Journal of Economics, Finance and Accounting Studies
ISSN: 2709-0809
DOI: 10.32996/jefas
Journal Homepage: www.al-kindipublisher.com/index.php/jefas

JEFAS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Stock Market Downturn and Stock Market Concentration

Zeqi Zhang[1], Yunqi Zhang[2] ✉ and Xiaoyu Zhang[3]
[12]School of Finance, Nankai University, Tianjin, China
[3]Sun Yat-Sen University, Guangzhou, China
Corresponding Author: Yunqi Zhang, **E-mail**: zhangyunqi@nankai.edu.cn

| ABSTRACT
As an important component of corporate inequality, stock market concentration has become a focus of attention in academia in recent years. However, existing literature focuses on its negative consequences, and research on the determinants of stock market concentration is scarce. This paper investigates for the first time how stock market downturns affect stock market concentration. Using data on stock markets in both the United States and China, we find a negative correlation between market-wide returns and stock market concentration. To address endogeneity and establish causal inference, we exploit two natural experiments: the COVID-19 pandemic and the subprime crisis. We find that stock market concentration increases during these crises, and we also find some heterogeneity between the United States and China. Our findings have important policy implications regarding inequality during market downturns.

| KEYWORDS
Stock market concentration, inequality, market downturn, COVID-19, subprime crisis.

| ARTICLE INFORMATION
ACCEPTED: 20 April 2023 **PUBLISHED:** 23 April 2023 **DOI:** 10.32996/jefas.2023.5.2.12

1. Introduction

Wealth inequality is one of the most important topics in the field of economics and finance. In addition to conventional literature on income inequality among residents, in recent years, academia has also begun to pay attention to wealth inequality among *corporations*. In a competitive market, market share, technical talent, and profits often gradually accumulate in the most successful companies due to competition among companies. This change is reflected not only in the product market but also in the stock market. In 2015, 50% of the total revenue of listed companies in the United States was equal to the sum of the total revenue of the top 30 companies, and 50% of the total assets were only equal to the sum of the assets of the top 35 companies (Kahle and Stulz, 2017).

The inequality in corporate wealth and the stock market has critical negative consequences. Fogel et al. (2008) show that the stability of the largest companies in a country is negatively correlated with the country's economic growth. Countries with less variation in the composition of large firms experience significantly lower growth rates in per capita GDP and total factor productivity (TFP). Using stock market concentration, Bae, Bailey, and Kang (2021) examine the economic impact of corporate inequality on the financial market. Stock market concentration refers to the proportion of market capitalization occupied by companies with high market value. Their research shows that stock market concentration is closely related to several indicators of economic growth and can predict economic growth in the next few years. Stock market concentration hinders market competition by blocking the financing channels of new enterprises, thereby hindering the sustained growth of the industry and national economy. A highly concentrated stock market also indicates a decline in future innovation levels, including fewer initial public offerings (IPOs), lower patent-to-population ratios, and poorer capital allocation efficiency.

Extant literature focuses on the negative consequences of high stock market concentration, but there is little research on the factors that affect stock market concentration. This paper studies how to market downturns affect stock market concentration, deepens our understanding of this novel indicator, and has important policy implications regarding government intervention during crises.

We use data from listed companies in China and the United States to answer this research question. First, we classify companies into different industries according to the Standard Industry Classification (SIC), take the top ten companies in each industry by market capitalization, and calculate the total market stock concentration by industry market capitalization weighting. We find that stock concentration is negatively correlated with the return on market (industry) indices representing market trends. This indicates that stock market concentration increases when the market downturns. Furthermore, we group companies in the same industry by market capitalization and find that the stock returns of some specific groups are more sensitive to market downturns, which leads to a negative correlation between stock market concentration and market trends.

To address potential endogeneity issues, this article uses the COVID-19 pandemic and the subprime crisis as natural experiments to establish causal inferences. First, we find that market concentration increased during the pandemic, and companies with a market capitalization in the top 20% of their industry had significantly higher stock returns than other companies. Second, the subprime crisis in 2008 was the largest and most widespread financial crisis in the 21st century. We find that stock concentration increased significantly during the financial crisis, and the effects are more pronounced in the United States as it was more affected by the financial crisis than China.

The academic contributions of this paper are mainly in the following aspects. Firstly, this paper enriches our understanding of the relationship between the stock market and economic fundamentals. Bae, Bailey, and Kang (2021) found that the higher the concentration of the stock market, the lower the economic growth rate in the next five years. In contrast, this paper starts from the exogenous changes in the economic fundamental, expands the measurement of stock market concentration, and studies the impact of stock market trends on stock market concentration. Secondly, this paper enriches the research on the inherent connection between corporate *inequality* and the financial market and finds that the downturn of the financial market will exacerbate wealth inequality at the company level.

Our findings hold significant policy implications. Corporate inequality has been on the rise over the past few decades, and the stock market's growth is closely linked to this inequality. The increase in the inequality on the stock market reduces the ability of small firms to raise capital and worsens corporate equality, leading to more income inequality. Our study demonstrates that during crises, corporate inequality in the stock market gets aggravated due to the faster devaluation of small firms' assets. As a result, regulators must consider policies that support small firms during the intervention to prevent the exacerbation of inequality.

