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China's Financial Network with International Spillovers: A First Look

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Abstract

Using a modified spillover index approach from the perspective of financial shocks transmission, this study is the first to explore China's financial institution (FI) network after the global financial crisis, allowing for interactions with the financial sectors of four major global economies. We document that: (1) although banks still dominate China's financial sector, nonbank FIs also bear considerable influence; (2) the market-oriented large commercial banks generally play a more pronounced role than the four state-owned megabanks in transmitting



financial shocks; (3) China's financial sector exerts noticeable influence on the global financial sector, particularly that of Japan; and (4) monetary policy measures dominate in determining the overall influence from other FIs to a particular FI while firm-specific factors dominate in determining the influence of a particular FI on other FIs. These findings have important policy implications.

Key Words

C Systemic risk Financial network Shadow banking Macroprudential regulation

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INTRODUCTION

The 2015 2016 Chinese stock market turbulence triggered global fears over the possibility of another global crisis. 1 The worldwide anxiety again underscored the conventional wisdom prevailing since the 2008 global financial crisis: understanding the mechanism of financial shock transmission among financial institutions (FIs) is crucial to prevent the occurrence and propagation of financial crises, establish efficient regulation and supervision, and promote appropriate asset pricing and risk management (Acharya et al., 2012, 2017; Acemoglu et al., 2012, 2015; Adrian and Brunnermeier, 2016). Unfortunately, despite basic facts underscoring the global importance of China's financial system China has the second-largest stock market in the world and the four biggest state owned Chinese banks (i.e., the Big Four the Industrial and Commercial Bank of China, the Bank of China, the China Construction Bank, and the Agricultural Bank of China) are among the top ten FIs in the world there is no comprehensive study on the financial shock transmission mechanism in China's financial system. This study attempts to fill this gap.

Based on a modified financial network analysis (Diebold and Yilmaz, 2014; Yang and Zhou, 2013), we investigate the network structure and potential determinants of financial shock transmission among China's FIs since the

¹ During the turbulence, the Shanghai stock market had fallen 30% within a month (by July 9, 2015), and eventually lost 50% until the market became tranquil in February 2016. China's stock market slump in 2015 dominated discussions at the October 2015 International Monetary Fund (IMF) annual meeting of global finance ministers and central bankers held in Peru, with participants

Allen et al. (2012) als

of simultaneous foreign exchange and banking/stock market crises, which would impair sustainable economic growth in China.



onset of the 2008 global financial crisis, while controlling for the interactions between China and the four countries with the largest global financial services sectors (i.e., the United States [US], the United Kingdom [UK], Germany, and Japan). Similar to Diebold and Yilmaz, 2014 and Yang and Zhou (2013), we define the systemically important financial institutions (SIFIs) as those having relatively more influence, and thus, positive net influence (influence on others minus influence from others) on other institutions in the financial network. The influence of an FI on other FIs and its net influence in the financial shock transmission network arguably reflect the comparative importance of an FI within the network.

As reviewed below, our study generally falls into the large emerging body of literature on identifying SIFIs using public market data. In this study, we use the stock returns, ² based on a modified approach to the recently developed financial network analysis, to investigate China's financial shocks transmission network and the SIFIs in China, rather than other popular systemic risk measures used in previous studies. ³ This is so because all the current major measures on systemic risk mirror ranking of firms based on market risk or liabilities, which are (largely) reflected in the stock prices (Benoit et al., 2013, 2017).

Our study is particularly similar to Yang and Zhou (2013) and Diebold and Yilmaz, 2014. Yang and Zhou (2013) use credit default swap data to identify

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² As discussed in more detail later in the literature review, recent studies such as Carpenter et al. (2015) suggest good informational quality of stock prices of Chinese listed companies.

³ These are the Marginal Expected Shortfall and the Systemic Expected Shortfall of Acharya et al. (2012), the Systemic Risk Measure of Acharya et al. (2017) and Brownlees and Engle (2016), and the Delta Conditional Value-at-Risks of Adrian and Brunnermeier (2016).



the structure of credit risk network across the major US and EU FIs. Diebold and Yilmaz (2014) use stock returns to investigate the network connectedness among major US FIs based on the proposed network analysis derived from the vector autoregression (VAR) forecast error variance decomposition. Our study can be regarded as using an analytical approach combining the approaches used in these two studies, with special focus on Chinese listed FIs. First, we use the stock returns to investigate the financial transmission network among Chinese listed FIs, based on the modified Diebold and Yilmaz, 2014 network analysis. Following the two-step analytical approach proposed in Yang and Zhou (2013), we then further investigate the relevant determinants of such a network.

The study contributes in two ways. First, we contribute to a further understanding of China's financial system. Currently, the literature argues that China's financial system is still dominated by banks, especially by the Big Four (Allen et al., 2005; Berger et al., 2009; Ayyagari et al., 2010; Allen et al., 2012). As against this, we document a new finding that although banks still dominate China's financial system in terms of transmitting financial shocks, nonbank FIs' shocks already bear considerable influence on banks. This finding provides additional evidence on the importance of China's shadow banking problems during recent years (e.g., Allen et al., 2012; Tobin and Volz, 2018; Yang et al., 2019). Consistent with the importance of nonbank FIs and shadow banking problems, we also document the first empirical evidence that insurance companies in China largely resemble commercial banks on the basis of their stock market performance during the sample period.



We also present new evidence that after the global financial crisis, China's financial sector has surprisingly exerted considerable influence on the financial sectors in the four major developed countries. This influence is especially evident in the Japanese financial sector. Such a finding is intriguing, given the well-documented low correlations between Chinese and major global stock markets, especially between China and Japan (Carpenter et al., 20

controlled, bank-dominated, uniquely relationship-

(Carpenter and

Whitelaw, 2017). 4

Second, we contribute to the growing literature on systemic risk by exploring the transmission network among China's FIs while controlling for the influence from the financial sectors of major economies. Despite the fact that since 2008, four of the ten largest FIs in the world are Chinese, we are the first (to our best knowledge) to attempt a comprehensive examination of the pattern and determinants of financial shock transmission in China. Acemoglu financial system's

The argument is even stronger in the case of China, given the unique features of its financial system, ⁵ as pointed out in Carpenter and Whitelaw (2017).

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⁴ The above features could imply that China's financial sector might be informationally lagging or even still largely segmented from the rest of the world. The existing literature also documents macroeconomic spillover only from the US to China (e.g., Pang and Siklos, 2016) but little from China to the US. However, as correctly pointed out by Carpenter and Whitelaw (2017), we should avoid over-applying research findings developed for the US setting to understand China's distinctive financial system.

⁵ Take Chinese stock markets as an example. Such special features include 1-day minimum holding period, a 10% daily price move limit, short-sale restriction, trading suspension, IPO suspension,



We document a striking new finding that the market-oriented large commercial banks often play a more pronounced role than the Big Four in the financial shock transmission network, despite the latter's predominance in China's banking system. However, the role of these FIs is not static but changes quite dramatically over time. Interestingly, the Big Four do become relatively more influential in terms of financial shock transmission, primarily during turbulent periods (the 2008 financial crisis and the 2015 Chinese stock market crash), compared to tranquil periods. Further, extending many earlier studies (e.g., Yang and Zhou, 2013; Ballester et al., 2016; Helwege and Zhang, 2015), we find that various macroeconomic factors, especially China's monetary policy measures (including the money supply, interbank lending rate, and exchange rate), dominate in determining the influence of others on a particular FI in China. Meanwhile, we also find that firm-specific factors (e.g., leverage, size, and so on) dominate in determining the influence of an FI on other entities (as well as the net influence) in the network of financial shock transmission. These findings are supportive of the argument that microprudential regulation and supervision based on the conventional firmspecific approach are particularly insufficient to ensure financial stability in emerging economies, as underscored by Hahm et al. (2012). The rest of this study is organized as follows. Section 2 reviews the literature. Section 3 describes the data. Section 4 discusses the empirical methodology. Section 5 presents the empirical results. Section 6 further explores various determinants. Section 7 concludes the study.

Whitelaw, 2017). All these unique features point to the real possibility that the findings on the US and other developed countries might or might not apply in China's setting.



From another perspective, there are also various empirical approaches to measure systemic risk that carry direct implications for risk transmission. These approaches include financial index methods (e.g., IMF, BIS, and FSB, 2009; Allahrakha et al., 2015; Glasserman and Loudis, 2015), structural methods based on asset-liability and interbank market data (e.g., Mistrulli, 2011), and the reduced-form approach based on financial market data (e.g., Adrian and Brunnermeier, 2016; Acharya et al., 2012, 2017). The empirical approach adopted in this study is a reduced-form approach similar to Diebold and Yilmaz, 2014 and Yang and Zhou (2013), which can better model the interconnectedness of FIs or risk transmission beyond the tangible business connections. While not without its own limitations, such a capacity to comprehensively capture systemic risk should be valuable, because systemic risk does come from various sources beyond tangible business connections (Benoit et al., 2013, 2017).

On the theoretical dimensions, there may be various considerations or models that can motivate systemic risk and their transmission, where we use financial shocks more or less as a proxy for systemic risk. Allen et al. (2009) point out that there are at least three types of systemic risk that have direct implications for risk transmission among various FIs. Specifically, the first is a common asset shock (e.g., a fall in real estate or stock market prices), while the second may be a contagion where the failure of one FI leads to the failure of another due to investor panics or other psychological factors. The third common type of systemic risk is the failure of one FI that coincides with the failure of many others due to highly correlated portfolios among individual FIs. While Benoit et al. (2017) also discussed largely similar channels of systemic risk



transmissions among FIs (e.g., systemic risk-taking through business operations, contagion), they also made another important point unique to this body of literature that the approach which uses market data may produce systemic measures that are not directly connected to any particular theory, and that these measures could support a more efficient regulation (p. 109). Obviously, a similar point applies in the context of investigating systemic risk transmission.

Finally, similar to this study, Yang and Zhou (2013) point out that the identification of prime senders and receivers of information in the empirical framework of the financial network corresponds well to primary and secondary firms in the theoretical model of Jarrow and Yu (2001). Note also that the current application of Diebold and Yilmaz, 2014 typically does not allow for the role of exchange centers of credit risk information to be potentially systemically important, which is additionally considered in Yang and Zhou (2013).

DATA

We use daily stock return data to investigate the financial shock transmission network among China's FIs. As noted by Huang et al. (2009) and Benoit et al. (2013), using the asset price data of FIs has three advantages: 1) ease of access; 2) price changes incorporate market anticipation, thereby foresight; 3) high frequency, reflecting up-to-date risk transmission architecture, thereby ensuring timely financial regulation and supervision.



We collect the original stock closing prices from the CSMAR database and clean the data as follows. First, we collect the daily stock closing prices of all the financial sector companies traded on China's A-share stock market. The sample period from January 1, 2008 to December 31, 2015 yields a preliminary sample of 51 FIs publicly traded in China. The sample period starts on January 1, 2008, because nearly half of the listed banks in China went public in 2007. 6 Inclusion of more banks is important, as banks are an important source of international propagation of financial shocks (Peek and Rosengren, 1997; Imai and Takarabe, 2011; Cetorelli and Goldberg, 2012; Schnabl, 2012; Kamber and Thoenissen, 2013; Alpanda and Aysun, 2014). Moreover, China's financial system has been traditionally dominated by banks, especially by the Big Four. Hence, the beginning of the sample period enables us to include a sufficient number of listed banks (14 banks, including three of the Big Four) while also facilitating an examination of the impact of the 2008 global financial crisis. As a robustness check below, we also consider an alternative sample period starting on January 1, 2011 which incorporates all the 16 currently listed banks in China (including all the Big Four).

Second, we exclude the institutions that cannot satisfy the following two conditions from the preliminary sample: 1) the stock is continuously traded during the sample period without being suspended for a substantial time period; 2) the missing observations are on average fewer than 20 trading days (one month) per year. Then, we obtain a final sample of 25 FIs (including 14

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⁶ During 2007, the Industrial Bank went public in February, the China CITIC Bank in April, the Bank of Communications in May, the Bank of Nanjing and the Bank of Ningbo in July, and the Bank of Beijing and the China Construction Bank in September.

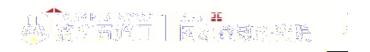


banks) between 2008 and 2015 and 32 FIs (including 16 banks) between 2011 and 2015.

Third, a few missing observations of FIs are replaced by the non-missing values of previous trading days. The stock returns are then calculated as the logarithmic change of the closing prices. As the prices of China's A-share stocks (except the ST-stocks) have been limited to±10% fluctuations during each trading day since December 16, 1996, we replace the return value with 9.531

their basic information, and the summary statistics for their stock returns are presented in Table 1.

Table 1 The Sample and Summary Statistics



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		Company Limited	CL)	601628		hsurance:	-0:0330	2:587	0,0240	
		ce:(Group) Co., Ltd.	CPI	691600		Insurance:	-0:0236	2.676	0,0209	
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0.0213	3.055	Industrial Securities			IS	601377		curities		
0.0426	2.950	Everbright Securities			ES	601788		curities		
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Although the capital account is still under strict control, China is one of the world's largest countries in terms of international trade (ranked number one since 2013). Furthermore, the country holds the world's largest foreign exchange reserves. Trade is an important channel of international transmission of financial shocks. Hence, given strong economic linkages between China and the rest of the world, the empirical results of spillovers on FIs within China may well be biased without controlling for the influence from the global financial sector. Thus, the analysis also includes financial sectors of four major economies, that is, the US, the UK, Germany, and Japan. We obtain the daily US, UK, and German financial sector indices. ⁷ However, we cannot find

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⁷ In the following robustness check, we also consider using bank indices instead of financial sector indices and the basic results remain the same.



a similar composite financial sector index for Japan, as there are four Tokyo Stock Exchange indices that exist separately for banks, securities firms, insurance companies, and other financial firms in Japan. Accordingly, we conducted a principal component analysis to extract the common factors underlying these four indices. The first principal component explains approximately 84% of the variation in these four indices, which is high enough to capture the common movements in the financial sector (Yang and Zhou, 2013). ⁸ We thus use it as a proxy for the financial sector index in Japan. The original data of the UK and Japanese indices are collected from the CEIC database, while the US index data are collected from the website of S&P Dow Jones Indices (http://us.spindices.com/), and the German index data are collected from Bloomberg.

