

Brooks, Douglas Howard; Kurmanalieva, Elvira; Yang, Tu-yong

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Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)
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Trade, Trade Finance, and Global Liquidity in Asia; Markov-Switching FAVAR Approach*

Douglas H. Brooks 
Asian Development Bank
dbrooks@adb.org

Elvira Kurmanalieva 
Eurasian Development Bank
ekurmanalieva@yahoo.com

Doo Yong Yang[†] 
Kyunghee University
yangdy@khu.ac.kr

This paper analyzes why the global financial crisis in 2008 severely affected Asia's trade. Asia has been suffering from the falls in export demand from developed countries. However the abrupt trade declines in Asia are not fully explained by reactions to this as in previous experiences. The question is why the financial crisis in 2008 brought about the abrupt and deep collapse in world trade, while other world-wide recessions had more moderate effects on world trade. This paper shows that the dynamic relationship between trade and trade finance is one important factor in explaining this question. This paper also applies the Granger (causality) test to uncover different relationships in the developed and developing economies and show different results for different countries in Asia. We employ a Markov-Switching FAVAR (Factor Augmented VAR) to show that global liquidity shocks are important factors in explaining the huge and abrupt trade drops in Asia.

Key words: Trade Finance, Global Liquidity, Markov-Switching Factor Augmented VAR
JEL classification: F19, F39, G01

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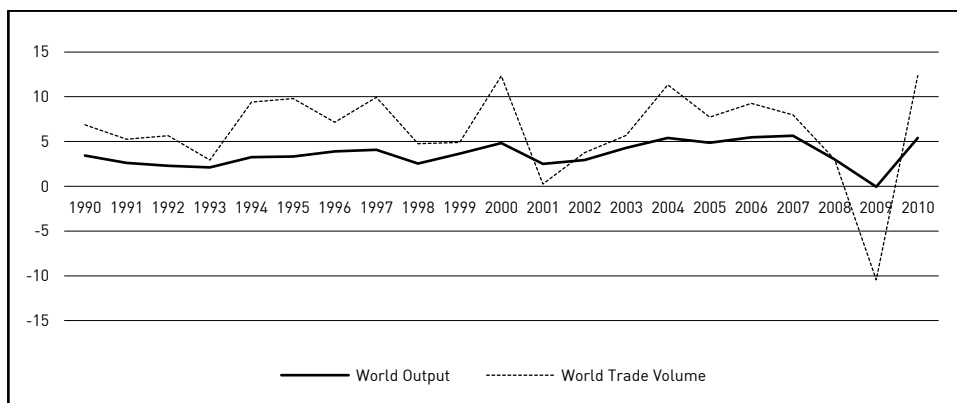
I. INTRODUCTION

Based mainly on experience gained in Asia and elsewhere, there is a need to improve the stability and security of sources of trade finance, especially to help deal with periods of financial crisis.

WTO Document WT/WGTDF/M/2 (2002)

The global crisis in 2008 contributed to the steepest fall of world trade recorded since the Great Depression. In the first quarter of 2009, nominal trade value fell 30% on average compared to 2008. The global trade volume also dropped by 18.5% year on year during this period (World trade monitor, 2012). Figure 1 indicates the drop in world trade and output from the recent crisis. If merchandise trade stops, causing containers to stall at ports, global supply chains are affected, multiplying the influence on output.

Figure 1. World Trade and Output



Source: World Economic Outlook Database October 2012.