2. Literature Review

2.1 Inequality

Earlier research mainly focused on household wealth inequality (Bewley, 1977; Gomez, 2016; Huggett, 1996; Kuhn, Schularick & Steins, 2020; Saez & Zauman, 2016). In recent years, academic has begun to pay attention to corporate inequality. Kahle and Stulz (2017) examined the wealth distribution of US-listed companies from 1975 to 2015. Based on the NAICS industry classification of the three-digit code, industry concentration in the United States in 2015 was more concentrated than before 1995, but not as much as in 1975. Although their research ignored foreign companies that are becoming increasingly significant and private companies, Grullon, Larkin, and Michaely (2019) considered private companies when studying the increase of industry concentration in the United States over the past 20 years and obtained consistent conclusions. Bawania and Larkin (2019), based on Canadian market data, find a trend of increasing concentration of total assets of companies. As the size of the largest companies gradually expands, the distribution of corporate wealth becomes increasingly unequal, which also aggravates the trend of global wage inequality to a certain extent (Mueller et al., 2017).

2.2 The Consequences of Corporate Inequality

Wealth inequality between firms is closely related to multiple research fields such as product market competition, monopoly, mergers and acquisitions, and stock markets. The increases in corporate inequality have the following negative impacts.

The first one is competition. Competition and creative destruction periodically bring profit increases and stock market value surges to small firms. However, in a market with high inequality (and hence less competition), large companies can maintain their advantage by suppressing new companies and their access to capital (Braun and Raddatz, 2008). The gradual concentration of the product market will significantly bring greater profits and valuations to the winner, usually long-established large companies, but will not necessarily increase the overall economic scale (Grullon et al., 2019).

The second one is about regulation. It is common for companies to grow and expand until they influence politics. Zingales (2017) has clearly demonstrated the significant increase in the Herfindahl Hirschman Index (HHI) over the past 20 years, indicating the increase in industrial concentration in the United States. He also suggested that the interaction between corporate power and politics could harm the normal functioning of the free market economy and prevent Congress from passing laws that are unfavorable to them. Secondly, large companies can successfully evade regulation by directly lobbying regulators, and the effect of this lobbying is significant (Lambert, 2015).

2.3 The Inequality in the Stock Market and its Consequences

Recent literature has started to focus on stock market concentration, which refers to the proportion of the highest market capitalization companies in the market capitalization of the entire market. Bae, Bailey, and Kang (2021) have shown that stock market concentration is closely related to several fundamental indicators of economic growth and predicts economic growth in the coming years. Stock market concentration hinders market competition by inhibiting the financing channels of new enterprises, thereby hindering the sustained growth of industries and national economies. High stock market concentration also indicates a decline in future innovation, fewer initial public offerings (IPOs), lower patent-to-population ratios, and poorer capital allocation efficiency.

The limitation of the current literature is that it does not analyze the determining factors that affect stock market concentration. This paper takes the first step in this field and would stimulate more studies in the future.

2.4 Firm Size and Stock Market Performance

Another literature related to this paper is the relationship between firm size and stock returns (Acharya & Pedersen, 2005; Banz, 1981; Berk et al., 1999; Dijk, 2011; Eleswarapu & Reinganum, 1993; Fama & French, 1992; Hou & Dijk, 2018; Hou & Moskowitz, 1985; Keim, 1983; Lamoureux & Sanger, 1989; Pastor & Stambaugh, 2003; Reinganum, 1981). There have been numerous studies in this field. These studies discuss the relationship between firm size and stock returns, as well as the mechanisms behind this relationship. The contribution of this paper is to discuss how the relationship between firm size and stock returns is affected by market conditions.

3. Methodology

3.1 Sample Construction

We obtained the closing prices of the Wind A-Share Index and China Securities FREE Float Index from the Wind database, which serves as the market indicator of the China stock market. We also obtain the closing prices of the NASDAQ Composite Index and Russell 3000 Index. In addition, we obtain closing prices, number of shares, and industry code based on the Standard Industry Classification (SIC) of listed firms in China and the United States from Compustat, all of which are daily data. The sample period is from January 1, 2007, to December 31, 2009, and from January 1, 2014, to December 31, 2020. The data on cases of COVID-19 in China and the United States are from the World Health Organization.

3.2 Definitions of Key Measures

The stock returns used in this paper are the logarithmic returns shown in Equation (3.1):

$$Return_{i,t} = \log\left(\frac{p_{i,t}}{p_{i,t-1}}\right) \qquad (3.1)$$

where $p_{i,t}$ is the closing price of stock *i*.

We denote the circulating market value of each listed firm on day *t* by $v_{1,t}, v_{2,t}, v_{3,t}, \dots, v_{n-1,t}, v_{n,t}$, such that for any *t*, we have $v_{1,t} \geq v_{2,t} \geq v_{3,t} \dots \geq v_{n-1,t} \geq v_{n,t}$

$$v_{i,t} = n_{i,t} * p_{i,t} \qquad (3.2)$$

where $n_{i,t}$ is the number of circulating shares of firm *i* on day *t*, and $p_{i,t}$ is the closing price of firm *i* on day *t*.

The Top50 stock market concentration is defined as:

$$Top50_t = \frac{\sum_{i=1}^{50} v_{i,t}}{\sum_{i=1}^{n} v_{i,t}} \qquad (3.3)$$

The circulating market value for listed firm i in industry *j* on day *t* is defined as $v_{1,1,t}, v_{2,1,t}, v_{3,1,t}, \dots, v_{n-1,m,t}, v_{n,m,t}$, such that for any j and t, $v_{1,j,t} \geq v_{2,j,t} \geq v_{3,j,t} \dots \geq v_{n-1,j,t} \geq v_{n,j,t}$, where *i* could be 1, 2, 3, ….