EMPIRICAL METHODOLOGY

We propose a modification to recently developed financial network analysis (Diebold and Yilmaz, 2014) to investigate the transmission of financial shocks among Chinese FIs. The approach is built on forecast error variance decomposition of Generalized Vector Autoregression (GVAR; Pesaran and Shin, 1998; Yang et al., 2006), which provides natural and insightful measures of connectedness to explore the weighted and directed networks (Diebold and Yilmaz, 2014). As the first step, we assume the datagenerating process of the stock returns of Chinese FIs and the financial sectors of the four major foreign

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⁸ The KMO values, which evaluate the soundness of the principal component analysis, are all above 0.8 for the overall principal component analysis and for each of the four indices.



(2)

is the standard deviation of the error term

for the j-th equation and is the selection vector, with the i-th element equal to one, and all other elements equal to zero. The sum of all the elements in each row of the variance decomposition table under the GVAR framework is not equal to one. Therefore, following Yang et al. (2006) and Diebold and Yilmaz, 2014, we normalize each entry of the variance decomposition matrix by its row sum:

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Then, based on such GVAR forecast error variance decomposition, the population financial shock transmission network can be fully shown in the connectedness table. The connectedness table (Table 2) demonstrates the central understanding of the various connectedness measures and their relationships. Its main upper-left N×N block contains the variance decompositions, with dij H

component. Hence, according to Diebold and Yilmaz, 2014, we define the pairwise directional connectedness from j to i as:

(4)

Note that , so there are separate pairwise directional connectedness measures. Then we can define the net pairwise directional connectedness as:

(5)



Table 2 Connectedness Table Schematic

	x_1	x_2		x_N	From others
<i>x</i> ₁	d_{11}^{H}	d_{12}^{H}		d_{1N}^{H}	$\Sigma_{j=1}^{N} d_{1j}^{H}, j \neq 1$
x_2	$d_{21}{}^H$	d_{22}^{H}		d_{2N}^{H}	$\Sigma_{j=1}^{N} d_{2j}^{H}$, $j \neq 2$
:	:	:	N.	:	i i
x_N	d_{N1}^{H}	d_{N2}^{H}		d_{NN}^{H}	$\sum_{j=1}^{N} d_{Nj}^{H}$, $j \neq N$
To others	$\Sigma_{l=1}{}^{N}d_{l1}{}^{H}, i \neq 1$	$\Sigma_{l=1}{}^{N}d_{i2}{}^{H}, i \neq 2$		$\sum_{i=1}^{N} d_{iN}^{H}, i \neq N$	$\frac{1}{N}\sum_{i,j=1}^{N}d_{ij}^{H}$, $i\neq j$

Source: Diebold and Yilmaz (2014).

The total directional connectedness from others to i are defined as:

(6)

The total directional connectedness to others from i is:

(7)

Then, the net total directional connectedness is:

(8)

The total connectedness can be calculated as:

$$-$$
 (9)

According to Diebold and Yilmaz, 2014, the SIFIs in the above connectedness network can be defined as the ones with relatively high total directional connectedness to others and thus positive net total directional connectedness. Then, the time-varying connectedness can be obtained using the fixed rolling window approach. We follow Yang and Zhou (2013) to conduct further analysis for the determinants of such financial shock transmission network, which will be illustrated in detail later.

Finally, some important comments are in order on the modified approach proposed in this study. First, it should be noted that controlling for the



influence from the financial sectors of the four major global economies on individual FIs in China is a significant difference between our empirical framework and the financial network approach proposed by Diebold and Yilmaz, 2014. This modification can thus be expected to improve the informational efficiency and accuracy of the VAR system. Without controlling for the influence from the financial sectors of the major global economies, as pointed by Kilian and Lütkepohl (2017), such a VAR system may suffer from an omitted-variable bias and become informationally deficient.

Second, the modified approach allows for more flexibility in recovering the structure of the financial network. As the financial network is composed of individual FIs, the starting point of the financial network analysis (e.g., Diebold and Yilmaz, 2014; Yang and Zhou, 2013) naturally focuses on the spillovers among individual FIs from the perspective of connectedness. However, unlike previous studies, our modified approach enables us to reveal the structure of financial network based on subgroups of individual FIs (however defined), rather than the information on individual FIs or the aggregate information across all FIs.

FULL SAMPLE RESULTS AND ROBUSTNESS CHECKS

Baseline Results

In what follows, we present the full sample results on the transmission of financial shocks among 25 FIs while controlling for the influences from the financial sectors of the four major global economies (i.e., the US, the UK, Germany, and Japan). Following Diebold and Yilmaz, 2014, we identify the institutions with higher positive net total directional connectedness and higher



total directional connectedness to others in the financial shock transmission network as SIFIs. We also briefly address the total directional connectedness from others when discussing the financial shock transmission network below.

We model the stock returns of the 25 FIs and the financial sectors of the four global economies¹⁰ as a 1-lag VAR system with the optimal lag in Eq. (1) being selected by minimizing the Akaike Information Criterion. 11 Similar to previous studies, we calculate the full sample connectedness based on 10-stepahead (i.e., two weeks) generalized forecast error variance decomposition. Table 3 shows the results echoing the schematic shown in Table 2. The result in Table 3 presents two novel findings concerning China's financial system: 1) the strikingly high total directional connectedness from others; 2) the high total directional connectedness to others and consequently, the high net total directional connectedness of the market-oriented commercial banks compared to the Big Four. In developed countries, business connection or borrowing lending linkage is a major determinant of interconnectedness among FIs (e.g., Acharya et al., 2012; Acemoglu et al., 2012, 2015). Arguably, either business connection or borrowing lending linkage strength may be enhanced in a more developed and integrated financial market. Additionally, an FI may be more influenced by other institutions with more exposure. Compared to the US financial market, the development of China's financial market lags and remains relatively underdeveloped. However, compared to the 70% 82% total directional connectedness from others of US FIs (Diebold and Yilmaz, 2014, Table 3, p. 126), the 89% 92% total directional connectedness from others of

¹⁰ Following Bessler and Yang (2003), the four global financial sectors are modeled on a same calendar day basis with China. We will discuss the nonsynchronous trading problem later.

¹¹ The maximum lag allowed is set to 15 days (3 weeks).



China's major FIs is noticeably higher. A plausible explanation for this phenomenon is that as China's financial system is still strongly controlled by the government, the asset prices of FIs share similar pricing factor, rather than being influenced by stronger inter-institution business connection. The pairwise inter-institution connection actually is indeed lower in China (Table 3) than the US (Diebold and Yilmaz, 2014, Table 3, p. 126). We can still obtain a higher total directional connectedness from others because we include more FIs in our sample and control for the influence from the financial sectors of the four major global economies.

Another interesting result presented in Table 3 is the more pronounced average influence of the market-oriented joint-stock commercial banks compared to the Big Four in the transmission of financial shocks. This finding extends the conventional argument regarding the role of banks as an important source of propagation of financial shocks (Peek and Rosengren, 1997; Imai and Takarabe, 2011; Cetorelli and Goldberg, 2012; Schnabl, 2012; Kamber and Thoenissen, 2013; Alpanda and Aysun, 2014). Although China's financial system is dominated by a large but under-developed banking system, especially the Big Four, the result presented here shows that market-oriented commercial banks (especially Huaxia Bank (HXB), China Merchants Bank (CMB), Industrial Bank (IB), Bank of Ningbo (BN), Ping An Bank (PAB), Bank of Communications (BC), and Shanghai Pudong Development Bank (PDB)) have much higher total directional connectedness to others on average (and thus a higher net total directional connectedness) than the Big Four in terms of financial shock transmission during the sample period. In line with Diebold and Yilmaz, 2014, such a finding would imply that these marketoriented joint-stock commercial banks might also need to receive more



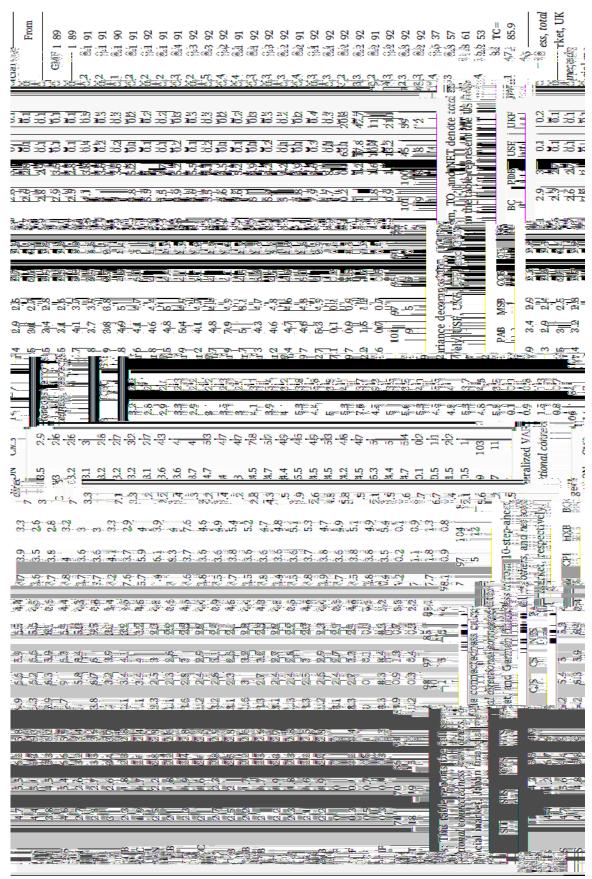
attention in the identification of SIFIs in China, perhaps a reflection of their more aggressive risk-taking culture. The finding is consistent with the recent evidence that the Big Four have dramatically improved their performance and have higher credit quality in their loan portfolio than market-oriented jointstock commercial banks. This has been the case since the commencement of Chinese banking reforms in 2004, when the Big Four had major loan problems (Bailey et al., 2011; Hao et al., 2014). The result is also consistent with the finding that joint-stock banks have the highest persistence in both profit and risk (Lee and Hsieh, 2013). It further extends the evidence that joint-stock banks are the most technically efficient, while larger commercial banks, including the Big Four, are less technically efficient in generating deposits and loans (Huang et al., 2017), as such technical efficiency does not yet address the associated risk issue such as aggressive risk-taking. Anecdotal evidence and news reports indeed verify such a concern for some joint-stock banks. ¹² Moreover, the three FIs in the insurance industry (i.e., PAI, CLI, and CPI) also exhibit an average influence resembling that of the market-oriented commercial banks, consistent with the well-known problem of aggressive risk-taking within the Chinese insurance industry during the sample period.

Table 3 Full Sample Connectedness of 25 Financial Institutions and 4 Major Global Financial Sectors, 2008-2015

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January 19, 2018. The fine was 462 million yuan or \$72 million, and the bad loan involved was 77.5 billion yuan or \$12 billion. Interestingly, Pu Dong was identified as a major sender of risk in this study before the incident was known to the public.







Of course, the more pronounced role of market-oriented joint-stock commercial banks and the emerging influence of nonbank FIs do not mean that Big Four are not important in terms of transmission of financial shocks. Rather, these findings reflect the new



connectedness from the trust, insurance, and banking sectors is approximately 4.4%, 11%, and 39%, respectively. For FIs in the insurance sector, the average total connectedness from the trust, securities, and banking sectors is approximately 2.8%, 23%, and 52%, respectively. For FIs in the banking sector, average total directional connectedness from the trust, securities, and insurance sectors is approximately 2.2%, 17%, and 11%, respectively, with total directional connectedness from nonbank FIs exceeding 30%. Therefore, although China's financial system remains dominated by the banking sector, nonbank FIs also exert considerable influence in the financial shock transmission network. China's financial system, especially the banking sector, also exerts considerable influence on the financial sectors of the four major global economies. The total directional connectedness to the US, UK, Japanese, and German financial sectors from China's banking sector is 1.7%, 11.5%, 20.4%, and 10%, respectively, while it is 0.8%, 5.7%, 12.3%, and 5.3%, respectively, from China's nonbank FIs in aggregate. China's financial sector shows a positive net pairwise directional connectedness to three out of the four global financial sectors (i.e., UK, Japanese, and German). The total directional connectedness to China's financial sector (i.e., the 25 institutions) from the US, the UK, Japan, and Germany is 3.4%, 5.6%, 7.1%, and 4.4%, respectively, while the total directional connectedness to the US, the UK, Japan, and Germany from China is 2.5%, 17.2%, 32.7%, and 15.3%, respectively. The net pairwise directional connectedness between China and 25.6%, and 10.9%,

respectively. Thus, China's financial sector exerts considerable influence on the financial sectors of the major global economies, especially the Japanese financial sector. This may be attributable to China's economic growth, strict



capital controls, and its growing importance in the world economy, particularly in the regional economy.