Unit: % change

The question is why the recent crisis brought about such an abrupt and deep collapse in world trade, while other world-wide recessions had more moderate effects on world trade, and why the decrease in world trade is much greater than the decrease in income. Some argue that the global demand shock was a driving factor for the 2008 abrupt collapse in trade. Freund (2009) asserts that the income

elasticity of trade has been increasing over time, that during recessions, trade is especially responsive to income, and that the significant increase in the income elasticity of trade may be attributed to the fragmentation of production and lean retailing.¹ Newbery and Stiglitz (1984) argue that trade can potentially increase uncertainty and income volatility by affecting price elasticities. Financial development could then be fostered by increased demand for trade insurance. Baldwin (2009) argues that the compositional and synchronicity effects exaggerate movement of the trade to GDP ratio. The compositional effect argument is based on the fact that postponeable goods consist of a small portion of the GDP, but the trade and demand shocks disproportionately affect the production of postponeable goods such as consumer durables and investment goods. The synchronicity effect is attributed to the increasing in-time delivery nature of vertically integrated production networks as well as the spatial synchronization of the global income drop. One potential source of supply shocks for explaining the recent abrupt and synchronized trade decrease on a global scale is internationalized supply chains. Since most trading activities are closely interconnected with each other, bankruptcies among trading companies due to deteriorating credit conditions suppress trade along the whole chain.

However, the abrupt and deep decrease in trade in a global scale in 2008 cannot be explained by the previous arguments. This paper focuses on the relationship between trade and financial factors. We believe that a lack of trade-credit financing in particular is a contributing factor to decrease in global trade in 2008 which is different from other recessions. Beginning in 2008, financial turmoil in global markets led to the collapse of some banks engaged in trade finance. The credit squeeze in international financial markets began to seriously impinge on world trade, where roughly 90% of all merchandise trade is reliant upon some form of short-term credit, insurance, or guarantee. Evidence of a slowdown in trade finance was also seen in declining growth of the foreign liabilities of commercial banks. The cost of short-term credit for trade finance also rose, contributing to the slowdown in trading activities. The WTO estimated that a gap of as much as \$25 billion opened between global demand and supply for trade credit.

¹ Freund (2009) finds that elasticity of trade to income increased over time from under 2 in the 1960s to over 3.5 the 2000s.

The combination of the global inter-bank lending freeze and collapse of the speculative, leveraged commodity price bubble undermined both the confidence of banks in the ability of peer banks to pay obligations when due, and confidence in the value of cargo as security for trade credit if liquidated on default. The credit crunch in banks that were leading trade finance providers, concerns about traders' access to credit and creditworthiness, higher cost of letters of credit, and more stringent lending standards and guarantee requirements especially impacted short-term financing for exporters, importers, and shipping firms, and for smaller firms (who are more dependent on letters of credit). The result was that those with goods to export and those with goods to import, no matter how worthy and well capitalized, were left standing quayside without bank finance for trade, with negative consequences for their customers, shareholders, and employees.

Adding to the difficulties, letters of credit are short term, so that they become easier targets than longer term assets which can't be renegotiated as easily for scaling back credit when liquidity tightens around bank operations. Moreover, many bulk cargoes are financed in dollars but non-US banks were progressively starved of dollar credit as it was hoarded by US banks when the funding crisis intensified. While export credit agencies tend to play a countercyclical role by supporting export transactions when their domestic banks pull back, they were initially slow to respond to the deepening global slowdown. With the inter-bank liquidity crisis, banks moved to reduce overall counterparty exposure, including trade credit. When sales were declining and inventories rising, this was not a major issue. But if demand was to suddenly rise sharply, and letters of credit remained in short supply, this could limit the supply of goods. Eventually, improving demand should lead to easier credit conditions as banks become increasingly less pessimistic about company default risk. Letters of credit should then become more readily available. In the interim, the interrelations between trade and the financial crisis have important implications for future policy making and the speed of recovery.²

Trade credit and bank credit can substitute or complement each other in times of financial difficulties. Trade credit provides a cushion through which wealthier firms insure poorer firms against the consequences of reduced liquidity. This substitute hypothesis views trade credit as an alternative to bank credit for short-

² Do and Levchenko (2007) suggest reverse causality running from trade to financial development.

term financing. Burkart and Ellingsen (2004) build a theoretical explanation for trade credit shortages in crisis times based on the assumption that diverting inputs (inter-firm credit) is less profitable than diverting constrained cash (bank credit). Their model explains why trade credit has a short maturity and is more common in less developed financial markets, and why accounts payable of large unrated firms are more countercyclical than those of smaller firms.