The stock market concentration of industry *j* is defined as:

$$Industry_{j,t} = \frac{\sum_{i=1}^{10} v_{i,j,t}}{\sum_{i=1}^{n} v_{i,j,t}} \qquad (3.4)$$

The industry-weighted stock market concentration is defined as:

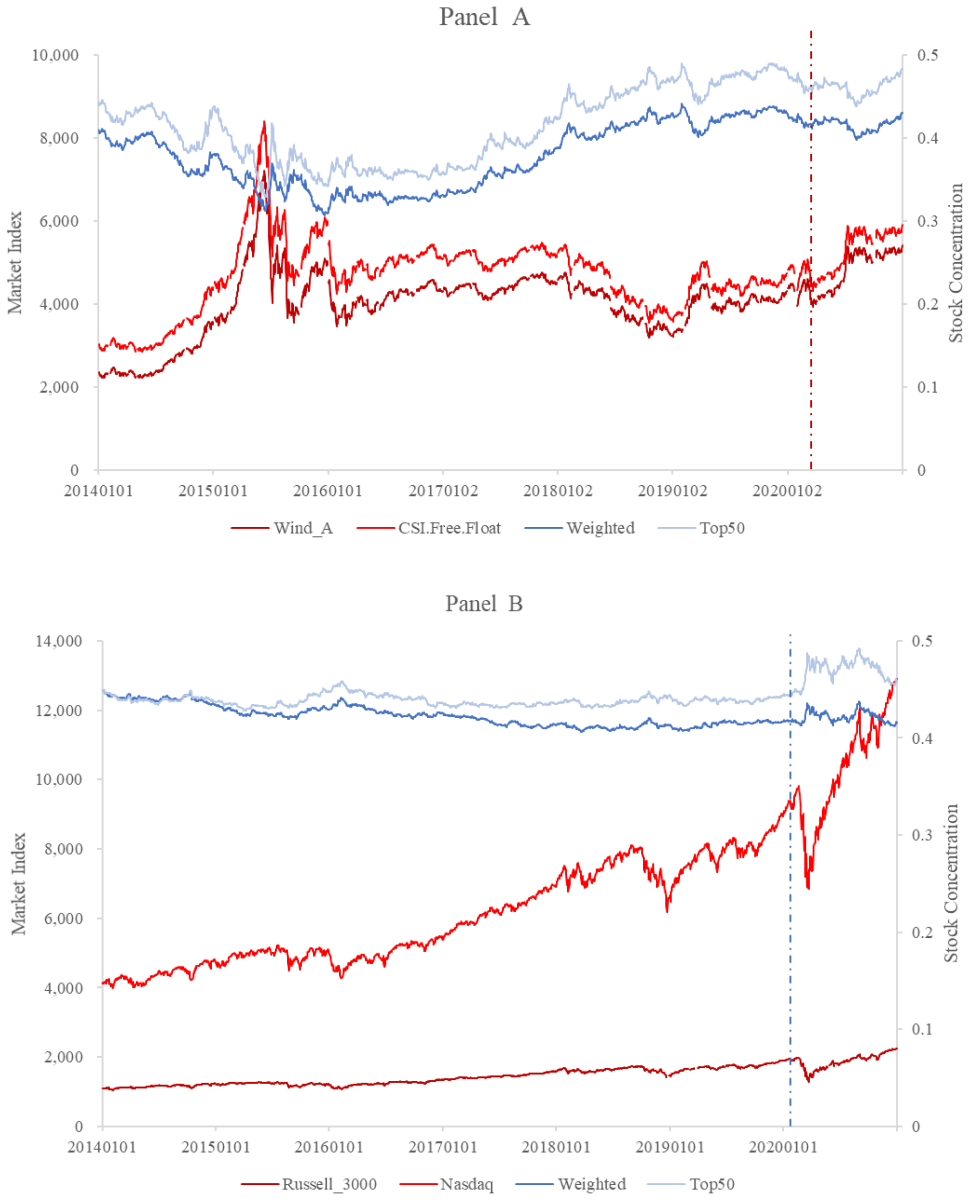
$$Weighted_t = \frac{\sum_{j=1}^{m}\sum_{i=1}^{10} v_{i,j,t}}{\sum_{j=1}^{m}\sum_{i=1}^{n} v_{i,j,t}} \quad (3.5)$$

4. Results and Discussion

4.1 Baseline Results

Following Bae, Bailey, and Kang (2021) [4], we calculated the industry-weighted stock market concentration and the Top 50 stock market concentration from 2014 to 2020. The industry-weighted stock market concentration refers to the proportion of the sum of the market capitalizations of the top 10 companies with the largest market capitalizations *in each industry* according to the SIC to the market capitalization of the entire market, as defined in Equation (3.4). The Top 50 stock market concentration refers to the proportion of the sum of the market capitalizations of the 50 companies with the largest market capitalizations in the entire market to the total market capitalization of all listed companies in the market, as defined in Equation (3.5). For market indices, we selected the Wind A-Share Index for the A-share market and the NASDAQ Composite Index and Russell 3000 Index for the United States market. The trends of stock market concentration and market indices are shown in Figure 3.1, where Panel A is for the A-share market data, and Panel B is for the United States stock market data.

Figure 3.1 Market Trend and Stock Market Concentration



The stock market concentration and market indices in Figure 3.1 show an obvious negative relationship. In Panel A for China, Chinese stocks rose sharply after 2014 and reached a historical high in mid-2015. The Wind A-Share Index reached 7,224 points on June 12, 2015, followed by a sharp drop in the stock market. At the same time, the stock market concentration declined sharply and then rebounded quickly.

In Panel B for the United States, the Top 50 stock market concentration is relatively stable, while the industry-weighted stock market concentration slowly decreased as the stock index rose. The inverse relationship was particularly evident during the COVID-19 epidemic: the Nasdaq Composite Index fell from 9,817 points on February 19, 2020, to 6,861 points on March 23, 2020, and both types of stock market concentration had explosive growth during the same period.

Note after that, the Federal Reserve and the Government intervened in the market, and this negative relationship became *positive*, which indicates that government intervention could make efficiency (market return) *positively* correlated with equality.