Table 4 Total Directional Connectedness from Each Sector/Market, 2008-2015

	Total dire	ectional conne	ctedness from						Nonban	ks		
	Trust	Securities	s Insurance	Bank	USF	UKF	JPF	GMF		4G	GFN	
SIT	11	35.6	11	42	0.1	0.2	0.2	0.1	57.6	0.	0.6	
SLS	4.4	48.7	10.5	36	0.1	0.1	0.2	0.1	63.6	0.	0.5	
GYS	4.7	45.9 .	11	37 6	Q.1.	.0.1		_0.1	61.6	0	14	
0.4	HTS	4	43.3	11.4	41	0	0.1	0.2	0.1	58.7		
0.5	PS	4.7	45.7	10.7	38.5	0.1	0.1	0.2	0.1	61.1		
0.5	CJS	4.4	45.1	10.6	39.4	0.1	0.1	0.2	0.1	60.1		
0.6	CS	3.8	40.5	12.1	42.8	0.1	0.1	0.3	0.1	56.4		
0.5	NES	4.6	45.9	10.7	38.5	0.1	0.1	0.2	0.1	61.2		
1.8	PAI	2.7	22.4	20.1	52.6	0.4	0.5	0.5	0.4	45.2		
1.2	CLI	2.8	23.4	20.1	52.3	0.2	0.3	0.4	0.3	46.3		
1.2	CPI	3	23.4	20.1	52.2	0.2	0.3	0.4	0.3	46.5		
0.8	HXB	2.3	17	10.9	68.8	0.1	0.2	0.3	0.2	30.2		
0.7	BOC	1.9	15.4	10.9	71.1	0.1	0.2	0.3	0.1	28.2		
0.7	BON	2.5	18.8	10.5	67.4	0.1	0.2	0.3	0.1	31.8		
1.2	CMB	2	16.3	11.4	68.8	0.2	0.3	0.4	0.3	29.7		
0.9	IB	2.3	17.4	10.7	68.6	0.1	0.3	0.3	0.2	30.4		
1	ICBC	2	15.2	10.8	70.9	0.2	0.3	0.3	0.2	28		
0.6	BN	2.7	19.6	10.3	67	0.1	0.2	0.2	0.1	32.6		
0.7	PAB	2.5	18.1	10.9	67.6	0.1	0.2	0.3	0.1	31.5		
0.8	MSB	2.2	15.9	11	70.1	0.1	0.3	0.2	0.2	29.1		
1	CCB	2	16.3	11.5	69.3	0.2	0.3	0.3	0.2	29.8		
0.8	CB	2.2	17	10.7	69.3	0.1	0.2	0.3	0.2	29.9		
0.8	BB	2.3	16.9	10.9	69.3	0.1	0.2	0.3	0.2	30.1		
1.4	BC	2.1	15.6	11.4	69.4	0.3	0.4	0.4	0.3	29.1		
0.9	PDB	2.2	17.8	10.5	68.6	0.1	0.3	0.3	0.2	30.5		
97.5	USF	0	0.2	0.6	1.7	63.1	20.8	1	12.6	0.8		
82.7	UKF	0.3	2	3.4	11.5	17.8	42.7	3.4	18.8	5.7		
67.2	JPF	0.5	6.1	5.7	20.4	10.4	11	39	6.8	12.3		
84.6	GMF	0.3	1.9	3.1	10	13.2	21.1	3.1	47.2	5.3		

ctor (Trust, Notes: This table reports the total directional connectedness of the 25 financial institutions and 4 global financial sectors from each secure the ab- Securities, Insurance, and Bank) or global financial market (US, UK, Japan, and Germany). USF, UKF, JPF, and GMF in the table a banks: the breviations for the US financial market, UK financial market, Japanese financial market, and German financial market, respectively. Not nonbank financial sector. 4GFM: all four global financial sectors.

Robustness Checks

We conduct several robustness checks on the main results above. The first robustness check is to use the banking sector indices instead of financial sector indices to control for the influence from the financial sectors of the four major global economies. ¹³ As discussed earlier, we focus on bank-dominated China's financial system, and banks can be both an important source of

¹³ We still use the financial sector index for Germany, as we cannot find a readily available banking sector index.



international propagation of financial shocks and an important channel for transmitting them. Accordingly, it might be important to determine whether the transmission pattern of financial shocks among China's FIs will change if we restrict the outside influence only to that from the banking sector, instead of the entire financial sector.

Table 5 Robustness Checks

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63	.53	<u></u>	SLS_	89	7.0		- 1.9	80	70	-19	. 80	71	=	18 _ 9	1	702
88	3 -3	92	90	-2	70		77	7	GYS	91	86	-	5 91	1 80	5 –	5 91
91		93	103	10	70		76	6	HTS	91	91					91
83			86	-6	65		61	-4	PS	90	82			-		
92		93	95	2	70		78	8	CJS	91	90			-		
99		94	106	12	69		72	3	CS	92	97		92			92
86			92	-1	69		71	2	NES	91	85		-			_
	02 10	93	103	10	65		51	-14	PAI	91	94		91			92
	01 9	93	91	-2	66		56	-10	CLI	92	97		92			92
	1 9	93	99	6	65		53	- 12	CPI	92	97	_	92		_	92
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92	103 106	11 14	92 92	103 106	11 14	92-		107 15 108 15		93 94	108	6 14	80 80	95 97	15 17	IB
91	84	-7	91	84	-7	93		37 –		91	79	-12	73	64	-9	ICBC
91	105 مردر	13			_/		0 1ر				- 106	-12	73 -776	75		. BNa
PAB	92	101 9			101		92	103	11		93	102	9	77	80	3
MSB	92	97 5			97 5		92	100	8		92	89	-3	79	87	8
CCB	92	95 3			95 3		92	99	7		92	88	-4	76	76	0
CB	91	91 0			91 (92	94	2		92	81	-11	74	68	-6
BB	92	99 7			99 7		92	101	9		93	95	2	78	82	4
BC	92	101 9			01 9		92	106	14		93	99	6	79	90	11
	02						93	103	11.	_ ,	03	100	3	29		.8,/
16	USF	37	45	8	37	42	5	52		35	-17	51	46	-5	36	52
13	UKF	57	59	2	52	51	_	1 68		40	-28	61	59	-2	51	64
-34	JPF	61	15	-46	53	13	_	40 63		37	-26	57	11	-46	45	11
0	GMF	53	43	-10	49	40	_	9 63		27	-36	51	39	-12	47	47
	HuaT											94	107	13		
	GFS											93	103	10		
	CMS											93	104			
	IS											93	96	3		
	ES											93	101	8		
	AB											92	88	-4		
	EB											93	102	9		
	TC	85.9			85.3			87.3	3			88.6			68.1	

netretones. Mottes Thin solve spects thre extending tional nonnocted ness from which intimates [Form], to the extending the control of the six transmission network obtained from four robust-checks: 1) using the bank index rathe infrancial from four robust-checks: 1) using the bank index rathe infrancial from four robust-checks: 1) using the bank index rathe infrancial from four robust-checks: 1) using the bank index rathe index to control for the infraence-from four global francial sectors (Banking Index): 2) node ing the US_UK_and Germa index (Banking Index): 2) node ing the US_UK_and Germa index (Banking Index): 2) incorporating more francial institutions (32 institutions); and 4) using the first returns filtered by the returns of Shanghai A Share Stock Index (Filtered returns). The results estimated previously (Bas are also presented to facilitate comparison. TC: total connectedness.

The second robustness check investigates the potential nonsynchronous trading problem. In line with Bessler and Yang (2003), our main previous results are based on modeling all financial market data matched on the same



calendar day. Trading in the European (UK and German) and North American (the US) stock markets lags behind China's and Japan's on the same calendar day. Combining this fact with the GVAR forecast error variance decomposition, this implies that the stock markets of Japan and China are the leading markets. Therefore, following Bessler and Yang (2003), we model the US, UK, and German markets as the leading markets in the VAR system as our second robustness check.

The third robustness check is to incorporate more FIS in our sample. During 2008 2015, a number of FIs went public in China, including the last of the Big Four the Agricultural Bank of China. We thus redefine the sample period starting from 2011 rather than 2008 to incorporate seven extra institutions in the sample, which results in 32 FIs during 2011 2015, including all the Big Four.

The fourth robustness check is to examine whether our basic results are mainly driven by the impact of common components or common factors to Chinese FIs, although macroeconomic factors may play a role (as shown below). One might argue that the high detected connectedness among China's FIs may well be caused by common trends of the stock market prices as a proxy for overall expectations of fundamentals, or common factors that drives the stock prices rather than truly reflect interconnectedness. To address this issue, we filter out all of the FIs' stock returns by regressing each return series on the return of the Shanghai A-Share Stock Index and then recast our analysis using the filtered returns.

Table 5 reports the total directional connectedness from others, to others, and the net total directional connectedness of each FI (or sector) extracted from





and call for a more in-depth investigation of the dynamic transmission network of financial shocks below.

The result driven from using FIs' filtered returns shows a mitigated and yet still highly interconnected pattern of Chinese FIs, without changing our main findings. In particular, banks still dominate China's financial sector, and nonbank FIs also bear considerable influence. The market-oriented large commercial banks also still generally play a more pronounced role than the Big Four in transmitting financial shocks. Finally, although the connectedness apparently decrease as we filter out common components of FIs' returns, the results still show positive net pairwise directional connectedness from China's financial sector to the UK, Japan, and German financial sectors. ¹⁵ Thus, the basic results above largely reflect true interconnectedness rather than being mainly driven by common components. In summary, the main results generally remain robust.

DYNAMIC CONNECTEDNESS AND ITS DETERMINANTS

In what follows, we attempt to answer two important questions arising from our previous analysis: 1) Is the transmission of financial shocks among



regulation and supervision, which requires up-to-date information about the dynamic transmission of financial shocks as well as the potential role each FI plays in the network. To this end, similar to Diebold and Yilmaz, 2014, we use a 120-trading-day (one-half year) ¹⁶ fixed rolling window to extract the dynamic connectedness of each FI (or market). Figs. 1, 2, and 3 depict the extracted net total directional connectedness, the total directional connectedness from others, and the total directional connectedness to others for each FI (or market), respectively. These dynamic connectedness patterns re-confirm our previous full sample conclusions while also having several implications for financial regulation and supervision. First, both the total directional connectedness from others (Fig. 2) and the total directional connectedness to others (Fig. 3) change over time, which results in timevarying net total directional connectedness (Fig. 1). These findings imply that the role each institution plays in financial shock transmission also changes over time. The conventional approach of identifying SIFIs based on lowfrequency financial indices (e.g., IMF, BIS, and FSB, 2009; Allahrakha et al., 2015; Glasserman and Loudis, 2015) may fail to capture these dynamic changes. Thus, these indices are hardly able to serve the full purpose of efficient regulation and supervision.

Second, the dynamic financial shock transmission patterns confirm the dominant role of banks in China's financial system as well as the growing importance of nonbanking FIs. Consistent with the full sample result, the dynamic net total directional connectedness of banks exhibits a higher frequency of positive net influence in the financial shock transmission

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¹⁶ In China, trading days of the stock market are roughly 240 days per year, due to additional public holidays such as the 1-week Spring Festival, and so on.



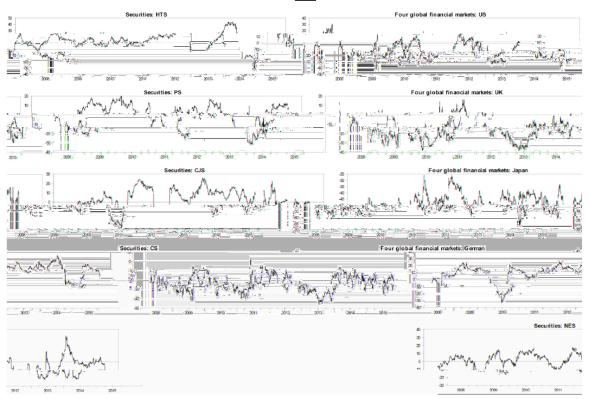
network (Fig. 1-Panel B) than the nonbank FIs (Fig. 1-Panel A). However, the 11 nonbank FIs (especially the three insurance sector FIs and a few institutions in the securities sector) each exert a positive net influence in the financial shock transmission network during most of the sample period.

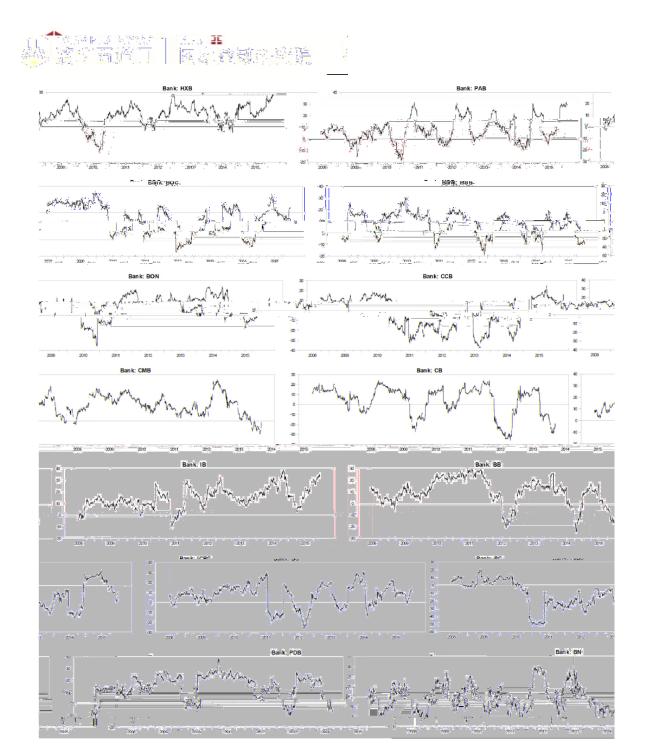
Third, the market-oriented commercial banks have much greater influence than the Big Four in the financial shock transmission network. The SIFIs identified from the previous full sample connectedness table, that is, Huaxia Bank (HXB), China Merchants Bank (CMB), and Industrial Bank (IB) among others, exert a positive net influence more frequently in the financial shock transmission network. Nevertheless, an interesting result of the three incorporated Big Four banks is that they exert a positive net influence during the turmoil period (2008 financial crisis and the 2015 Chinese stock market crash) but a negative net influence during other tranquil periods in the financial shock transmission network.

Figure 1 Dynamic Net Total Directional Connectedness, 2008-2015. A: 11 Nonbank Financial Institutions and 4 Global Financial Sectors B: 14 Banks









Determinants of Dynamic Connectedness

We have investigated the full sample and the dynamic transmission of financial shocks among China's FIs. A natural question is then, what are the major factors that produced such a network? To answer this question, we follow Yang and Zhou (2013) and conduct further analysis. Before conducting



the analysis, we use a 120-trading-day fixed rolling window to extract the total directional connectedness from others, to others, and the net total directional connectedness of each FI using the expanded sample of 32 FIs during 2011 2015. Incorporating more FIs will help facilitate our investigation of the firm-specific determinants. To serve as a further robustness check, as shown in Fig. 4, we verify that the dynamics of net total directional connectedness of the 25 FIs during 2008 2015 and during 2011 2015 are strongly similar, thus confirming again the robustness of the main results above.