Does trade finance decline during financial crises, eventually causing a decline in trade volume? Or is it the other way around, i.e., trade generates demand for trade finance so when trade declines in a crisis, trade finance falls accordingly? Causality is especially important during periods of financial crises. A few studies (Ronci, 2004; IMF, 2003; Auboin and Meier-Ewert, 2003) document that during the 1998 crises in Asia and Russia, trade finance declined as a result of the financial crises and caused a decline in trade. During the recent (sub-prime) crisis, IMF (2009) found a very small effect of reduced trade finance on trade. While Ronci (2004) found strong causality running from trade finance to trade, a more recent study by Thomas (2009) suggests that the impact is far less than earlier suggested.

Against this backdrop, this paper analyzes the relationship between trade, trade finance, and liquidity crisis in Asia. We explore the relationship between trade and trade finance across normal and stressed liquidity conditions. This provides explanation for the close relationship between the recent global liquidity crisis and global trade collapse. In order to identify the dynamic relationship between trade and trade finance, we employ a Markov-Switching FAVAR (Factor-Augmented Vector Auto-Regression) approach. Bernanke et al (2005) proposed the FAVAR to identify a monetary transmission mechanism. The FAVAR approach overcomes the low-dimensionality problem in structural VAR methods. We utilize an extended FAVAR based on a Markov-switching framework. This approach allows identification of different shock responses depending on different states of the economy. We find that the responses of trade activities from global liquidity shocks under stressed liquidity are greater and quicker than in a normal state of liquidity. We focus on Asia where the trade impacts were arguably greatest (Freund 2009).

II. PREVAILING CONDITIONS

Excessive liquidity prevailing on a world wide scale is widely accepted as one of the major factors behind development of global financial bubbles. The M2/GDP ratio of the US, euro area (including U.K.) and Japan was increasing since the first quarter of 2001.

Some advocate the use of both quantity and price indicators because an easing of liquidity conditions tends to show up not only in an expanding stock of money, but also in lower interest rates. Short-term nominal interest rates for major developed economies has declined since early 2000s, where Japan started its zero interest rate policy in the fourth quarter of 1995, and the US and Europe had decreasing interest rates from late 2000 after the IT bubble burst.

Liquidity conditions changed after the second quarter of 2007, when major economies' policy rates increased to cope with inflationary pressures from oil price hikes. In 2008, liquidity conditions deteriorated as the financial conditions in the US worsened following the bankruptcy of Lehman Brothers. In late 2008, the EMBI index reached over 7%.³ These abrupt changes in global financial conditions affected the real economy, especially trade transactions, through a variety of channels including the channel between trade and trade finance described above.

Credit to finance trade can be provided either by financial institutions, by trade partners, or by government agencies. Characteristics of each are provided in Table 1 below.

In this paper we use the term "trade credit" to refer to trade finance originating from a trading partner or government agency, to distinguish it from bank credit to trading companies. Figure 2 shows the world volumes of trade transactions (export only) and trade finance in the world, and Figure 3 shows the same for Asia.⁴ The total of world exports increased steadily from the early 2000s, reaching a peak of \$17 trillion by the end of 2007. However, beginning in the first quarter of 2008, there was a huge drop in trade which continued throughout the year. Trade finance, here a combined figure of BIS short-term bank loans and export credit, shows a

³ The Emerging Markets Bond Index (EMBI) represents total returns for traded external debt instruments (external meaning foreign currency denominated fixed income) in the emerging markets.

⁴ Trade finance represents the total summation of trade credit from BOP statistics in IMF and BIS short-term bank claims.