We then conduct a rigorous analysis of the weighted stock market concentration on the performance of various stock indices from 2014 to 2020. The Wind A-Share Index was selected for the Chinese market, and the Nasdaq Composite Index was selected for the United States market. $Weighted_t$ represents the proportion of the sum of the market capitalizations of the top 10 companies in each industry to the total market capitalization of all listed companies in the market, as defined in Equation (3.5), and $Index_t$ represents the return of the selected index. The following regression was established:

$$Weighted_t = \beta_1 * Index_t + \varepsilon_t \quad (3.6)$$

Particularly, we remove years in which the market experienced crashes in some of the tests using Equation 3.6 to eliminate the effects of the stock market crisis period. They are 2015 (a serious stock crash) and 2020 (COVID-19) for China, and 2020 (COVID-19) for the United States. We also perform Equation 3.6 on these years separately.

In addition, we group the firms according to the firm's market value within the industry, with a group interval of 20%, and divided them into Bottom, Low, Medium, High, and Top groups. We constructed a categorical variable for each group. We set the Top, Bottom, and non-Top groups (as marked in the table) as the benchmark groups, respectively, and then performed the following regression (Equation 3.7). FE_i and FE_t represent the firm and time-fixed effects, respectively. The regression results of Equation (3.6) are shown in Table 3.1, where Panel A and B are for the Chinese and US stock markets, respectively. The results of Equation (3.7) are shown in Panel C of Table 3.1.

$$Return_{i,t} = \beta_1 * Categorical_i + \beta_2 * Index_t + \beta_3 * Index_t * Categorical_i + FE_i + FE_t + \varepsilon_{i,t} \quad (3.7)$$

Table 3.1 Stock Market Concentration and Index Return

Dependent Variable: Stock Concentration	2014-2020	2015	2016-2019	2020
	(1)	(2)	(3)	(4)
Index	-0.036***	-0.069***	-0.189***	-0.035***
	(0.004)	(0.005)	(0.014)	(0.004)
P-value	0.000	0.000	0.000	0.000
Observations	1707	244	975	243
Adjusted R-squared	0.044	0.441	0.167	0.228
Panel B United States				
Dependent Variable: Stock Concentration	2014-2020	2014-2019	2020	
	(1)	(2)	(3)	
Index	-0.023***	-0.042***	-0.009***	
	(0.001)	(0.001)	(0.002)	
P-value	0.000	0.000	0.000	
Observations	1763	1510	253	
Adjusted R-squared	0.448	0.790	0.047	

Panel C Dummy

Dependent Variable: Stock return	China			United States		
	Top	Bottom	Non-Top	Top	Bottom	Non-Top
	(1)	(2)	(3)	(4)	(5)	(6)
Bottom	-0.004***			-0.025***		
	(0.000)			(0.001)		
Low	-0.003***	0.001***		-0.005***	0.020***	
	(0.000)	(0.000)		(0.001)	(0.001)	
Medium	-0.002***	0.002***		-0.001**	0.024***	
	(0.000)	(0.000)		(0.000)	(0.001)	
High	-0.001***	0.003***		0.000	0.025***	
	(0.000)	(0.000)		(0.000)	(0.001)	
Top		0.004***	0.001***		0.025***	-0.000
		(0.000)	(0.000)		(0.001)	(0.000)
*Index * Bottom*	0.006			-0.742***		
	(0.018)			(0.020)		
*Index * Low*	0.068***	0.063***		-0.547***	0.195***	
	(0.016)	(0.010)		(0.018)	(0.016)	
*Index * Medium*	0.037**	0.032***		-0.106***	0.636***	
	(0.016)	(0.010)		(0.018)	(0.017)	
*Index * High*	0.001	-0.005		0.105***	0.847***	
	(0.014)	(0.013)		(0.015)	(0.015)	
*Index * Top*		-0.006	-0.028*		0.742***	0.322***
		(0.018)	(0.015)		(0.020)	(0.016)
P-value	0.000	0.000	0.000	0.000	0.000	0.000
Time Fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5280569	5280569	5280569	8342220	8342220	8342220
Adjusted R-squared	0.250	0.250	0.249	0.006	0.006	0.004

The results of Panel A and B show that the weighted stock market concentration has a significant negative correlation with stock index returns both in crisis periods (the 2015 Chinese stock crash and the 2020 US-China COVID-19 epidemic) and non-crisis periods. The results of columns (1) and (2) in Panel C show that in the Chinese market, the Low and Medium groups are more sensitive to the market return than the Top Group. These stocks rise faster than the stocks in the Top Group during the bull markets, thus driving down the stock market concentration. However, their value also evaporates more quickly during bear markets or even crisis periods, and the change in their market capitalization is one of the main driving factors for the negative correlation between stock market concentration and market index returns.

The results of columns (4) and (5) reflect that the United States market is opposite to those of China. That may be because the government and the central banks' intervention affected the stock market more in the United States than in China during the COVID, as indicated by Figure 3.1.