Table 6 reports the summary statistics of dynamic total directional connectedness from others, to others, and the net total directional connectedness of the 32 FIs. Again, these summary statistics confirm our previous conclusions: 1) Banks play a central role in the transmission of financial shocks; 2) Nonbank FIs also have a considerable influence in the financial shock transmission network; and 3) Market-oriented commercial banks typically play a more pronounced role than the Big Four in financial shock transmission network. In the following analysis, we will use the connectedness measured at the end of a month (or quarter) to explore how various factors at monthly (or quarterly) intervals could affect the spillover pattern.

Macroeconomic Factors

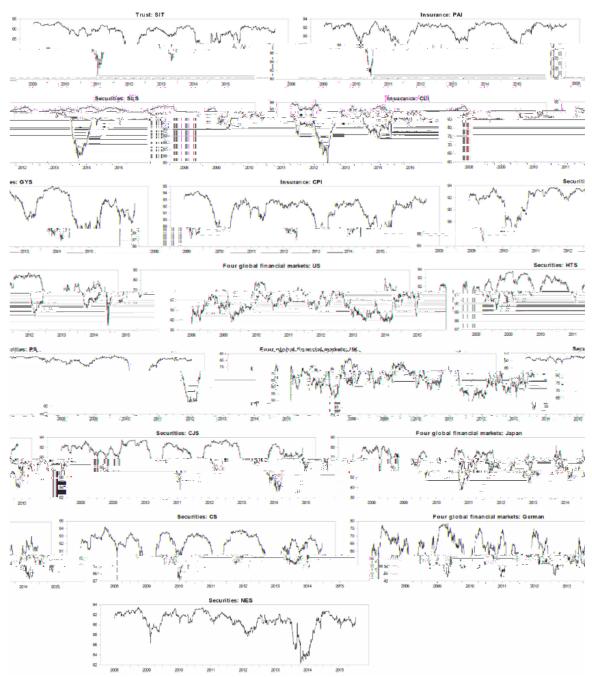
In this section, we will investigate whether the transmission of financial shocks is influenced by macroeconomic factors. The impact of macroeconomic factors on the performance and risk of FIs can be even more pronounced than firm-specific factors, as suggested by Collin-Dufresne et al. (2001). We will comprehensively examine a number of macroeconomic

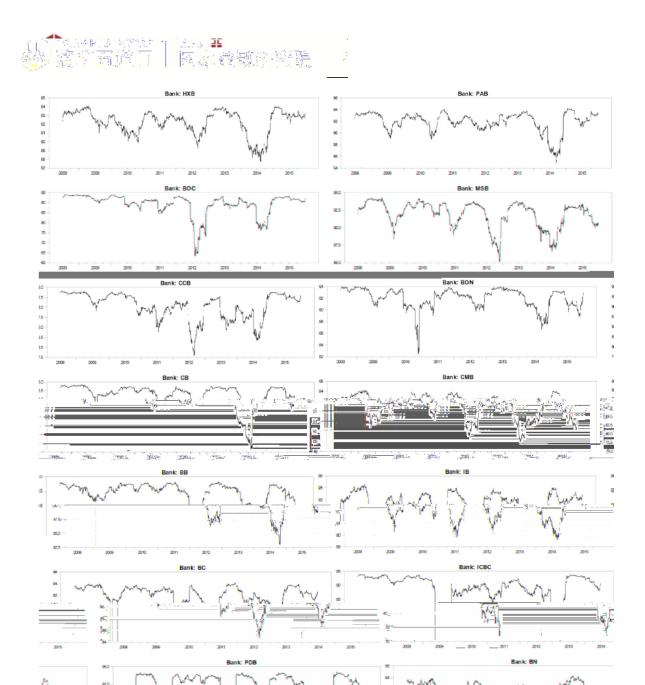


factors in China.¹⁷ Following Yang and Zhou (2013), as a preliminary analysis, we will first use a simple regression based on Newey-West robust standard errors to examine whether a certain macroeconomic factor (or various indicators of the same factor) impacts the connectedness (net, from, to) of an FI with both statistical and (at least some) economic significance. ¹⁸ Then, based on the results of these simple regressions, we will further conduct multiple regressions based on Newey-West robust standard errors to finalize the selection of comparatively important factors, after controlling for collinearity of these factors.

Figure 2







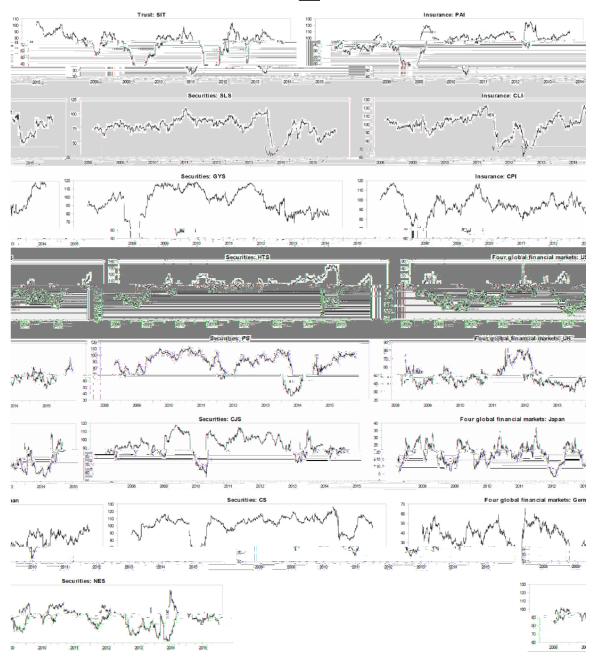
First, we examine whether the transmission of financial shocks is affected by various monetary policy measures. An important monetary measure in China is the money supply, particularly M2 and its various components (quasi money and its three components, i.e., saving deposits, time deposits, and other deposits). As reported in Table 7-A, only quasi money and its component of



other deposits impact total directional connectedness from others with both statistical and economic significance (Panel A of Table 7-A). This finding implies that financial shock transmission is affected by M2, mainly through component.

Figure 3 Dynamic Total Directional Connectedness to Others, 2008-2015. A:11 Nonbank Financial Institutions and 4 Global Financial Sectors B: 14 Banks





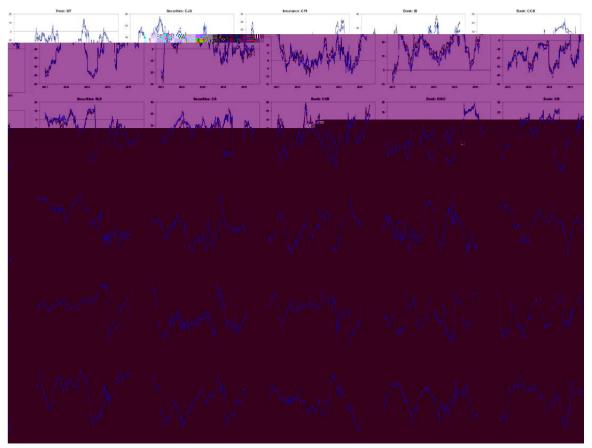


Second, with interest rate liberalization, short-



year. We find that longer-maturity SHIBOR (6-month, 9-month, and 1-year) affect total directional connectedness from others with both statistical and economic significance (Panel B of Table 7-A), with longer-maturity SHIBOR having an even more significant impact on financial shock transmission.

Figure 4 Net Total Directional Connectedness of 25 Financial Institutions Extracted from 2008 to 2015 and 2008-2015 Samples.



Notes: The black line and blue line represent the net total directional connectedness estimated from the 2008-2015 25-financial-institution sample and the 2011-2015 32-financial-institution sample, respectively.

Third, we examine whether the transmission of financial shocks is affected by the development of informal financial systems or the shadow banking system in China. These systems have been suggested as potentially destructive factors in China's financial system (e.g., Allen et al., 2012). Due to poor data



availability, we used a very limited proxy to examine the three most popular informal finance measures in China. These included emerging Internet finance as measured by Yu'e Bao¹⁹ 7-day annualized return as the proxy, the informal credit market measured by the Wenzhou private lending rate (average, automobile, and real estate mortgage), and the shadow banking system as proxied by deposit and portfolio investments of the insurance sector. We found that the Yu'e Bao 7-day annualized return and the Wenzhou private lending rate (especially for automobile mortgage lending) had both statistically and_economically significant impact on the total directional connectedness from others for the transmission of financial shocks (Panel C of Table 7-A).

Fourth, we examine whether the transmission network of financial shocks is affected by the RMB exchange rate with increasing internationalization, as measured by currency swap programs between China and other countries. Years of continuing RMB appreciation and rapid increases in China's foreign exchange reserves suggest there is a large amount which is a potentially destructive force in China's financial system (Allen et

al., 2012). Specifically, we examine the influence of China's real



Table 6 Summary Statistics of Estimated Dynamic Connectedness 2011-2015.

		From				То				Net			
	-torseas	Mean .	Std.D	Min.	. Max.	Mean	Std.D	Mina	-Макы	Margow	Std.D	Minerca	Mov
35909fc —	-3623c	^ ^% <u>5ass</u>	0.700	^ <u>~30</u> 011	0.710	55.45A100		···~#2227.	\		<u></u>		11 Diss./?'''
0.106	0.155	0.505		S_3		0.904	0.055	0.689	0.95	0.798	0.2	0.272	10018
0.067	0.125	0.209	0.264	GYS_		0.932	0.015	0.887	0.954	0.998	0.137	0.701	1.214
=0:157	0.131	0.381	0.441	HTS		0.939	0.008	0.892	0.953	1.096	-0.133	0.555	1.373
-0.037	0.143	-0.408	0.178	PS		0.908	0.059	0.696	0.949	0.872	0.193	0.371	1.124
0.058	0.097	0.266	0.278	CJS		0.931	0.016	0.872	0.952	0.989	0.107	0.621	1.198
0.168	0.092	0.135	0.35	CS		0.94	0.008	0.919	0.953	1.108	0.092	0.803	1.289
0.002	0.104	0.251	0.356			0.927	0.014	0.875	0.946	0.925	0.11	0.669	1.294
0.164	0.091	0.001	0.425	HUAT	ľ	0.939	0.009	0.911	0.952	1.103-	-0.092	0.942	1.359
0.12	0.121	0.117				0.937	0.01	0.905	0.951	1.056	-0.7124	0.813	1.364
0.119	0.12	0.182	0.442	CMS		0.935	0.011	0.898	0.951	1.055	0.124	0.716	1.371
0.082	0.109	0.224	0.271	IS		0.933	0.013-	-0.898	0.949	1.015	-0.116	0.683	-1.198
77//	_(<u>}-</u> ()89 <u></u> -	_0;L	- (): 1.5 a		.937		0.932-4-1		0.901	0.95	1.023	q.1q3 =-	⟨)./ 53.——1
53	-0.083	-0.7075	0.058	0.322	PAI		0.932	0.01	0.203-	-0.947	1.017	0.077	0.875 1
44	0.032	0.129	6.226	0.314	€LI_		0.929	0.012	0.892	0.95	6.961	0.135	0.677
83	0.038	-0.071	-0.105	0.239	-CPI		0.932	-0.011	0.899	0.949	0:969	-0.076	0.824 1
XXzc -	UVES	0.114	0.336	u dud	Noc	BOLL SEE	0.029			O OLO			
==1.212=	0.02	A - H IO.11	6	2260	.273	Bankav	0:52	7 0.02	0.85	3-0:951	0.95	IIIII0:131	IIII0.528
=1.208=	0.10	30.07	/203	0920	.2-78	≣HXB	0.93						0.818
1.16	-0.14	4 0514	190.4	443 0	.22	BOC	().90)				0.761		
1.242 =	0.12	4 0009	95 -0.	1980	.298	=BON	0.93	_	_			0.1	0.734
=1.27=	0.09				.34	CMB	0.93		0.90				
≡ 1.283≡	0∄4				.342	IB	0,93						0.826
1.145_	-0.18				198	ICBC	(),9()						
0.8	94 1.2	64 ();[1,27(0	0.46	0.E0Z/2/=	0:338	BN THE		9380				0650318
O.Z					-0:159 -	0.303	PAB						1990.12
0.6				109f	0.217	0.202	MSB						≥45 0:10
0.4				E155-	-0.428-	0.219	CCB						⁷ 85- 0 .1 8
0.4				11/9	-0.393	0.228	GB						895——0 <i>:2=</i>
0.6				±1.25	0.246=	0#3(03	BB						0:14
0.6				M24	05217	0.284	BC						062 0:13
- 0 1. //	5 1.2	8	0.1160	M14	- O.139	0.342	PDB-		:936 O	.015 03	385 0.	.953 1.0	052-012
0.39	921.1	55 (11111 0	E134	-0.418 <u>-</u>	0.213	AB-		0-9120	.034 0	799 0:	.947().8	KO1 0-16
C]+6	56: 1.9		1=0950	.095	-0 ≥ /3-	0.295	KB=		9350	016 0.8	379-0	951 1.0	03010

Notes: This table reports the summary statistics of estimated dynamic total directional connectedness from others (From), to others (To), and net total directional connectedness (Net) of 32 financial institutions using a 120-trading-day fixed rolling window. Std.D: standard deviation; av.: average.

Fifth, we examine whether the transmission network of financial shocks is affected by the various Banking Climate Indices (BCIs) constructed by the PBOC. BCIs involve a wide range of macroeconomic activities that are closely related to the operation of banks. BCIs also serve as an important reference for financial regulation and supervision in China. We examine the BCIs for the degree of economic overheating, the industry climate, bankers' confidence, money policy sentiment, profitability, demand for various loans



(manufacturing and nonmanufacturing, large, medium, and small and micro enterprises, and so on), and loan approvals. Our findings reveal that only the BCI of money policy sentiment impacts the total directional connectedness from others in the transmission network of financial shocks with both statistical and economic significance (Panel E of Table 7-A).