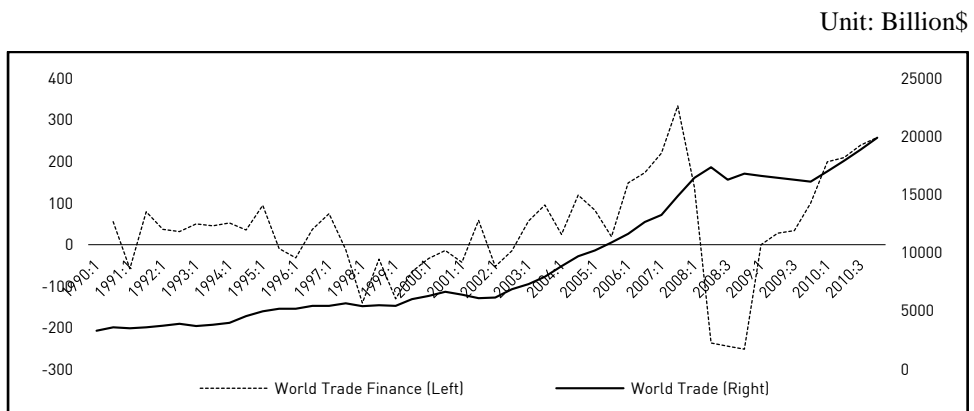
similar pattern to trade transactions. Export credit decreased from \$370 billion to \$100 billion during the second half of 2007 and the first half of 2008 prior to the decrease in trade transactions.

Table 1. Characteristic of Trade Finance

	Banking Trade Finance:	Trading Partner Financing:	Export Credit Agency(ECA)
Trade Finance	<ul style="list-style-type: none"> - Banks reduce risk of nonpayment (documentary collection or letter of credit) - Banks reduce credit risk (export credit insurance) - Banks provide credit (trade lending) 	<ul style="list-style-type: none"> - Trading partners provide credit (cash-in-advance or open account), or - Mother companies provide finance to subsidiary - Banks do not play role 	<ul style="list-style-type: none"> - Special export credit facilities regulated by government - Only lending, or only insurance, or both - Can be 100% state-run ECA, or private company as agent
	BIS Banks Short-term Claims	BOP Data on Trade Credits	Berne Union Data
DATA-Proxy			Berne Union members' direct insurance or lending, i.e. amount reinsured by others are not deducted and amounts reinsured by members for others are not added.

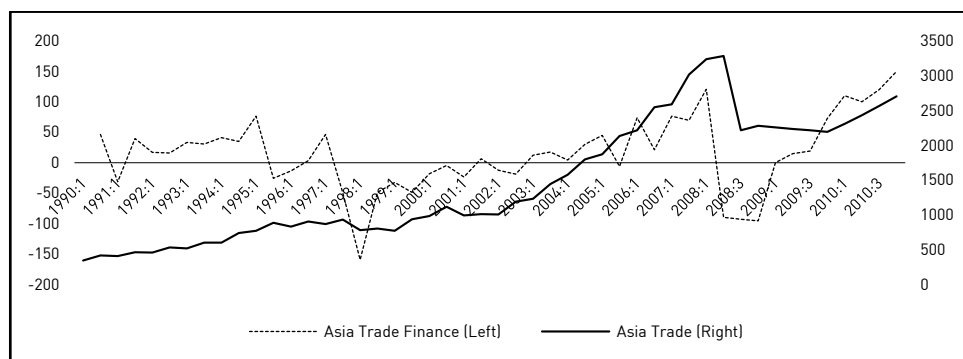
Asia is more dependent on the global economy than most regions since exports account for 47% of GDP in Asia, an increase of almost 10 percentage points since 1997. Even though the patterns of trade and trade finance in Asia are similar to those of the world in general, Asia's trade decreased more in 2008.

Figure 2. Trade and Trade Finance: World



Source: Bank for International Settlement and Balance of Payment (IMF) and CEIC

Figure 3. Export and Export Finance: Asia



Source: Bank for International Settlement and Balance of Payment (IMF) and CEIC

III. EMPIRICAL INVESTIGATION

Most empirical research on trade finance has suffered from the lack of an adequate dataset to analyze the impacts of trade finance on trade and other activities. Moreover, available datasets have some difficulties in distinguishing pure trade finance from among the collected data on trade credit and bank credit. In this paper, we use aggregated data as a proxy for several forms of trade finance. Based on the data, we conduct causality tests, and more formally analyze the relationship between trade finance and trade with FAVAR techniques.