4.2 Exogenous Shock: COVID-19 Pandemic

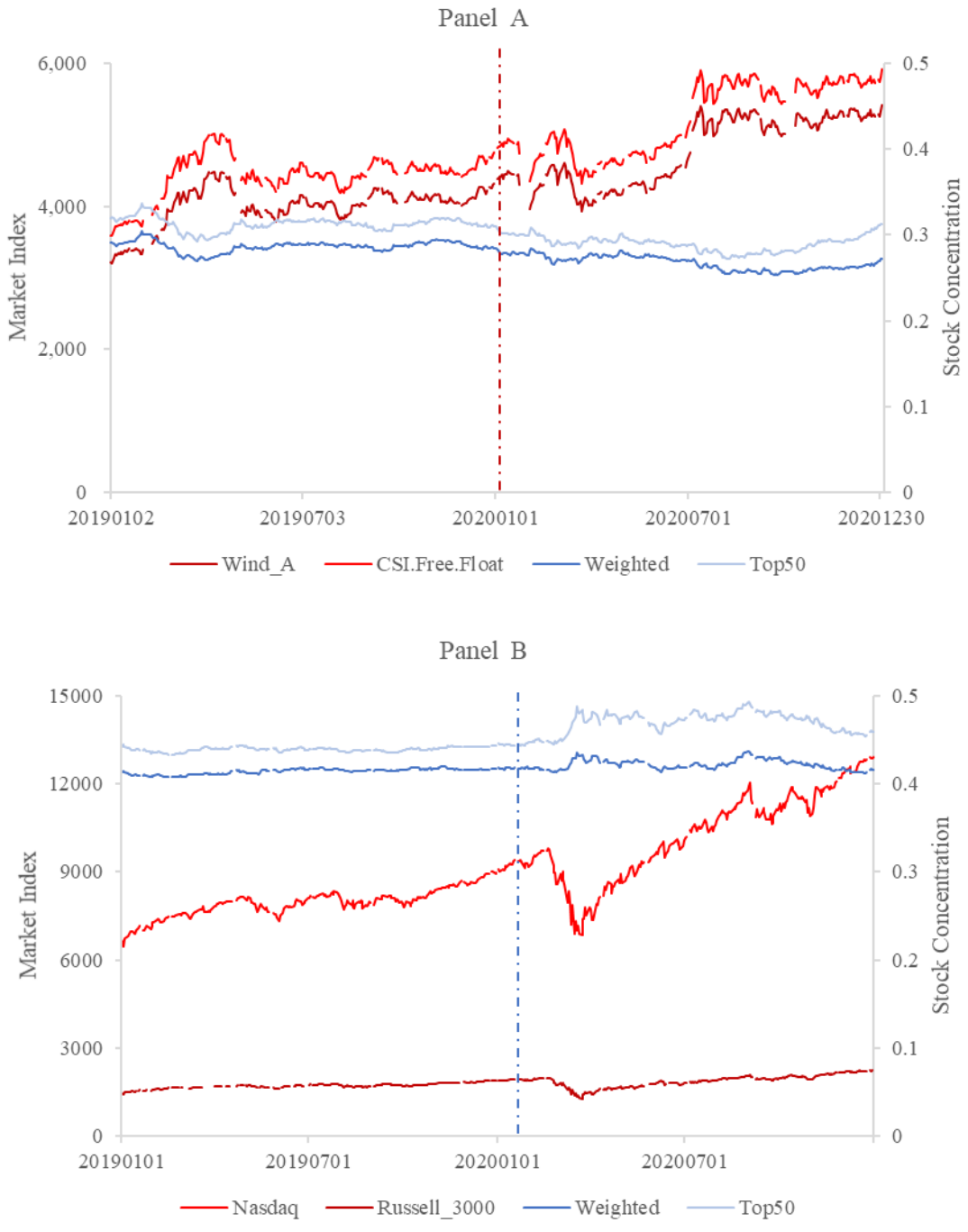
The evidence in the previous sections demonstrates the negative correlation between the stock market concentration and market index returns. In this section, we use exogenous shocks to the stock market to address the potential endogeneity problem and show that this negative correlation is causality.

We first exploit the COVID-19 pandemic as an exogenous shock to the stock market. The crisis led to 18.2 million global excess deaths (Lancet, 2022) and led to a global economic crisis. As a consequence, the COVID-19 pandemic also caused huge fluctuations in stock prices. In the first five months of 2020, the S&P 500 index fell 34% from its high to its low, and stock markets in Brazil,

China, Italy, and Japan experienced low points of 46%, 25%, 41%, and 31%, respectively. We consider the crisis as an exogenous shock to the stock market condition (an exogenous market downturn) and investigate how the stock market concentration is affected.

Figure 3.2 shows the changes in market indices and stock market concentration in China and the United States from January 1, 2019, to December 31, 2020. Panel A shows the changes in the Chinese market, where Wind_A represents the Wind A-share Index, CSI Free Float represents the CSI Free Float Index, and the red dotted line indicates the date of the first reported case of COVID-19 (January 4, 2020). Panel B shows the changes in the United States market, where Nasdaq represents the Nasdaq Composite Index, Russell represents the Russell 3000 Index, and the blue line indicates the date of the first reported case of COVID-19 (January 20, 2020).

Figure 3.2 Market Index and Stock Market Concentration during 2019-2020



Panel A shows that the Chinese stock market experienced two sharp declines in 2020. The first decline occurred after the Wuhan lockdown on January 23, 2020, and the second decline occurred immediately after the United States stock market circuit breaker on March 9, 2020. The crash in the United States stock market was more substantial. Starting from February 19, the Nasdaq Composite Index plummeted from 9,817 points to 6,861 points on March 23, including four circuit breakers from March 9 to March 22.

In both panels, the stock market concentration goes in a way generally opposite that of the index, except after April in Panel B, when the regulators started to intervene in the economy, and the stock market rebounded quickly. Note that this does *not* contradict our main arguments. Instead, it shows how government intervention can mitigate the aggravation of inequality during crises.