Sixth, we explore the role of the Chinese real estate market, especially the funding sources of real estate investment. China's booming real estate market, especially its soaring housing prices, has attracted worldwide attention during the past decade. For

from the financial crisis. Allen et al. (2012) noted the potentially destructive outcomes for China's financial system if turmoil emerges in the Chinese real estate market. Nevertheless, our findings do not show that real estate market investment affects the transmission network of financial shocks with either statistical or economic significance. Almost all types of real estate investment funding sources



governments to depend heavily on land transformation and the so-called financial platform firms to finance their public expenditures. Such local government behaviors are deemed as the hands pushing China's booming real estate market, with potentially destructive effects for China's financial system (Allen et al., 2012). Nevertheless, our study results do not reveal that any of these related variables are economically significant (Panel G of Table 7-A).

Table 7 Macroeconomic Factors.



7-A: S	simple re	egressions															
							Net			From				То			
							Estimate	Obs.	adj-R²	Estima	te C	bs.	adj-R ²	Estima	ite Ob	s. adj	-R ²
Panel	A: Mon	ey policy—	-money sup	ply, M2,	, year to y	ear growt	th (%)										
Mone	y supply	7-M2					0.128 (0.446)	1728	-0.000	0.04 (0.065)		728	-0.000	0.082	172	28 -0	.001
M2: (Quasi mo	oney					-0.132 (0.304)	1728	-0.000		0*** 1	728	0.030	- 0.37 (0.334	2 172	28 0.0	01
M2, (Quasi mo	oney: savin	g deposit				-0.078	1728	-0.000		9 1	728	0.001	-0.10	6 172		.000
0.001	M2,	Quasi mon	iey: time de	eposit,				0.019 (0.145)	1728	-0.001	0.00 (0.019	09	1728	-0.000	(0.160	27 17	28
0.000	M2,	Quasi mon	ney: other d	eposit				0.004	1728	-0.001	0.0 – 0.0 – 0.0 0)	19***	1728	0.026	- 0.0 - 0.04	15 17	28
)@snoce	I Dis Silvenowski	osti Hotoatkso	ik (E)/Tiese:	rál 198atirza di	58018CORB <i>(</i> *	960	30.000				9,1			, sv. car.	91	
1:(0)(0))	(f)Appros					·		0.0018	117/248	(0).(0T0)1	0.1622	ox .	717£28 1	-(0):(0)(0)(3)	0.144	1172	28
	-							(0.563)	4.500		(0.07/5	_	-1.500	070.00	(0.619	_	
FOOZ. .635) ^	Lyne	ok	37333.	×				_ n-no1	1778	(0.577)	0-070		1728	0.073) `	-0-02	1173	<u> </u>
0.046 -	1728	-0.001	2 weel	k						-0.106	1728	-(0.059	1728	0.000)
.600)										(0.542)	4500			0.072)	4500		
0.021	1728	-0.001	1 mon	tn						-0.098 (0.578)	1728	-		0.078 0.074)	1728	0.000)
	1728	0,000	.3.mon	th						-0.389	1728	- (,	-0.240*	1728	Q QQ!	·
) <u> </u>			(0:906)``	•										840)			— (0:
10	1728-	0.018	1.224	1728	0.002	——-6-m	onth								1728	0.000	(
3)	1720	0.027	(1.147) - 1.469	1728	0.002	0	onth							.036) 0.749	1728	0.000	(0.
20***																0.000	
	1728		(1.242)	1720	0.002	9 m	onth							.123)			(0.
3) 7 9*** 3)	1728	0.029	(1.242) -1.543 (1.295)	1728	0.002	1 ye	ear el C: Informa				inance, f	olk cr	(1. (1. edit mark	.123) 0.764 .175) et, shadov	w bankin		(0.
3) 79*** 3) 22***	1728 992	0.029	(1.242) -1.543 (1.295) -0.855 (1.238) -0.471	1728 992	0.002	1 ye Pane Yu'e Wen	ear	anualized	return (%	6)	inance, f	olk cr	(1. (1. edit mark – (1.	.123) 0.764 .175) et, shadov 0.333 .089)	w bankin	g system – 0.001 – 0.000	- (0. (0.
20*** 3) 79*** 3) 22*** 3) 56***	1728 992 1376	0.029 0.023 . 0.020 (0:054)	(1.242) -1.543 (1.295) -0.855 (1.238) -0.471	1728 992 1376.	0.002 0.001	1 ye Pane Yu'e Wen	el C: Informa e Bao 7-day a nzhou privat	anualized e lendino	return (%	(6) rane (%)	inance, f		(1. (1. (1. (1. (1. (1. (1. (1. (1. (1.	.123) 0.764 .175) et, shadov 0.333 .089)	w bankin 992	g system 0.001 0.000 (0:4	- (0. 1 - (0. 1 - (0. 1 - (0. 1 + (0.
3) 79*** 3) 22*** 3) 556***	1728 992 1376 Werkt	0.029 0.023 0.020 (0.054) 0.020	(1.242) - 1.543 (1.295) - 0.855 (1.238) - 0.471	992 1376.	0.002 0.001 0.001 0.001	1 ye Pane Yu'e Wen 489)	el C: Inform e Bao 7-day a nzhou ncivat	anualized e lending -0;_3/-4 0.882)	return (%	6) rage (%)	- 0.394 (0.154)	9,5	(1 - (1 edit mark - (1	.123) 0.764 .175) et, shadov 0.333 .089) 0.215	w bankin 992 1376 	g system 0.001 0.000 (0:4	-(0. (0. (0. (43)
3) 79*** 3) 22*** 3) 56***	1728 992 1376 Werkt	0.029 0.023 0.020 (0.054) 0.020	(1.242) -1.543 (1.295) -0.855 (1.238) -0.471	992 1376.	0.002 0.001 0.001 0.001	1 ye Pane Yu'e Wen 489)	el C: Inform e Bao 7-day a nzhou nciyat	anualized e lending =0;_3/-0 0.882) =0.185	return (%	(6) rane (%)	- 0.394 (0.154) 0.095	9,5	(1 - (1 edit mark - (1	.123) 0.764 .175) et, shadov 0.333 .089)	w bankin 992 1376 	g system 0.001 0.000 (0:4	-(0. (0. (0. (43)
3) 79*** 3) 22*** 3) 56***	1728 992 1376 Wenzh	0.029 0.023 . 0.020 (0.054) to!! private	(1.242) -1.543 (1.295) -0.855 (1.238) -0.471.	992 ,, 1376,	0.002 0.0010 ∩ ∩ 1(0	1 ye Pane Yu'e Wen 489)	el C: Informa e Bao 7-day a nzhou nciuat	e lending 6 ending 10; 3/- 0 10: 882) 10: 185 10: 185 10: 185	return (% rate: ave) 1375	6) rage (%)	- 0.394 (0.154)	*	(1 (1. edit mark - (1	.123) 0.764 .175) et, shadov 0.333 .089) 0.215	w bankin 992 1376 	g system 0.001 0.000 (0:4	- ((0. (0. (0. (43) (43) (43) (5) (-)
3) 79*** 3) 22*** 3) 56***	1728 992 1376 Wenzh	0.029 0.023 . 0.020 (0.054) to!! private	(1.242) - 1.543 (1.295) - 0.855 (1.238) - 0.471	992 ,, 1376,	0.002 0.0010 ∩ ∩ 1(0	1 ye Pane Yu'e Wen 489)	el C: Informa e Bao 7-day a nzhou ncixat ()	e lending 0, 3/ 0 0,882) 0,185 0,419) 0,366 5,650)	return (% rate: ave) 1375	-0.000	- %394 (0-154) (0.095 (0.051) - 0.502 (0.772)	*	(1 - (1 - (1 - (1 - (1 - (1 - (1 - (1 -	.123) 0.764 .175) et, shadov 0.333 .089) 0.215	w bankin 992 1376 1376 1376 1376 1376 1376 1376 1376	g system 	- ((0. (0. (0. (43) (43) (43) (5) (-)
3) 79*** 3) 22*** 3) 556***	1728 992 1376 Wenzh Insura	0.029 0.023 0.023 0.020(0:054) 000 private noe sector:	(1.242) -1.543 (1.295) -0.855 (1.238) -0.471.	992 1376	0.002 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001	1 ye Pant Yu'e Wer 489)``` (C363634 346 tgage (%)	el C: Informa e Bao 7-day : nzhou ncivat ((() 3 ()	e lending 6 lending 10; 3/ " 10,882) 10,185 10,419) 13,366	return (% rate: ave; 1375 1376 1728	-0.000	- %394 (0.154) 0.095 (0.051) - 0.502	*	(1 - (1 - (1 - (1 - (1 - (1 - (1 - (1 -	.123) 0.764 .175) et, shadov 0.333 0.89) 0.215	w bankin 992 1376 1376 1376 1376 1376 1376 1376 1376	g system 	-((0. (0. (43) (43) (5)
33) 79*** 33) 22*** 30 556*** 5000	992 1376 Wenzh Insura Insura	0.029 0.023 0.020 0.0541 001 0 varve nou private nce sector: nce sector:	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,e-c.t.ng-2.	992 1376 e: action te: real esit, RMB nvestmer	0.002 0.001 0.001 (0.005) Me*The estate month bin (log-) bit, RMB bit visuages	1 ye Pant Yu'e Wer 489)``` (C363634 346 tgage (%)	el C: Informa e Bao 7-day a nzhou ncivet ((3 ()	anualized e lending 0.882) 0.185 0.419 .366 5.650) .395 2.736)	return (% 1375 1376 1728 1728	- 0.000 - 0.000	- 3394 (0.154); - 0.095 (0.051) - 0.502 (0.772) 0.361 (0.364)	*	(1	.123) 0.764 .175) et, shadov 0.333 .089) 0.215 0.001	w bankin 992 1376 (2.005) 0.281 (0.460) 2.864 (6.257) 1.756 (3.010)	8 system - 0.001 - 0.000 - 0.000 - 0.376 1376 1728	(0. (0. (0. (0. (0. (0. (0. (0. (0. (0.
33) 79*** 33) 22*** 30 556*** 5000	992 1376 Wenzh Insura Insura	0.029 0.023 0.020 0.0541 001 0 varve nou private nce sector: nce sector:	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,0.473,	992 1376 e: action te: real esit, RMB nvestmer	0.002 0.001 0.001 (0.005) Me*The estate month bin (log-) bit, RMB bit visuages	1 ye Pant Yu'e Wer 489)``` (C363634 346 tgage (%)	el C: Informa e Bao 7-day a nzhou ndisel ()	e lending 0.3/ 0.882) 0.185 0.419) 0.366 5.650) .395	return (% 1375 1376 1728 1728	6) Tane (%) - 0.000 0.000	- 3394 (0.154)- 0.095 (0.051) - 0.502 (0.772) 0.361		(1	.123) 0.764 .175) et, shadov 0.333 .089) 0.215	w bankin 992 1376 1376 1376 1376 1376 1376 1376 1376	8 system - 0.001 - 0.000 (0.4 11 1376 1728 1728	(0. (0. (0. (0. (0. (0. (0. (0. (0. (0.
3) 79*** 3) 22*** 3) 556*** 0000 0000	992 1376 Wenzh Insura Insura	0.029 0.023 0.020 0.054) 0.054) 0.054) 0.056) 0.056) 0.056) 0.056) 0.056) 0.056) 0.056) 0.056) 0.056) 0.056)	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,e-c.t.ng-2.	992 1376. 1376. 1376. 1376. 1376. 137	0.002 0.001 0.001 0.001 0.001 only like the more state more bn (log-) ht, RMB by 100)	1 ye Pant Yu'e Wer 489)``` (C363634 346 tgage (%)	el C: Informa e Bao 7-day a nzhou ndisel ()	e lending e lending 0. 3/. 7 0.882 0.185 0.419 0.366 5.650) .395 2.736)	1376 1728 1728 1728	6) 20(-9): -0.000 0.000 -0.000	-0.394 (0.154) -0.095 (0.051) -0.502 (0.772) 0.361 (0.364)	•	(1	.123) 0.764 .175) et, shadov 0.333 .089) 0.215 0.001	w bankin 992 1376 	8 system - 0.001 - 0.000 (0.4 117 1374 1728 1728 1728 - 0	(0. (0. (0. (0. (0. (0. (0. (0. (0. (0.
22************************************	992 1326 Wenzh Insura Insura Panel Real e	0.029 0.023 0.020 (0.054) 1001 be valve 1001 private 11 curre	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,	992 1376. e: zcon te: real e sit, RMB avestmer currency (2010 =	0.002 0.001 0.001 (Given and the control of the	1 ye Pant Yu'e Wer 489)``` (C363634 346 tgage (%)	el C: Informa e Bao 7-day a nzhou ndisel ()	e lending e lending 0. 3/. 7 0.882 0.185 0.419 0.366 5.650) .395 2.736)	return (% rate: ave; 375 1376 1728 1728 1728	-0.000 -0.000 -0.000 -0.000 -1728	- \$394 (0.154) - 0.095 (0.051) - 0.502 (0.772) 0.361 (0.364) - 0.000 - 0.000	· · · · · · · · · · · · · · · · · · ·	(1	.123) 0.764 .175) et, shadou 0.333 .089) 0.215 0.001 0.000 0.001	w bankin 992 1376 	8 system - 0.001 -0.000 (0.4 11 3.7 1376 1728 1728 -0.000 (0.6	(0. (0. (0. (43))) (43)) (43) (43) (43) (43) (43