1. Data

This paper employs two different forms of trade finance for our analysis, namely, bank credit and trade credit. Bank credit data is obtained from BIS data on BIS banks' reported short-term claims to particular countries as a proxy for trade finance. This data does not separate trade financing from other purposes of bank credit, so we provisionally assume that a large portion of short term credit is provided to finance trade as in Ronci (2004). More reliable trade finance data can be obtained from the Berne Union, an association of institutions for export credit and investment insurance. However this data is available only from 2005. The trade credit line in Balance of Payments

statistics includes claims and liabilities arising from the direct extension of credit for transactions in goods and services and advance payments for work in progress (or to be undertaken) that is associated with such transactions (BOP Manual, 1993). However this does not include loans to finance trade. Furthermore, sometimes trade credit data obscures the time difference because statistics are recorded only when ownership changes.

The empirical analysis also utilizes other aggregate economic variables that represent determinants of trade and trade financing, including each countries' GDP, real effective exchange rate, and interest rate premia. Moreover, we consider global variables that affect the relationship between trade and trade finance such as the Federal funds rate, the TED spread, and the EMBI index.⁵

2. Causality Test

Before formally analyzing the dynamic relationship between trade and trade finance, we conduct VAR and FAVAR Granger causality tests with one lagged variables.⁶ Table 2 shows results of a Granger causality test for Asian countries. It shows that causality between trade financing and trade in PRC and Korea runs in both directions. However for most countries except Thailand, bank credit is the greatest influencing factor for both exports and imports. Trade credit liabilities are found to be important for imports of PRC, Indonesia, Malaysia, Philippines and Vietnam.

All global variables Granger cause trade and trade financing in Asia. The EMBI index shows the most causality for trade and trade financing in Asian countries except Japan. The TED spread Granger causes trade in all countries, PRC, India, and Vietnam, where it causes trade financing instead. We found statistically significant signs for G7's GDP growth Granger causing trade in Hong Kong and Korea, and trade financing in Indonesia. The common Asian factor mostly Granger causes trade in Asian countries except

⁵ The TED spread is the difference between the interest rates on interbank loans and short-term U.S. government debt.

⁶ Conducting the FAVAR Granger causality test is based on Mandilaras and Popper (2009).

PRC, Thailand, Philippines and Malaysia. Overall, Asia's exports are found to be the most endogenous variable. The EMBI index and common factor (see below) are the most important variables, with the EMBI causing both trade and trade financing, and the common factor mostly causing trade in Asia.

Table 2. Granger Causality Probabilities

Variable	VAR Granger Causality Test				FAVAR Granger Causality Test			
	Exports	Imports	Bank credit	Trade credit	Factor	TED	EMBI	YG7
PRC								
Exports		**	*				**	
Imports			**	**				
Bank credit	**							
Trade credit		**			**	**	***	
HKG								
Exports					***	***	***	*
Imports			**					
Bank credit								
Trade credit								
IND								
Exports			*		***			
Imports			**		**			
Bank credit								
Trade credit					***	*	**	
INO								
Exports		**	**		***	***	***	
Imports	**		*	**				
Bank credit								
Trade credit								**
JPN								
Exports				*	**	***		
Imports						*		
Trade credit								
KOR								
Exports			*		**	***	***	***
Imports			*					
Bank credit	**							
Trade credit							**	

Table 2. Continued

Variable	VAR Granger Causality Test				FAVAR Granger Causality Test			
	Exports	Imports	Bank credit	Trade credit	Factor	TED	EMBI	YG7
SIN								
Exports					**	***	***	
Imports								
Bank credit		*						
TAI								
Exports		*	***		**	*		
Imports	*		***		*			
Bank credit								
Trade credit					**	**	***	
THA								
Exports						***	**	
Imports							**	
Bank credit								
Trade credit					**			
VIE								
Exports				*	**		**	
Imports				***			*	
Bank credit								
Trade credit			*				**	