We then perform rigorous regression analyses as follows:

$$Return_{i,t} = \beta_1 * Post + \varepsilon_{i,t} \quad (3.8)$$

$$Concentration_{i,t} = \beta_1 * Post + FE_i + \varepsilon_{i,t} \quad (3.9)$$

Where r_{it} represents the return of stock i on day t. $Concentration_{i,t}$ represents the stock market concentration defined in equations (3.3), (3.4), and (3.5). In addition to two stock market concentration measures defined previously, we use *Industry* to denote the stock concentration in each industry, which is the proportion of the market value of the top ten circulating companies in the industry to the total circulating value of all listed companies in the industry. The fixed effect variable FE_i is used in this panel regression to control for industry fixed effects. *Post* is a dummy variable for the COVID-19 crisis period, which is one from the day when the first confirmed case was reported in the country (January 4, 2020, for China and January 20, 2020, for the United States). To eliminate the effects of government intervention, the sample period starts from January 1, 2020, and ends when the two governments begin to intervene in the stock market. The Chinese sample data ends on February 3, 2020, when the People's Bank of China injects RMB 1.2 trillion for reverse repo. The United States sample data ends on March 3, 2020, when the Federal Reserve cut interest rates by 50bp for the first time since the subprime crisis in 2008.

Table 3.2 reports the results. Panel A shows that in both China and the United States, the markets experienced negative returns after the outbreak of the pandemic and before the government intervention. In Panel B, Columns (1), (3), and (5) are for China, and columns (2), (4), and (6) are for the United States. The results show that the stock returns in both China and the United States have generally and significantly declined after the COVID-19 crisis. The Top50 stock market concentration and industry stock market concentration in the United States both show a significant increase, while the results in the Chinese stock market are the opposite. Combined with Figure 3.2, although the decline in the Chinese stock index is significant, the rebound trend is remarkable and persistent, which may be the reason why the data results do not match the hypothesis.

Following Equation (3.7), we introduce a categorical variable associated with the circulating market value of companies into the empirical model, replace *Index* with *Post*, and adopt the sample period of Equation (3.9). Then, we can get the model Equation (3.10). The fixed effect variables FE_i and FE_t represent the firm and time-fixed effects.

$$Return_{i,t} = \beta_1 * Categorical_i + \beta_2 * Index_t * Categorical_i + FE_i + FE_t + \varepsilon_{i,t} \quad (3.10)$$

Table 3.2 Results of the Pandemic Crisis

Panel A		
Dependent Variable: Stock Return	China	United States
	(1)	(2)
Post	-0.013***	-0.006***
	(0.000)	(0.000)
P-value	0.000	0.000
Firm Fixed-effect	Yes	Yes
Observations	94290	343891
Adjusted R-squared	0.011	0.000
Panel B		

Dependent Variable: Stock Concentration	Weighted		Industry		Top50	
	China	United States	China	United States	China	United States
	(1)	(2)	(3)	(4)	(5)	(6)
Post	-0.005***	-0.001**	0.005	0.004**	-0.007***	0.002***
	(0.001)	(0.001)	(0.004)	(0.002)	(0.001)	(0.001)
P-value	0.000	0.027	0.041	0.000	0.000	0.000
Industry Fixed-effect	No	No	Yes	Yes	No	No
Observations	24	42	216	378	24	42
Adjusted R-squared	0.540	0.095	0.996	1.000	0.671	0.305

Table 3.3 Results for the Pandemic Crisis- by Group

Dependent Variable: Stock return	China			United States		
	Top	Bottom	Non-Top	Top	Bottom	Non-Top
	(1)	(2)	(3)	(4)	(5)	(6)
Bottom	-0.027***			-0.171***		
	(0.002)			(0.015)		
Low	-0.019***	0.008***		-0.046***	0.125***	
	(0.002)	(0.001)		(0.007)	(0.014)	
Medium	-0.011***	0.015***		-0.014***	0.157***	
	(0.002)	(0.001)		(0.004)	(0.014)	
High	-0.005***	0.022***		0.000	0.171***	
	(0.002)	(0.002)		(0.003)	(0.015)	
Top		0.027***	0.004***		0.171***	0.004**
		(0.002)	(0.002)		(0.015)	(0.002)
*Post * Bottom*	-0.002***			0.002		
	(0.001)			(0.002)		
*Post * Low*	-0.003***	-0.001		-0.002	-0.004	
	(0.001)	(0.001)		(0.002)	(0.003)	
*Post * Medium*	-0.004***	-0.001**		-0.002***	-0.003*	
	(0.001)	(0.001)		(0.001)	(0.002)	
*Post * High*	-0.002**	0.000		-0.002***	-0.003*	
	(0.001)	(0.001)		(0.000)	(0.002)	
Post Top*		0.002***	0.003***		-0.002	0.001*
		(0.001)	(0.001)		(0.002)	(0.001)
P-value	0.000	0.000	0.000	0.000	0.000	0.731
Time Fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	84751	84751	84751	215513	215513	215513
Adjusted R-squared	0.209	0.209	0.207	0.005	0.005	0.000

Table 3.3 report the results. The results for both China and the United States show that the Top group had the highest return during the COVID-19 period, which indicates that the stock market concentration increased. Particularly, the evidence in Columns

(4) to (6) further validates that the results in Columns (4) to (5) of Panel C in Table 3 do not show a higher return for top firms because the sample period in Table 3.1 includes the period after government intervention. Overall, the results show that the exogenous market downturn increased the stock market concentration.

4.3 Exogenous Shock: Subprime Crisis

The impact of the pandemic on the stock market may differ from conventional financial crises, such as the impact on stocks in different industries. Therefore, we also exploit the subprime crisis as another exogenous shock to study the changes in stock market concentration during the market downturn.

In August 2007, the crisis caused by subprime mortgage defaults started to spread in the financial system and finally evolved into a global financial crisis. Figure 3.3 reflects the trend of the CSI Free Float Index and the Nasdaq Composite Index from January 1, 2007, to December 31, 2009. Both markets witness a downturn after the outbreak of the crisis. Figure 3.4 shows the changes in stock market concentration in China and the United States during the same period.