33) 79*** 33) 222*** 36) 260000 0000 0000 0000 0000 0000 0000	1728 992 1326 Wenzh Wenzh Insura Insura Panel e -0.001	0.029 0.023 0.023 0.020 (0.054) 1000 private note sector: nce sector: D: Exchang fficient exc	(1.242) -1.543 (1.295) -0.855 (1.238) -0.471,	1728 992 1376. e: action te: real esit, RMB nvestmer currency (2010 = 1 week 1 month	0.002 0.001 0.	1 ye Pane Yu'e Wer 4890'' tgage (%)	el C: Informa e Bao 7-day a nzhou ndisel ()	e lending e lending 0. 3/. 7 0.882 0.185 0.419 0.366 5.650) .395 2.736)	1376 1728 1728 1728 1728 1700 10003 10000 100000 100000000000000	6) 7200 (%) -0.000 0.000 -0.000 0.000 1728 0.1728 0.1728	-0.3394 (0.1394) (0.095) (0.051) -0.502 (0.772) 0.361 (0.364) -0.000 -0.000	11 - (11)	(1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (.123) 0.764 .175) et, shadou 0.333 .089) 0.215 .0001 0.000 0.001 1728 1728	w bankin 992 1376 	8 system - 0.001 - 0.000 (0.4 11 1376 1728 1728 1728 - 0 (0.6	(0.001) 1
22**** (3) (3) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	1728 992 1326 Wenzh Wenzh Insura Insura Panel e -0.001	0.029 0.023 0.020 (0.054) 1001 be valve 1001 private 11 curre	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,	1728 992 1376. e: action te: real esit, RMB nvestmer currency (2010 = 1 week 1 month	0.002 0.001 0.	1 ye Pane Yu'e Wer 4890'' tgage (%)	el C: Informa e Bao 7-day a nzhou ndisel ()	e lending e lending 0. 3/. 7 0.882 0.185 0.419 0.366 5.650) .395 2.736)	1376 1728 1728 1728 1728 1728 1728 1728 1728	- 0.000 - 0.000 - 0.000 0.000 0.000 0 1728 0 1728 0 193	- \$394 (0.154) - 0.095 (0.051) - 0.502 (0.772) 0.361 (0.364) - 0.000 - 0.000	· · · · · · · · · · · · · · · · · · ·	(1	.123) 0.764 .175) et, shadou 0.333 0.899) 0.215 0.001 0.000 0.001 1728 1728 1728	w bankin 992 1376 	8 system - 0.001 -0.000 (0.4 11 3.7 1376 1728 1728 -0.000 (0.6	(0. (0. (0. (0. (0. (0. (0. (0. (0. (0.
22**** (i) (i) (ii) (iii) (iii	1728 992 1326 Wer 21 Wenzh Insura Insura Panel Panel	0.029 0.023 0.023 0.020 (0.054) 002 private note sector: nce sector: nce sector: 1 Curro 0.000	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473 -e-c.rag ⁻²	992 1376. e: econ e: real e sit, RMB evestmer currency (2010 = 1 week 1 month	0.002 0.001 0.001 0.001 (0.000) Me Tale bn (log-) ht, RMB b v swaps 100) (%)	1 ye Pantyu'e Wen 4800 Tagge 496 ttgage (%)	el C: Informa e Bao 7-day a nzhou ndisel ()	e lending e lending 0. 3/. 7 0.882 0.185 0.419 0.366 5.650) .395 2.736)	return (% 1375 1376 1728 1728 1728 1728 1728 1728 1728 1728	6) rean (%) - 0.000 0.000 - 0.000 0.000 0.1728 0.1728 0.005	- 13394 (0.154) 0.095 (0.051) - 0.502 (0.772) 0.361 (0.364) - 0.000 - 0.000	· · · · · · · · · · · · · · · · · · ·	(1	.123) 0.764 .175) et, shadou 0.333 .089) 0.215 0.001 0.000 0.001 1728 1728 1728 1728	w bankin 992 1376 	8 system - 0.001 - 0.000, (6) 4 11 13/4 1376 1728 1728 - 0.00 (0.6	(0.0 (0.0 (0.0 (0.0 (0.0 (0.0 (0.0 (0.0
22**** 3) 22*** 5) 2000 000 0 2 1728 1728 1728 1728 1728 1728	1728 992 1326 Wenzh Insura Insura Insura -0.001 -0.001	0.029 0.023 0.023 0.020 (0.054) 100 private noe sector: nee sector: 1 Curro 1 Curro 1000	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,	992 1376. e: econ e: real e sit, RMB evestmer currency (2010 = 1 week 1 month	0.002 0.001 0.001 0.001 (0.000) Me Tale bn (log-) ht, RMB b v swaps 100) (%)	1 ye Pantyu'e Wen 4800 Tagge 496 ttgage (%)	el C: Informa e Bao 7-day a nzhou ndisel ()	e lending e lending 0. 3/. 7 0.882 0.185 0.419 0.366 5.650) .395 2.736)	return (% 1375 1376 1728 1728 1728 1728 1728 1728 1728 1728	6) rean (%) - 0.000 0.000 - 0.000 0.000 0.1728 0.1728 0.005	- 0.394 (0.154) 0.095 (0.051) - 0.502 (0.772) 0.361 (0.364) - 0.000 - 0.000	11 - (11 - 0.00)	(1. (1. (1. (1. (1. (1. (1. (1. (1. (1.	.123) 0.764 .175) et, shadou 0.333 .089) 0.215 .0001 0.000 0.001 1728 1728 1728 1728 1000 114	w bankin 992 1376 	8 system - 0.001 - 0.000 - 0.04 - 0.000 - 0.0007	- ((0. (0. (0. (0. (0. (0. (0. (0. (0. (
22**** 3) 22*** 5) 2000 000 0 2 1728 1728 1728 1728 1728 1728	1728 992 1326 Wenzh Insura Insura Insura -0.001 -0.001	0.029 0.023 0.023 0.020 (G.054) 00 private nce sector: nce sector: nce sector: 1 Curro 1 Curro 1000	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,	992 1376 1376 te: real esit, RMB avestmer currency (2010 = 1 week 1 month	0.002 0.001 0.	1 ye Pantyu'e Wen 4800'' Casasa yd ttgage (%)	el C: Informa e Bao 7-day a nzhou ndisel ()	e lending 9.882 0.1882 0.1885 0.419 0.366 5.650 3.395 2.736)	return (% 1375 1376 1728 1728 1728 1728 1728 1728 1728 1728	6) rean (%) - 0.000 0.000 - 0.000 0.000 0.1728 0.1728 0.005	-0.394 (0.154)- 0.095 (0.051) -0.502 (0.772) 0.361 (0.364) -0.00 -0.00	11 - (11 - 0.00)	(1	.123) 0.764 .175) et, shadou 0.333 .089) 0.215 .0001 0.000 0.001 1728 1728 1728 1728 1000 114	w bankin 992 1376 	8 system - 0.001 - 0.000 - 0.000 1376 1728 1728 - 0.00 - 0.00 - 0.004	(0. (0. (0. (0. (0. (0. (0. (0. (0. (0.
22************************************	1728 992 1326 Werzh Insura Insura Panel Real e -0.001 -0.001 78-01	0.029 0.023 0.023 0.020 (0.054) 002 private note sector: nce sector: 1 Curre 1 Curre 000 000	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473	992 1376. e: ezron te: real e sit, RMB nvestmer currency (2010 = 1 week 1 month	0.002 0.001 0.001 (One of the first term of the content of the	1 ye Pantyu'e Wen 4890: ". Case wa ttgage (%)	el C: Informa e Bao 7-day : nzhou ncivat (() 3 () 0	0.3/ 0.882) 0.185 0.419) .366 5.650) .395 2.736)	return (% 1375 1376 1728 1728 1728 1728 1728 1728 1728 1728	6) rean (%) - 0.000 0.000 - 0.000 0.000 0.1728 0.1728 0.005	-0.394 (0.154)- 0.095 (0.051) -0.502 (0.772) 0.361 (0.364) -0.00 -0.00	11 - (11 - 0.00)	(1 — (1 — (1 — (1 — (1 — (1 — (1 — (1 —	.123) 0.764 .175) et, shadou 0.333 .089) 0.215 0.001 0.000 0.001 1728 1728 1728 1138	w bankin 992 1376 	8 system - 0.001 - 0.000 - (0.4 11 13.74 1728 1728 1728 - 0 (0.6 - 0.00 0.0007	(0. (0. (0. (0. (0. (0. (0. (0. (0. (0.
79*** 33 1728 1728 1728 1728 1728 1728 1728 1728	1728 992 1326 Wenzh Insura Insura Insura -0.001 -0.001	0.029 0.023 0.023 0.020 (0.054) 002 private note sector: nce sector: 1 Curre 1 Curre 000 000	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,	992 1376. e: ezron te: real e sit, RMB nvestmer currency (2010 = 1 week 1 month	0.002 0.001 0.001 (One of the first term of the content of the	1 ye Pantyu'e Wen 4890: ". Case wa ttgage (%)	el C: Informa e Bao 7-day a nzhou ndiset (() 3 () 0	0.3/ 0.882) 0.185 0.419) .366 5.650) .395 2.736)	return (% 1375 1376 1728 1728 1728 1728 1728 1728 1728 1728	6) rean (%) - 0.000 0.000 - 0.000 0.000 0.1728 0.1728 0.005	-0.394 (0.154)- 0.095 (0.051) -0.502 (0.772) 0.361 (0.364) -0.00 -0.00	11 - (11 - 0.00)	(1	.123) 0.764 .175) et, shadou 0.333 .089) 0.215 .0001 0.000 0.001 1728 1728 1728 1728 1000 114	w bankin 992 1376 	8 system - 0.001 - 0.000 - (0.4 11 13.74 1728 1728 1728 - 0 (0.6 - 0.00 0.0007	(0.001 (0
22**** 3) 56*** 6) 0000 0000 2 1728	1728 992 1326 Werzh Insura Insura Panel Real e -0.001 -0.001 78-01	0.029 0.023 0.023 0.020 (C.054) 100 private noe sector: 1 Curr 1 Curr 1000	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,	992 1376. e: ezron te: real e sit, RMB nvestmer currency (2010 = 1 week 1 month	0.002 0.001 0.001 0.001 0.001 0.001 0.001 0.000	Pantyu'e Wen 480) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	el C: Informate Bao 7-day and a property of the control of the con	anualized e lending 10, 37, 7	return (% 1376 1376 1728 1728 1728 1728 1728 1728 1728 1728	6) rean (%) - 0.000 0.000 - 0.000 0.000 0.1728 0.1728 0.005 - 0.012	-0.394 (0.154)- 0.095 (0.051) -0.502 (0.772) 0.361 (0.364) -0.00 -0.00	11 - (11 - 0.00)	(1. (1. (1. (1. (1. (1. (1. (1. (1. (1.	.123) 0.764 .175) et, shadou 0.333 .089) 0.215 0.001 0.000 0.001 1728 1728 1728 1138	w bankin 992 1376 	9 system - 0.001 - 0.000 - 0.000 1376 1728 1728 - 0.00 - 0.00 - 0.00 - 0.00 - 0.00	- ((0.) (0.) (0.) (0.) (0.) (0.) (0.) (0
22**** 33) 22*** 33) 56*** 0000 0 1728 1728 1728 1728	1728 992 1326 Werzh Insura Insura Panel Real e -0.001 -0.001 78-01	0.029 0.023 0.023 0.020 (C.054) 102 by vare 102 private 112 curre 113 curre 114 curre 115 curre 116 curre 117	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473,	1728 992 1376. e: 2001 e: real e sit, RMB evestmer currency (2010 = 1 week 1 month wae; 37 swap: 6	0.002 0.001 0.	1 ye Pantyu'e Wen 4800:: Casesex/d tgage (%) n (log-)	el C: Informa e Bao 7-day : nzhou ncivat (() 3 () 0	9. 37. 9. 9.882 9. 0.185 0.419 0.366 5.650) 3.395 2.736) 0.047 0.070 0.0	return (% 1375 1376 1728 1728 1728 1728 1728 1728 1728 1728	6) rean (%) - 0.000 0.000 - 0.000 0.000 0.1728 0.1728 0.005 - 0.012	-0.394 (0.154)- 0.095 (0.051) -0.502 (0.772) 0.361 (0.364) -0.00 -0.00	11 - (11 - 0.00)	(1. (1. (1. (1. (1. (1. (1. (1. (1. (1.	.123) 0.764 .175) et, shadou 0.333 .089) 0.215 0.001 0.000 0.001 1728 1728 1728 183	w bankin 992 1376 	9 system - 0.001 - 0.000 - 0.000 1376 1728 1728 - 0.00 - 0.00 - 0.00 - 0.00 - 0.00 - 0.00	(0. (0. (0. (0. (0. (0. (0. (0. (0. (0.
22************************************	1728 992 1326 Werz 1 Werz 1 Insura Insura Insura Panel -0.001 -0.001 -0.001 -0.001	0.029 0.023 0.023 0.020 (G.0;4) 000 private nce sector: nce sector: 1 Curr 1 Curr 000 000 000 2 -0.00 (0.0)	(1.242) -1.543 (1.295) -0.855 (1.238) -0.473	9921376. e: zaron e: real e sit, RMB nvestmer currency (2010 = 1 week 1 month swap: 6	0.002 0.001 0.001 (0.003/16**Tick to not in (0.003) to not in (0.003) (%) 100) 100) 100)	1 ye Panet E: B BCF degree	el C: Informa Bao 7-day : nzhou ncivat ()	0.347 0.419 0.419 0.419 0.419 0.419 0.47 0.700 0.47 0.0700	return (% 1375 1376 1728 1728 1728 1728 1728 1728 1728 1728	6) rean (%) - 0.000 0.000 - 0.000 0.000 0.1728 0.1728 0.005 - 0.012	-0.394 (0.154)- 0.095 (0.051) -0.502 (0.772) 0.361 (0.364) -0.00 -0.00	11 - (11 - 0.00)	(1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (.123) 0.764 .175) et, shadov 0.333 .089) 0.215 0.001 0.000 0.001 1728 1728 1728 1728	w bankin 992 1376 	8 system - 0.001 - 0.000 - 0.000 1728 - 1728 - 0.000	(0. (0. (0. (0. (0. (0. (0. (0. (0. (0.