Note: ***, **, * - means significance at 1%, 5%, 10% level

3. Markov Switching -FAVAR Approach

To analyze the dynamics of trade and trade finance in response to global shocks, we propose the Markov Switching Factor Augmented Vector Autoregressive model (MS-FAVAR). Recent studies incorporate unobserved components in econometric analysis, because the limited set of variables that are usually considered do not capture all dynamics of the explanatory variables. However, when the analysis is extended to a broader set of variables, a dimensionality problem arises. The factor-model approach, first proposed by Stock and Watson (2002), allows the systemic information in a large dataset to be summarized by a few estimated common factors. This methodology was extended and applied in the Factor Augmented VAR of Bernanke et al. (2005) and Stock and Watson (2005). The principal

advantages of the FAVAR are: (i) common factors can capture more information in large sets of data; (ii) the factor structure helps to show the response of all data to policy variables; (iii) common factors may be better proxies for global economic or credit conditions and serve as instruments to solve the endogeneity problem; (iv) it solves the dimensionality problem in vector autoregression analysis by reducing the number of variables. It is usually done in two steps. The first step involves derivation of common factors from a large dataset through principal component analysis. The second step is vector autoregression (VAR) estimation including common factors and policy variables. Finally, impulse responses are calculated using parameters from both steps.

Despite its simplicity and originality, FAVAR does not capture structural changes and external shocks such as the global crisis. This is why we estimate a Markov-Switching VAR (MS-VAR). The core of Markov-switching models is an assumption on unobservable presence of a regime variable, which represents probabilities of staying in different regime states.

It can be represented with the following equations:

$$\text{Step 1: } X_t = \Lambda_f F_t + \Lambda_y Y_t + e_t \quad (1)$$

$$\begin{aligned} \text{Step 2: } \begin{bmatrix} F_t \\ Y_t \end{bmatrix} &= v(s_t) + A(s_t) \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + u_t \\ u_t | s_t &\sim NID(0, \Sigma(s_t)) \end{aligned} \quad (2)$$

Estimation of common factors involves principal component analysis. Bernanke et al (2005) select different numbers of factors determined by information criteria. First, eigenvalues and eigenvectors are estimated. The largest eigenvalue captures the most information.

The Markov-Switching VAR is estimated through the EM (Expectation-Maximization) algorithm. Under this procedure, the hidden Markov chain is first inferred in the expectation step for a given set of parameters, then the

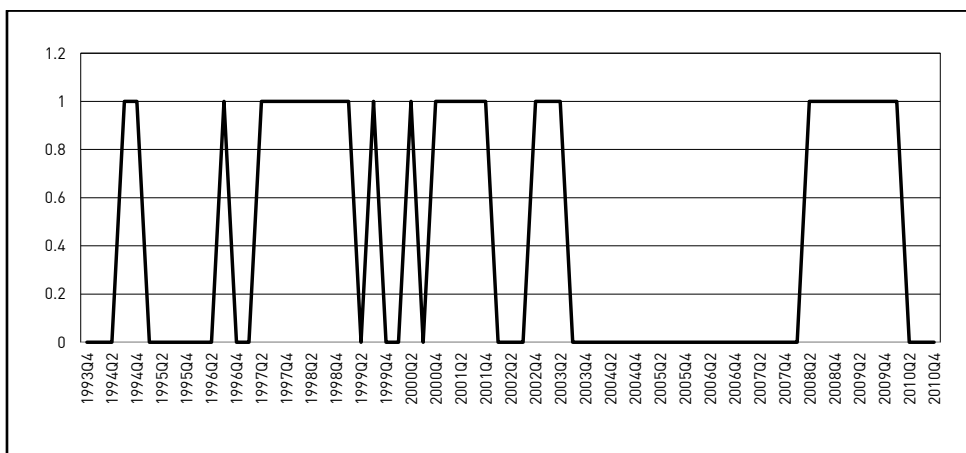
parameters for the hidden Markov chain are re-estimated in the maximization step. These two steps are repeated until convergence is achieved. We assume that each country's economy is affected by the vector Y of global variables and an unobserved common component F . Since we are interested in financial and real shocks, the vector of global variables includes G7 GDP, the EMBI index, and Federal Funds Rate.

$$Y = \begin{bmatrix} G7Y \\ EMBI \\ FFR \end{bmatrix}$$

The rest of the common dynamics is supposed to be captured by F . This may reflect some general conditions like 'economic activity', 'availability of trade finance', and 'financial market constraints'.

