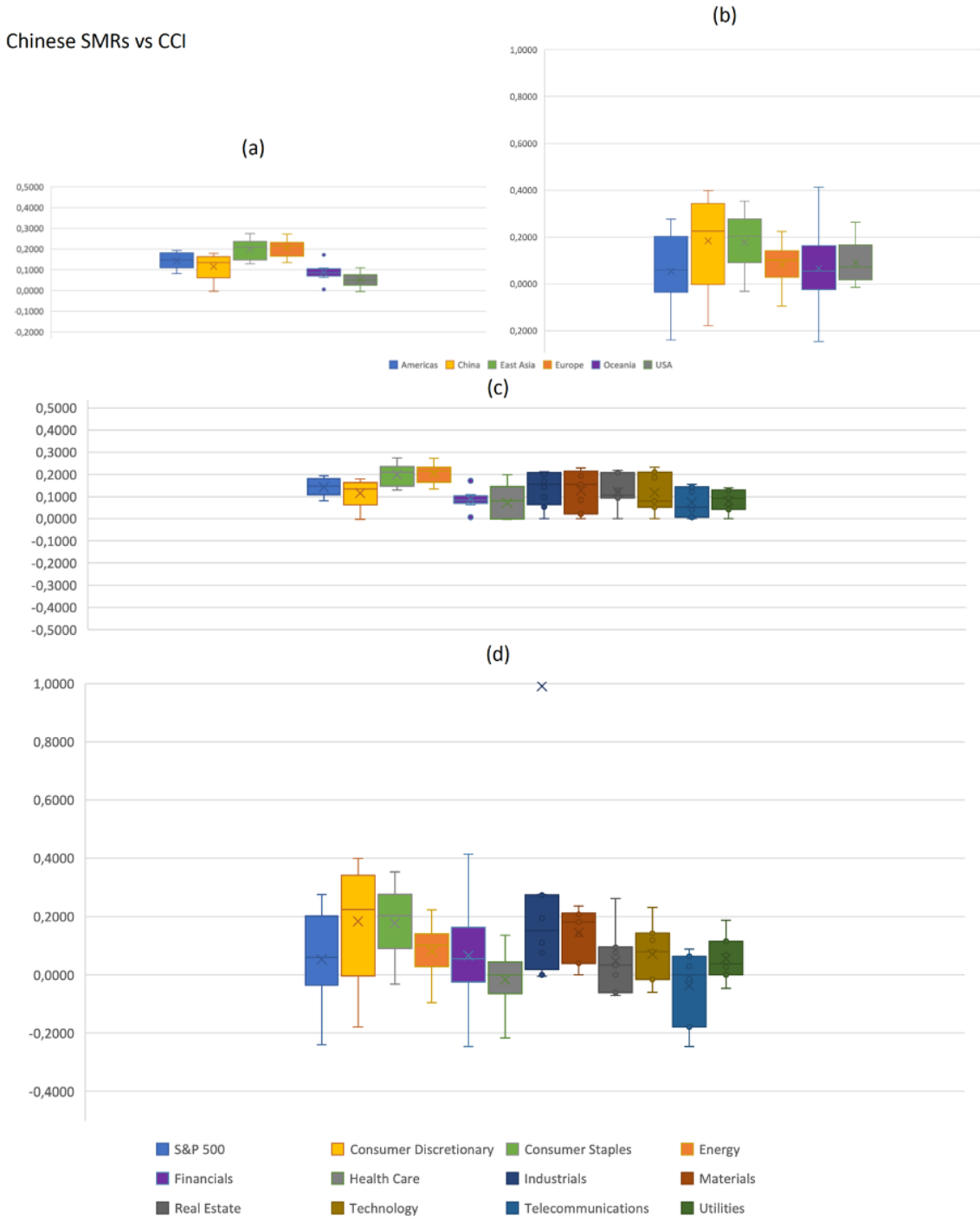


Figure 11: Dispersion of correlations between Chinese SMRs and  $\Delta CCI$ . Per region, across sectors (a) full-sample (b) pandemic period. Per sector, across regions (c) full-sample (d) pandemic period.

show that all foreign  $\Delta$ CCIs have impact on the performance of at least one Chinese stock market sector. We prefer to think that the impact of the foreign  $\Delta$ CCIs on Chinese SMRs is mainly through the consumption channel. In other words, consumers in the other five regions are critical consumers in one or more sectors of the Chinese market. This is because the results in the other direction suggest that foreign  $\Delta$ CCIs cannot be affected by the Chinese SMRs, which denies the hypothesis that foreign consumers are investors in the Chinese market.