	Mot	196.		Fine		п.яг.		т_	£1	
adj-R ²		Esti	mate	Obs.	adj-R²	Estima	te C	bs. adj-	R ² Esti	mate
-0.001	BCI: bankers' condifence	-0. (0.0	002 63)	1728	-0.001	0.003		728 -0	0.00	
-10 C YEAR	ere III III upa alimpe <mark>ja sjerojna</mark> n.	0.700		\$48°			II seed			-
1790	DCI DecCtability			0710	1790	0.600	(0:01		າດ ດດາ	(C
1728	0.000 BGI:-Profitability			0.041	1728	-0.000	- 0.0 - (0.01		28 0.003	-
.000	BCt:-loan demand	-0.039	1728)0 –	0.001	1728	-0.001	-0.040	1728
		(0.091)				.012)			(0.100)	
.000	BCI: loan demand, manufacturing	-0.047	1728	-0.00		0.002	1728	-0.001	-0.048	1728
000	BCI: loan demand, non-manufacturing	(0.093) -0.062	1728	-0.0		.012) 000	1728	-0.001	(0.102) -0.062	1728
0.000	bei. Ioan demand, non-mandracturing	(0.164)	1/20	-0.00		.021)	1/20	-0.001	(0.180)	1/20
00	BCI: loan demand, large enterprise	-0.119	1728	0.000		0.006	1728	-0.001	-0.126	1728
	, , ,	(0.209)			(0	.028)			(0.230)	
0.000	BCI: loan demand, medium enterprise	-0.049	1728	-0.00		0.003	1728	-0.001	-0.052	1728
000	DCI loop domand amall and minus enterprise	(0.109)	1720	0.00		.014)	1720	0.001	(0.119)	1720
0.000	BCI: loan demand, small and micro enterprise	-0.045 (0.093)	1728	-0.0		0.012 .011)	1728	0.001	-0.057 (0.101)	1728
00	BCI: loan approval	0.100	1728	-0.00		055*	1728	0.005	0.156	1728
		(0.230)				.032)			(0.256)	
	Panel F: Real Estate market: real estate climate and real estate in	vestment (I	(FD							
0.001	Real estate climate (index, 2000 = 100)	-0.100	1728	-0.00	0.0	052	1728	0.001	-0.048	1728
		(0.323)			(0	.043)			(0.357)	
.001	REI: domestic loans, RMB mn (log-)	0.313	1728	-0.00		0.516***	1728	0.009	-0.203	1728
	ner a constant a const	(1.086)				.159)	4500		(1.202)	
0.001	REI: foreign invesment, RMB mn (log-)	-0.050 (0.832)	1728	-0.00		0.145	1728	0.001	-0.194 (0.948)	1728
0.001	REI: foreign invesment, direct invesmtne, RMB mn (log-)	- 0.040	1728	-0.00		.156) 0.154	1728	0.001	-0.194	1728
	1 1	(0.833)				.155)			(0.949)	
0.001	REI: self raised, RMB mn (log-)	0.186	1728	-0.00	01 –	0.391***	1728	0.007	-0.204	1728
	ner was a second	(0.864)	4500			.142)	4500		(0.965)	4500
0.001	REI: self raised, self owned, RMB mn (log-)	0.100 (0.850)	1728	-0.00		0.414*** .146)	1728	0.008	-0.314 (0.954)	1728
0.001	REI: other funds, RMB mn (log-)	0.262	1728	-0.00		0.276**	1728	0.004	-0.014	1728
.001	Tan outer rands, rand mir (10g)	(0.787)	1,20	0.0		.126)	1,20	0.00	(0.877)	1,20
0.001	REI: other funds, deposits & advanced payment, RMB mn (log-)	0.260	1728	-0.00		0.292**	1728	0.005	-0.033	1728
		(0.774)				.124)			(0.863)	
0.001	REI: other funds, mortgage, RMB mn (log-)	0.326	1728	-0.00		0.242*	1728	0.003	0.084	1728
		(0.810)			(0	.124)			(0.898)	
	Panel G: Government surplus, revenue, and expenditure (RMB br									
0.001	Government surplus	0.073	1728	-0.00		0.266** .120)	1728	0.001	-0.193 (0.793)	1728
0.000	Government revenue	(0.712) 1.420	1728	-0.00		383	1728	0.000	1.803	1728
	Government revenue	(2.327)	1,20	0.0		.379)	1,20	0.000	(2.604)	1,20
0.000	Government expenditure	0.543	1728	-0.00	00 0.	545***	1728	0.004	1.088	1728
		(1.205)				.154)			(1.321)	
0.001	Central government surplus	-0.015	1664	-0.00		0.392***	1664	0.003	-0.406	1664
0.001	Central government revenue	(0.682) 0.688	1664	-0.00		.100) 0.208	1664	-0.000	(0.755) 0.481	1664
.001	Central government revenue	(1.325)	1004	0.00		.213)	1004	0.000	(1.479)	1004
L0:00	Lentral novement expenditure	1 086	1664	ე.ე.ე	ა <u>ი</u> <u>ბ.</u>	565#	1664	-0.003	1.7F1	1664
2:098)					910)			_(0:262)		
= 0:200-	1.662 G.1901 Local government sungus				268:	116621	0.33611	0.19358*	165	0.00
(4l.105) 2.238	1664 0.000 Local government revenue				.9 79) 502	1664	-0.000	-(0.182) 0.736*_	1664	0.00
(2.776)	_1004 0.000 Local government revenue				.486)	1004	0.000	(0.388)	1004	0.00.
1.270	1664 0.000 Local government expenditure				511	1664	-0.000	0.659***	1664	0.00
(1.266)					153)			(0.151)		



Notes: This table reports results of multiple regressions with robust standard errors. The heteroscedasticity and autocorrelation consistent standard errors

5%, and 1%, respectively.

Based on the above results of simple regressions, we further perform a set of multiple variable robust regressions to determine the comparatively important factors, as many of these factors may be related to one another. Table 7e regressions with



In the following sections, we will investigate whether and how the transmission of financial shocks in China is influenced by firm specific factors, as commonly discussed in the literature (e.g., Chen et al., 2010; Li et al., 2019). First, we examine the influence of leverage ratios (i.e., total debt to total assets, long-term debt to total assets, and short-term debt to total assets). Yang and Zhou (2013) also find that the short-term debt ratio is one of the significant determinants affecting credit risk spillovers among American and European banks around the time of the recent global financial crisis. We find that the long-term debt to total assets ratio positively influences the total directional connectedness from others, to others, and the net total directional connectedness, while the short-term debt to total assets ratio negatively influences these types of connectedness. The net result is that the total debt to total assets ratios loses statistical significance. ²⁰

Second, we examine whether the transmission of financial shocks is affected by FIs' (short-term) liquidity, as measured by the accounts receivable turnover, the ratio of liquid assets to total assets, the ratio of current assets to total assets, and receivables to total asset. Accounts receivable turnover is an important proxy for short-term liquidity, and has a negative influence, which decreases the influence of an FI in the shock transmission networks. Similarly, we find that the ratio of liquid assets negatively affects the influence of an FI in the financial shock transmission network (net, from, and to), while the current assets ratio and receivable assets generally have no statistical significance. These findings are also generally consistent with the above negative influence of short-term debt to total assets.

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 $^{^{20}}$ According to the definitions, total debt to total asset=long-term debt to total asset + short-term debt to total asset.



Third, we consider the influence of FI size. Largely consistent with the insignificant results of Yang and Zhou (2013) concerning the largest American and European FIs, we find the size may even have a negative impact on the transmission of financial shocks among Chinese FIs. This finding may



for profitability. Better profitability will surely attract more market attention, resulting in a significant positive influence of net operational cash flow per share on total directional connectedness from others and to others, as well as net total directional connectedness during the transmission of financial shocks. For further confirmation, we also examine the influence of basic profit ratio per share, finding that it has a similar but even stronger influence pattern than net operational cash flow per share. Concerning the profit structure, we find that both financial profit and operating profit ratios negatively affect the roles of FIs in the shock transmission network. However, only the operating profit ratio is statistically significant.

Fifth, we further examine the role of FI asset tangibility. Specifically, we explore the ratios of the intangible assets to total assets and tangible assets to total assets. We document that the intangible (tangible) asset ratio negatively (positively) affects the roles of FIs in the shock transmission network (net, from, and to).

Finally, among the individually significant factors based on simple regressions, we conduct multiple regressions with Newey-West robust standard errors to select the more important factors at the 10% significance level. ²¹ In the first set of multiple regressions, we include accounts receivable turnover, but not the short-term debt to total assets and liquid assets to total assets ratios due to concerns of collinearity. Although we can only obtain preliminary results from 44 observations, the findings suggest that accounts receivable turnover may not be as important as it was in the simple regression.

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²¹ The intangible assets to total assets ratio is excluded because of its perfect collinearity with tangible assets to total assets.



In particular, the estimated coefficients lose their statistical significance and the adjusted R2 turns out to be comparatively lower (Columns 1 3 of Table 8-B). Then, we conduct another set of multiple regressions while excluding accounts receivable turnover (Columns 4 6 of Table 8-B), and find that:1) The four variables that significantly affect total directional connectedness from others, to others, and the net total directional connectedness are short term debt to total assets (negative), liquid asset to total assets (negative), size (negative), and basic profit ratio per share (positive); 2) Although each of these four factors impact directional connectedness of both from others and to

and thus, also affect net total directional connectedness; 3) More interestingly, compared to the macroeconomic factors presented in Table 7, firm-specific factors have much more explanatory power (adjusted R2) with regard to the total directional connectedness to others (and thus, net total directional connectedness), while macroeconomic factors bear more influence in determining total directional connectedness from others for the transmission of financial shocks. Obviously, the above analysis is preliminary. Further research is needed to examine the issue in more depth.

Table 8 Firm-Specific Factors.



8-A: Simple r	regressions									
		Net			From			То		
		Estimate	Obs.	Adj-R ²	Estimate	Obs.	Adj-R ²	Estimate	Obs.	Adj-R ²
Total debt to	total asset	0.054 (0.058)	576	0.003	0.014 (0.009)	576	0.012	0.068 (0.065)	576	0.005
Long-term de	ebt to total asset	0.100* (0.054)	483	0.018	0.018*	483	0.020	0.118*	483	0.020
Short-term de	ebt to total asset	-1.382*** (0.324)	483	0.061	-0.118** (0.056)	483	0.014	-1.500*** (0.377)	483	0.057
Assounte rese	ovenble, termsver	Q.CC1***	344	:0:150	_0.000*- =(0±0000)	⊒1411 st	2.031	0_002***	.164	.0.142
iouidity_asset	t to total asset	-0.739***	483	0.069	-0:067**	4830	018	-0.807***	483	0:065
Currency	asset to total asset	(0.193) 0.059	570	6 0.004	(0.031) 0.004	576	-0.001		57	6 0.0
Receivab	ole-asset to total asset	(0.042) 0.844	570		(0.007) 0.088**	576	0.000	(0.047) 0.932	57	
0.017	Size _(market value, RMB, log-)	m.= 1/3	(U=04 - 0.0	10) 016** 57	76 0.020	- 0.00		5 -0.001	——(9.50 -0.0	
0.030	Net operational cash flow per	share	0.00	3*** 39	99 0.032	0.000**	* 399	0.011	0.00	4***
0.039	Basic profit ratio per share		0.04	4*** 57	76 0.036	0.007**	* 576	0.034	0.05	0***
-0.002	Profit generated by financial	activities to total profit	(0.00 -0.0 (0.00	003 57	76 -0.002	(0.002) - 0.00 (0.001)	0 576	-0.002	(0.0) - 0.0 (0.00	003
0.002	Operational profit to total pro	ofit		250*** 57	76 0.002	- 0.001 (0.011)	7 576	-0.002	-	257**
B: Multiple	-									
B: Multiple		Dependent variables								
B: Multiple		1) (2)		(3)	(4		(5)		(6)	
	I - (1) (2)		_370EIO ****	to		(5) KG. III	- शतम	II. mg	z.
		1) (2)					(5' XC 11' 11' 11' 11' 11' 11' 11' 11' 11' 11	9721		
	I - (1) (2)		_ 95500 ***- ···· 0.034	30 <u>W</u>		(5) KC:II	· · · · · · · · · · · · · · · · · · ·	.010	
	I (congregateron decist, too todail nasses:	1) (2)		_ 95500 ***- ···· 0.034	30 <u>W</u>		(5' XC 11' 11' 11' 11' 11' 11' 11' 11' 11' 11	9721	.010	
- I	I coops former divide to testal sesses.	0.0001		0.034	· (0,022/ (0.822/)	-	(5) KG. III 0.058 (0.473***	-0.06	.01(0 .010) .090= .04(5)	-
Liq	Long-term debt to total seast.	(0.001) 0.007	(0	00.003/4 (00.003/5) (00.003/5) (00.000)	(0.001) (0.001)	- (0	(5) (6) 15 (6) 20 (6) 20 (6) 20 (7) 473*** (169) (0.032***	-0.06 (0.018 -0.00	1.010 1.010 1.0102 1.0102 1.0103 1.01	(0
Liq Size	I consequence district to tentral sussest Situated reproductive control suspending sussest Situated reproductive control suspending	(0.001) (0.001) (0.001) (0.024) (0.002)	(0 0. (0) (0)	0.084 (0.05.83 	(0.001) 0.009 (0.026) (0.002)		(5) 1003 1003 1003 1003 1009 1009 1001	-0.06 (0.018 -0.00 (0.001	00000 000000	(0) (0) (0)
Liq Size Net	Lerons ferror dent for federal assect. Situation recognition for federal assect. From the federal assect. From the federal assect. From the federal assect to total assect. From the federal assect for federal assect.	(0.001) 0.007 (0.024) (0.002) 0.024 (0.016)	0. (0 (0 (0 (0 (0 (0	.0001 (0.004 (0.005) .000) .000 .000) .000) .000)	(0.001) 0.009 (0.026) (0.002) (0.002) (0.0024 (0.016)	 (0 (0 (0 (0 0,0 (0	(5) 0.473*** 1.699 0.032*** .009) 0.001) 0.44***	-0.00 (0.018 -0.00 (0.000 (0.000 (0.000	.010 .099 .0905 .0	(0 - (0 (0 0. (0
Liq Siza Net	Expression district for forbid system. Situation of the forbid system.	(0.001) (0.001) (0.002) (0.024) (0.002) (0.024) (0.016) 1.316 (3.504)	0 (0) (0) (0) (0) (0)	00024 00024 0002 0002 0004 0000 0000 00	(0.001) 0.009 (0.026) (0.002) 0.024 (0.016) 0.6552 (3.960)	(0 (0 (0 (0 (0 (0 (0	(5) 100.03 100.03 100.032 100.032 100.009 100.001 1044 1013) 1074 10392	-0.06 (0.018 -0.00 (0.001 (0.000 (0.000 (0.000 0.006 (0.000 0.006 (0.000	(10)(0) (10)(0	(0 - (0 (0 0. (0
Liq Sizz Net Bas	Large ferror decay to total asset. Situation of the ferror of the ferro	0.007 (0.002) 0.0024 (0.016) 1.316	(0 0 (0 0 0 (0 0 	0.000) 0.000) 002 0.004) 0.000) 000 0.002)	(0.001) 0.009 (0.026) (0.002) 0.024 (0.016) 0.652 (3.960) - 4.418*		(5) (5) (6) (8) (8) (8) (9) (9) (9) (9) (10) (10) (10) (10) (10) (10) (10) (10	-0.00 (0.018 -0.00 (0.001 (0.000 (0.002 -0.018 (0.042 -0.00 (0.23)	(0)(0) (0	(0 - (0 (0 0. (0
Liq Siza Net Bas Op	Large ferror detail to total asset. Allow ferror detail asset. Allow ferror detail asset. Allow ferror detail asset.	(0.001) (0.001) (0.001) (0.002) (0.024) (0.002) (0.024) (0.016) 1.316 (3.504) -4.095** (2.001)	(0 0.0 (0 0.0 (0 0.0 (0 0 0.0 (0 0 0.0 (0 0 0 0	0.000) 0.000) 002 0.004) 0.000) 000 0.002) 0.0664 0.323 3.390) 5.101	(0.001) 0.009 (0.026) (0.002) 0.024 (0.016) 0.652 (3.960) - 4.418* (2.261) 21.09		(5) (6) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	-0.00 (0.018 -0.00 (0.0018 (0.002 (0.	(0) (0) (0) (0) (0) (0) (0) (0) (0) (0)	(0 (0 0. (0 6;
Liq Sizz Net Bas	I (I (I (I (I (I (I (I ((0.001) (0.001) (0.001) (0.002) (0.024) (0.002) (0.024) (0.016) (0.3504) (0.504) (0.504) (0.016) (0.504) (0.016) (0.504)	(0 0.0 (0) (0) (0) (0) (0) (0)	0004 (01058) .0000) 002 .0001 .0000 000 .0002 .002) .0644 0.0323 0.323 0.323	(0.001) 0.009 (0.026) (0.002) 0.024 (0.016) 0.652 (3.960) - 4.418*	(0) (0) (0) (0) (0) (0)	(5) (5) (6) (8) (8) (8) (9) (9) (9) (9) (10) (10) (10) (10) (10) (10) (10) (10	-0.06 (0.018 -0.00 (0.001 (0.000 (0.002 0.004 -0.00 (0.23 -31	(00000) (00000	(0 (0 (0 0. (0