Figure 3.3 Index Trend during 2007-2009

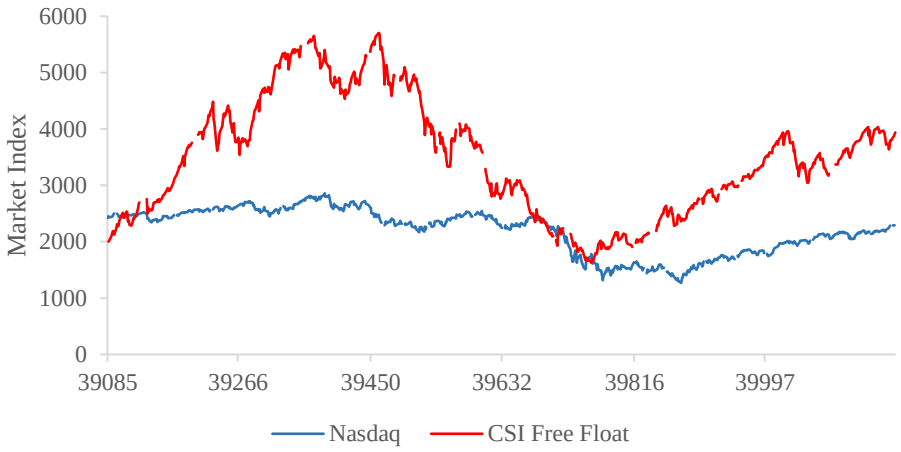


Figure 3.4 Stock Market Concentration during 2007-2009

To minimize the potential impact of confounding factors, we not only need to find an appropriate starting point for the subprime crisis but also need to eliminate the effects of regulator intervention. The starting dates for the subprime crisis period in the two

countries were defined as October 16, 2007 (when the China Security I 300 Index reached a historical peak in the A-share market) and August 6, 2007 (when American Home Mortgage Investment Corporation declared bankruptcy).

As of government intervention, the People's Bank of China (PBC) lowered the benchmark interest rate for one-year RMB loans by 0.27 percentage points, lowered the interest rate for personal housing provident fund loans (less than five years) by 0.18 percentage points, and lowered the reserve requirement ratio for RMB deposits of small and medium-sized financial institutions by 1 percentage point on September 16, 2008. For the United States, October 3, 2008, was the date when the Emergency Economic Stabilization Act of 2008 was passed. Therefore, the ending dates for the sample period are September 16, 2008, for China and October 3, 2008, for the United States.

Table 3.4 Results of the Subprime Crisis

Panel A

Dependent Variable: Stock Return	China	United States
	(1)	(2)
Post	-0.014***	-0.002***
	(0.000)	(0.000)
P-value	0.000	0.000
Firm Fixed-effect	Yes	Yes
Observations	608120	4600344
Adjusted R-squared	0.010	0.001

Panel B

Dependent Variable: Stock Concentration	Weighted		Industry		Top50	
	China	United States	China	United States	China	United States
	(1)	(2)	(3)	(4)	(5)	(6)
Post	-0.003	0.010***	0.011	0.022**	0.009***	0.008***
	(0.003)	(0.000)	(0.013)	(0.009)	(0.003)	(0.001)
P-value	0.392	0.000	0.000	0.000	0.003	0.000
Industry Fixed-effect	No	No	Yes	Yes	No	No
Observations	387	443	3329	4420	387	442
Adjusted R-squared	0.000	0.509	0.861	0.993	0.019	0.317

We perform regressions in Equations (3.3) and (3.4) using the sample period defined above, and the results are shown in Table 3.4. The results show that although there is a general and significant downward trend in stock returns in both China and the United States during the subprime crisis, the increase in stock market concentration in China is not as evident, with only a significant upward trend in the concentration of the Top 50 stocks. This is because the subprime crisis mainly affected China's real economy through imports and exports and had a relatively less significant impact on the overall returns of investment and the A-share market. This may be due to the lower degree of financial market openness and stricter capital controls in China. The results of the United States stock market are consistent with expectations: there is a significant increase in stock market concentration.

5. Conclusion

The objective of this paper is to explore the relationship between stock market downturns and stock market concentration. This paper finds that the overall rate of return of the stock market is negatively correlated with stock market concentration; that is, a stock market downturn will increase stock market concentration. Using the COVID-19 crisis and the subprime crisis as exogenous shocks, we found that stock market concentration increased significantly during the crises, and this increase was because specific-sized enterprises were more sensitive to changes in stock market returns.

The paper contributes to a broad literature on inequality. As an aspect of corporate wealth inequality, stock market concentration has attracted the attention of scholars in recent years. Current research focuses on exploring the negative effects of stock market concentration, but there is little research on the factors that affect it. This paper takes a step in this direction. The findings of this paper explain the impact of market downturns on corporate inequality and have important policy implications.

The limitation of this study is that the underline mechanisms of the relationship between concentration and the market trend are still unclear, which we leave for future research.