Table 6 and Figure 10 demonstrate the relations between Chinese SMRs with the worldwide consumer confidence indices, for the pandemic period. The Granger causality test from SMRs to  $\Delta$ CCIs indicates that all worldwide  $\Delta$ CCIs, except for Europe, are affected by at least one Chinese SMR. In fact, and at odds with the USA and European cases, Chinese stock returns connections increased during the pandemic. Likewise, but in the other direction, there is also no domestic causal connection, but there is at least one causality from each of the other regions. Also here there is an increase of significant connections, when compared to the full-time results. Compare Figures 9 and 10.

The increase in the number of significative connections during the pandemic is not only at odds with what we observed in the other markets, but also with what would be expected from using less amount of data. One possible explanation is the development and rapid growth of the Chinese stock market in recent years that lead to an increase in connections worldwide. So, the pandemic analysis identified relations that now exist, but did not exist in the past when we consider the full sample.

Figure 11 show that for the Chinese stock market, just like for USA and European stock markets, we observe for the full sample a larger number of significative correlation than for the pandemic period. For the full period, 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, while during the pandemic that number reduces to 43. In China we observe more negative correlations than in the other markets. Apart from in health care, it also happens in the sector of telecommunications.

## 5 Conclusion

Previous studies show that consumer confidence index and the stock market performance are positively correlated and may have a two-way Granger causal relationship, see 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 emphasised when investing in developed countries. The world is also increasingly globalised, specially when it comes to financial markets. Thus, the objective of the study is to investigate the relationships between global and sector stock market performance with worldwide consumer confidence changes during not only during the full sample, but also in particular during the pandemic period.

This study examines the relationship between global (six world regions) changes in the consumer confidence indices and twelve global and sector performance of USA, European, and Chinese stock markets from 2007 to 2021.

We use both contemporaneous correlation and Granger causality tests. In general, and for the three markets, we find positive correlations between our two variable: changes in consumer confidence indices ( $\Delta$ CCIs) and stock market returns (SMRs).

In terms of the two-way Granger causal relationships, and for the full time period, we find USA and European markets to be very much connected in both directions (contrary to research by [Salhin et al. \(2016\)](#)). But we also find that the Chinese stock market is much less connected and it is mainly in one

direction, from changes in consumer confidence worldwide to Chinese stock market returns, but not vice versa. Contemporaneous correlations in the full-sample were all positive and highly significant.

During the pandemic period, the results show that there are less significant connections between  $\Delta CCI$  and SMRs for the USA and European stock markets, but the number of connections to the Chinese stock market actually increased. One constant over the three stock markets is the negative correlation with the health care sector. In addition, correlations on the three markets became wider in terms of the range of values assumed.

From the Granger causality tests, our results suggest that, generally, the Granger impact from the SMRs to the changes in consumer confidence ( $SMRs \Rightarrow \Delta CCI$ ) is more substantial during the pandemic period. The causality running in the other direction ( $\Delta CCI \Rightarrow SMRs$ ) reduces its importance 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 explanations are the developing stage of the market, market inefficiency, and the fact institutions, more than average consumers, invest in the stock market.

One limitation of our study is that we only study the stock markets of USA, Europe, and China during 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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## Appendix

	Augmented Dickey-Fuller Test		Phillips-Perron Test	
	Dickey-Fuller	<i>p</i> -value	Dickey-Fuller $Z(\alpha)$	<i>p</i> -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
USA	-4.3864	0.01	-50.841	0.01

Table A1: Unit root tests for  $\Delta$ CCIs.

USA	Augmented Dickey-Fuller Test		Phillips-Perron Test	
	Lag order = 5		Truncation lag parameter = 4	
	Dickey-Fuller	<i>p</i> -value	Dickey-Fuller $Z(\alpha)$	<i>p</i> -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

Europe	Augmented Dickey-Fuller Test		Phillips-Perron Test	
	Lag order = 5		Truncation lag parameter = 4	
	Dickey-Fuller	<i>p</i> -value	Dickey-Fuller $Z(\alpha)$	<i>p</i> -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

China	Augmented Dickey-Fuller Test		Phillips-Perron Test	
	Lag order = 5		Truncation lag parameter = 4	
	Dickey-Fuller	<i>p</i> -value	Dickey-Fuller $Z(\alpha)$	<i>p</i> -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

Table A2: Unit root tests for SMRs.