Notes: This table reports the results of multiple regressions with robust standard errors. The heteroscedasticity and autocorrelation consistent

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significance at 10%, 5%, and 1%, respectively.



CONCLUSIONS

This study explores the transmission of financial shocks among China's FIs using stock return data while controlling for interactions with the financial sectors of the four major global economies (i.e., the US, the UK, Germany, and Japan). Based on the newly developed network analysis, we document several novel findings of China's financial system. In particular, although banks still dominate China's financial system, nonbank FIs also bear considerable influence in the transmission network of financial shocks, thus confirming the recent growing concerns about China's shadow banking problems (e.g., Allen et al., 2012). Interestingly, the market oriented large commercial banks played a more pronounced role than the Big Four in the financial shock transmission network during the sample period. The role that each FI plays during the transmission of financial shocks also varies over time. Furthermore, China's financial sector exerts considerable influence on financial sectors in major developed countries, especially Macroeconomic factors, especially currency-related factors, determine the degree of influence from other institutions on a particular FI while firm-specific factors mainly determine the degree of influence of a particular FI on others during the transmission of financial shocks.

The findings of this study suggest the need to reconsider the conventional approach of identifying SIFIs based on relatively low frequency financial data (e.g., IMF, BIS, and FSB, 2009; Allahrakha et al., 2015; Glasserman and Loudis, 2015). Such an approach could fail to capture the time-varying role that each institution may play in the transmission network of financial shocks, at least in China. The documented pattern of interconnectedness between



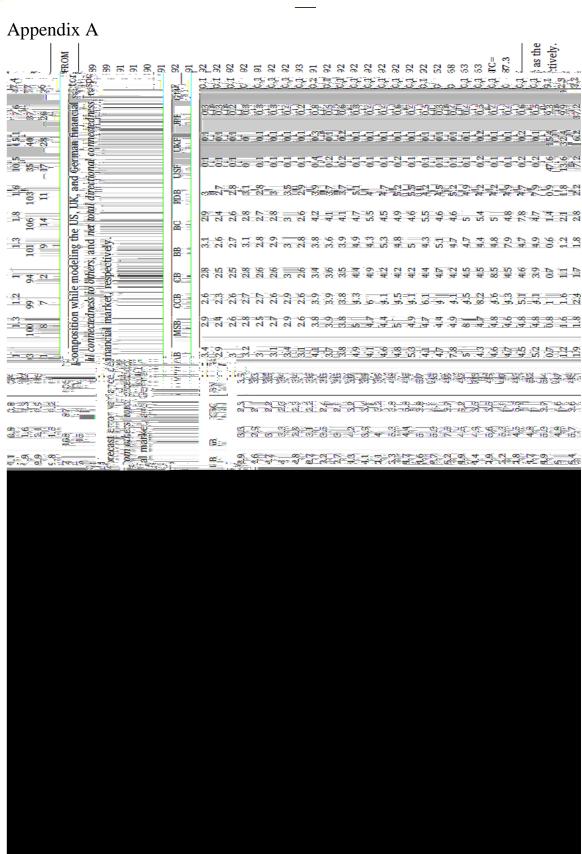
China and the financial sectors of the other four major global economies also implies that any policy intervention in the financial sector of a major country may spill over to the financial sectors in other countries. Accordingly, some international policy coordination involving China is warranted. Finally, to achieve efficient financial regulation and supervision in China, we must be more attentive to the emerging impact of nonbank FIs (Allen et al., 2012).

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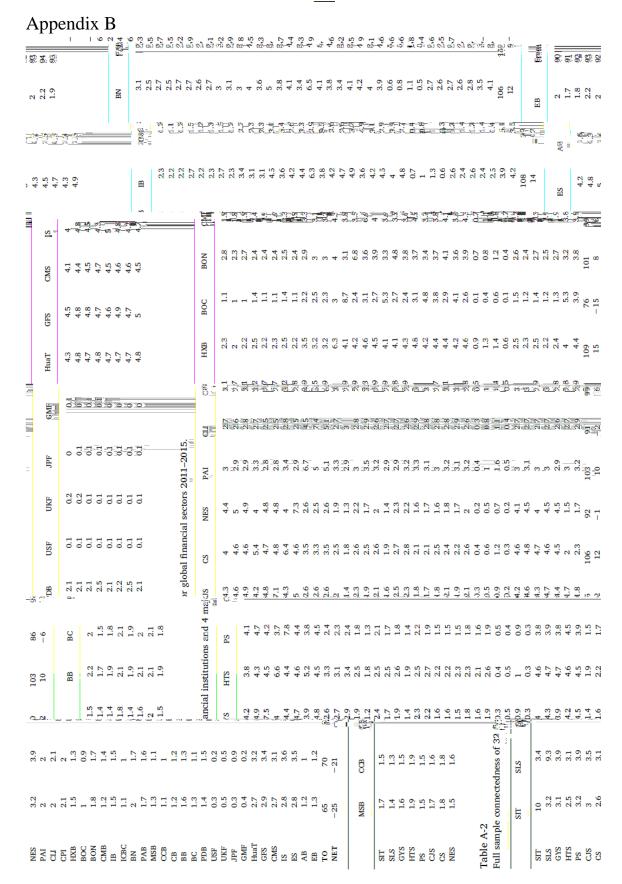
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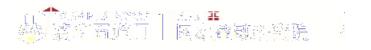
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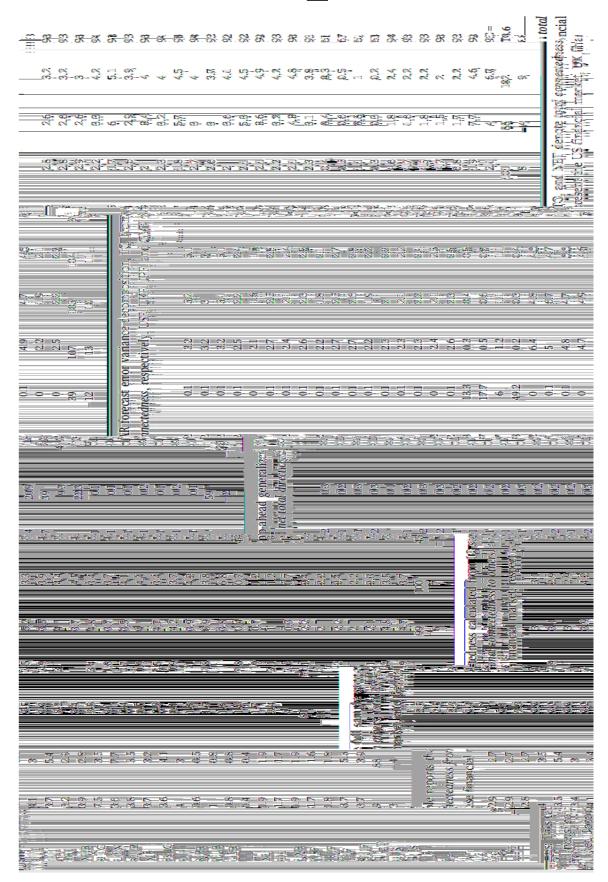




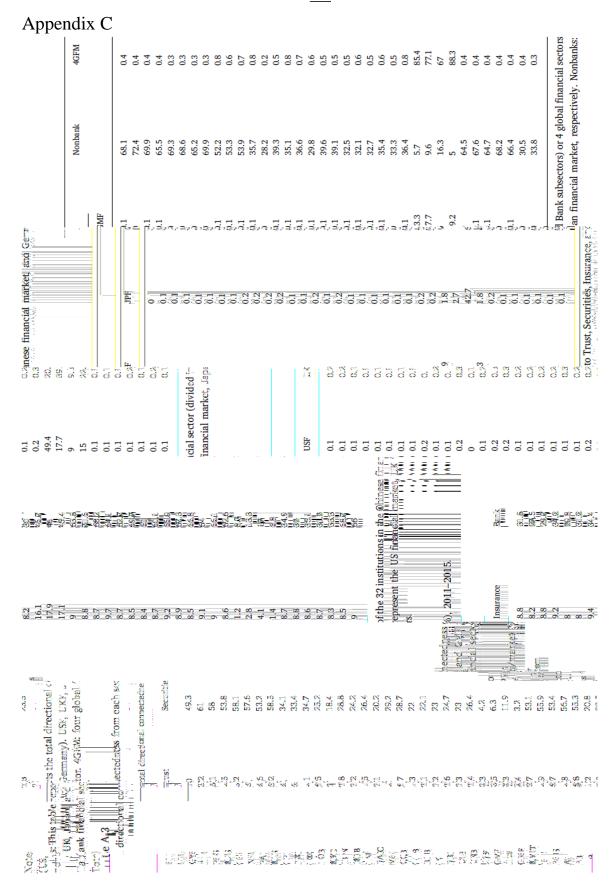




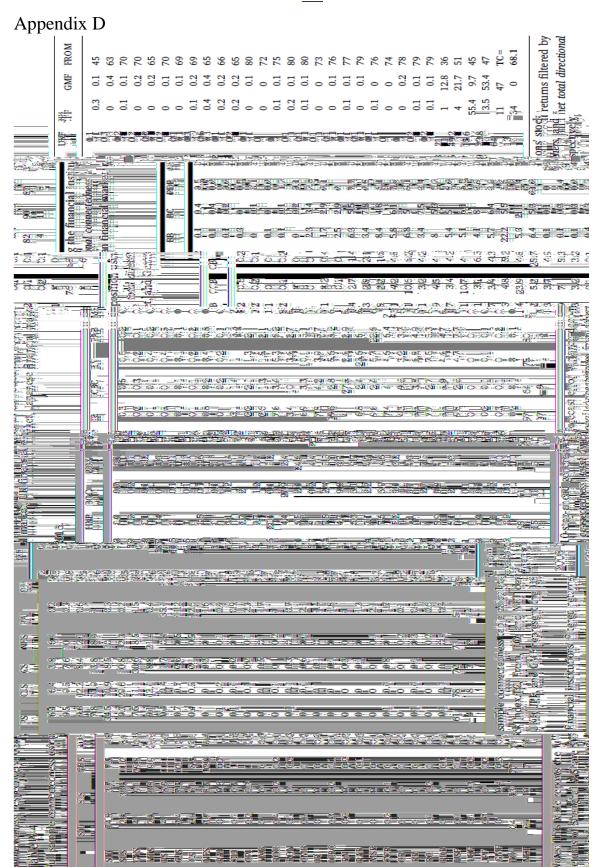














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