Funding: This research received no external funding.
Conflicts of Interest: The authors declare no conflict of interest.
Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

References

[1] Acharya, V. V., & Pedersen, L. H. (2005). Asset pricing with liquidity risk. *Journal of Financial Economics*, *77*(2), 375-410.
[2] Agarwal, S., Lucca, D., Seru, A., & Trebbi, F. (2014). Inconsistent regulators: Evidence from banking. *The Quarterly Journal of Economics*, *129*(2), 889-938.
[3] Bae, K. H., Bailey, W., & Kang, J. (2021). Why is stock market concentration bad for the economy? *Journal of Financial Economics*, *140*(2), 436-459.
[4] Braun, M., & Raddatz, C. (2008). The politics of financial development: evidence from trade liberalization. *The Journal of Finance*, *63*(3), 1469-1508.
[5] Bewley, T. F. (1977). *The Permanent Income Hypothesis and Welfare Economics*. Universitat. Institut fur Gesellschafts-und Wirtschaftswissenschafter.
[6] Bawania, R., & Larkin, Y. (2019). Are Industries Becoming More Concentrated? The Canadian Perspective. *The Canadian Perspective (March 20, 2019)*.
[7] Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics*, *9*(1), 3-18.
[8] Berk, J. B., Green, R. C., & Naik, V. (1999). Optimal investment, growth options, and security returns. *The Journal of Finance*, *54*(5), 1553-1607.
[9] Chan, K. C., & Chen, N. F. (1991). Structural and return characteristics of small and large firms. *The Journal of Finance*, *46*(4), 1467-1484.
[10] Eleswarapu, V. R., & Reinganum, M. R. (1993). The seasonal behavior of the liquidity premium in asset pricing. *Journal of Financial Economics*, *34*(3), 373-386.
[11] Fama, E. F., & French, K. R. (1992). The cross‐section of expected stock returns. *the Journal of Finance*, *47*(2), 427-465.
[12] Fogel, K., Morck, R., & Yeung, B. (2008). Big business stability and economic growth: Is what's good for General Motors good for America? *Journal of Financial Economics*, *89*(1), 83-108.
[13] Gomez, M. (2016). Asset prices and wealth inequality. *Working paper: Princeton*.
[14] Grullon, G., Larkin, Y., & Michaely, R. (2019). Are US industries becoming more concentrated? *Review of Finance*, *23*(4), 697-743.
[15] Hou, K., & Moskowitz, T. J. (2005). Market frictions, price delay, and the cross-section of expected returns. *The Review of Financial Studies*, *18*(3), 981-1020.
[16] Hirshleifer, D. (2001). Investor psychology and asset pricing. *The Journal of Finance*, *56*(4), 1533-1597.
[17] Hou, J., Van Dijk, A. I., Renzullo, L. J., & Vertessy, R. A. (2018). Using modelled discharge to develop satellite-based river gauging: a case study for the Amazon Basin. *Hydrology and Earth System Sciences*, *22*(12), 6435-6448.
[18] Huggett, M. (1996). Wealth distribution in life-cycle economies. *Journal of Monetary Economics*, *38*(3), 469-494.
[19] Keim, D. B. (1983). Size-related anomalies and stock return seasonality: Further empirical evidence. *Journal of Financial Economics*, *12*(1), 13-32.
[20] Kuhn, M., Schularick, M., & Steins, U. I. (2020). Income and wealth inequality in America, 1949–2016. *Journal of Political Economy*, *128*(9), 3469-3519.
[21] Kahle, K. M., & Stulz, R. M. (2017). Is the US public corporation in trouble? *Journal of Economic Perspectives*, *31*(3), 67-88.
[22] Lambert, T. (2019). Lobbying on regulatory enforcement actions: Evidence from US commercial and savings banks. *Management Science*, *65*(6), 2545-2572.
[23] Lamoureux, C. G., & Sanger, G. C. (1989). Firm size and turn‐of‐the‐year effects in the OTC/NASDAQ market. *The Journal of Finance*, *44*(5), 1219-1245.
[24] MacKinlay, A. C. (1995). Multifactor models do not explain deviations from the CAPM. *Journal of Financial Economics*, *38*(1), 3-28.
[25] MacKinlay, A. C. (1995). Multifactor models do not explain deviations from the CAPM. *Journal of Financial Economics*, *38*(1), 3-28.
[26] Mueller, H. M., Ouimet, P. P., & Simintzi, E. (2017). Wage inequality and firm growth. *American Economic Review*, *107*(5), 379-383.
[27] Pástor, Ľ., & Stambaugh, R. F. (2003). Liquidity risk and expected stock returns. *Journal of Political Economy*, *111*(3), 642-685.
[28] Reinganum, M. R. (1981). Misspecification of capital asset pricing: Empirical anomalies based on earnings' yields and market values. *Journal of Financial Economics*, *9*(1), 19-46.
[29] Reinhart, C. M., & Rogoff, K. S. (2008). Is the 2007 US sub-prime financial crisis so different? An international historical comparison. *American Economic Review*, *98*(2), 339-344.
[30] Schwert, G. W. (2003). Anomalies and market efficiency. *Handbook of the Economics of Finance*, *1*, 939-974.
[31] Shelanski, H. A., Solomon, J., & Harty, R. (2012). Merger Enforcement across Political Administrations in the United States. *Howard Shelanski, Jesse Solomon, Ronan P. Harty, Merger enforcement across political administrations in the United States*.
[32] Van Dijk, M. A. (2011). Is size dead? A review of the size effect in equity returns. *Journal of Banking & Finance*, *35*(12), 3263-3274.
[33] Saez, E., & Zucman, G. (2016). Wealth inequality in the United States since 1913: Evidence from capitalized income tax data. *The Quarterly Journal of Economics*, *131*(2), 519-578.
[34] Schmidt, M. I., Duncan, B. B., & COVID-19 Excess Mortality Collaborators. (2022). Estimating excess mortality due to the COVID-19 pandemic: a systematic analysis of COVID-19-related mortality, 2020–21. *The Lancet. London. Vol. 399, no. 10334 (2022), p. 1513-1536*.
[35] Van Dijk, M. A. (2011). Is size dead? A review of the size effect in equity returns. *Journal of Banking & Finance*, *35*(12), 3263-3274.
[36] Zingales, L. (2017). Towards a political theory of the firm. *Journal of Economic Perspectives*, *31*(3), 113-130.