The sample used in the estimation consists of Asian countries, with quarterly data from the 3rd quarter 1993 to 4th quarter 2010. Figure 4 below shows the probability of regime shift. Regime 1 that is plotted in the figure we call "crisis period (liquidity squeezing)", while regime 0 is "non-crisis period (normal liquidity)".

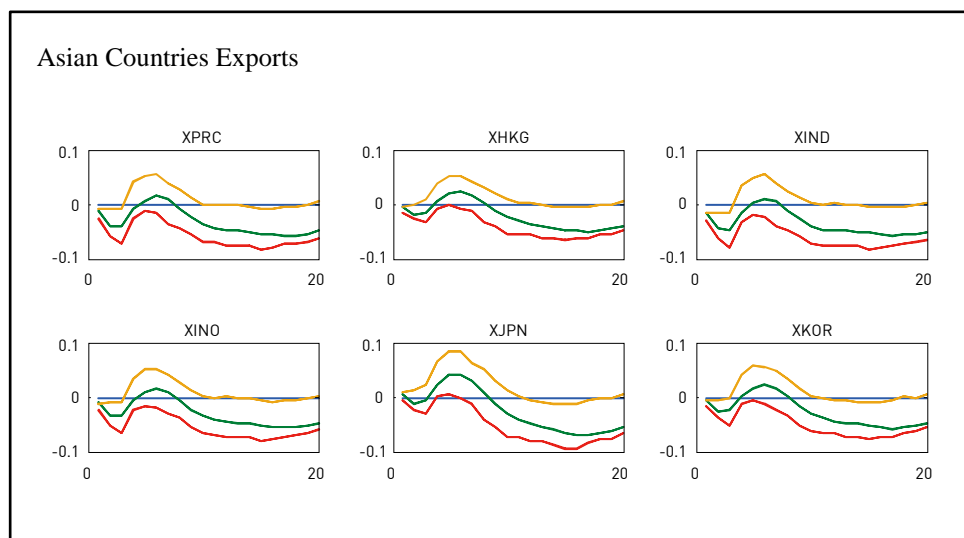
Figure 4. Probability of Regime Shift



1) Simple FAVAR

Figure 5 shows the simple FAVAR method which is not incorporated in the Markov switching part. We plot the impulse response of trade and GDP in Asian countries to global credit condition shocks: Federal Funds Rate (EMBI index is similar to the FFR) and G7 GDP growth rate. Impulse responses are reported in standard deviation units, to a one-basis point shock in global variables. First, the Federal Fund Rate shocks reduce exports in Asian economies except for the Philippines⁷. Most Asian countries show decrease in their exports at least 4 quarters after the Federal Funds Rate shocks. However, the decreases in trade are not statistically significant except for PRC, Indonesia and Viet Nam. Moreover, Asia's short-term bank credits decrease at least the first 2 to 4 quarters in general.

Figure 5. Impulse Response to FFR shock: Simple FAVAR approach⁸



⁷ Impulse response functions of imports are not reported, but they are similar to those of exports in general.

⁸ We denote X-exports, M-imports, Y-real income, BCL-short-term bank loans, TCL-trade credit liabilities, and countries PRC-China, HKG-Hong Kong, MAL-Malaysia, IND-India, INO-Indonesia, KOR-Korea, JPN-Japan, TAI-Taiwan, THA-Thailand, VIE-Vietnam.

Figure 5. Continued

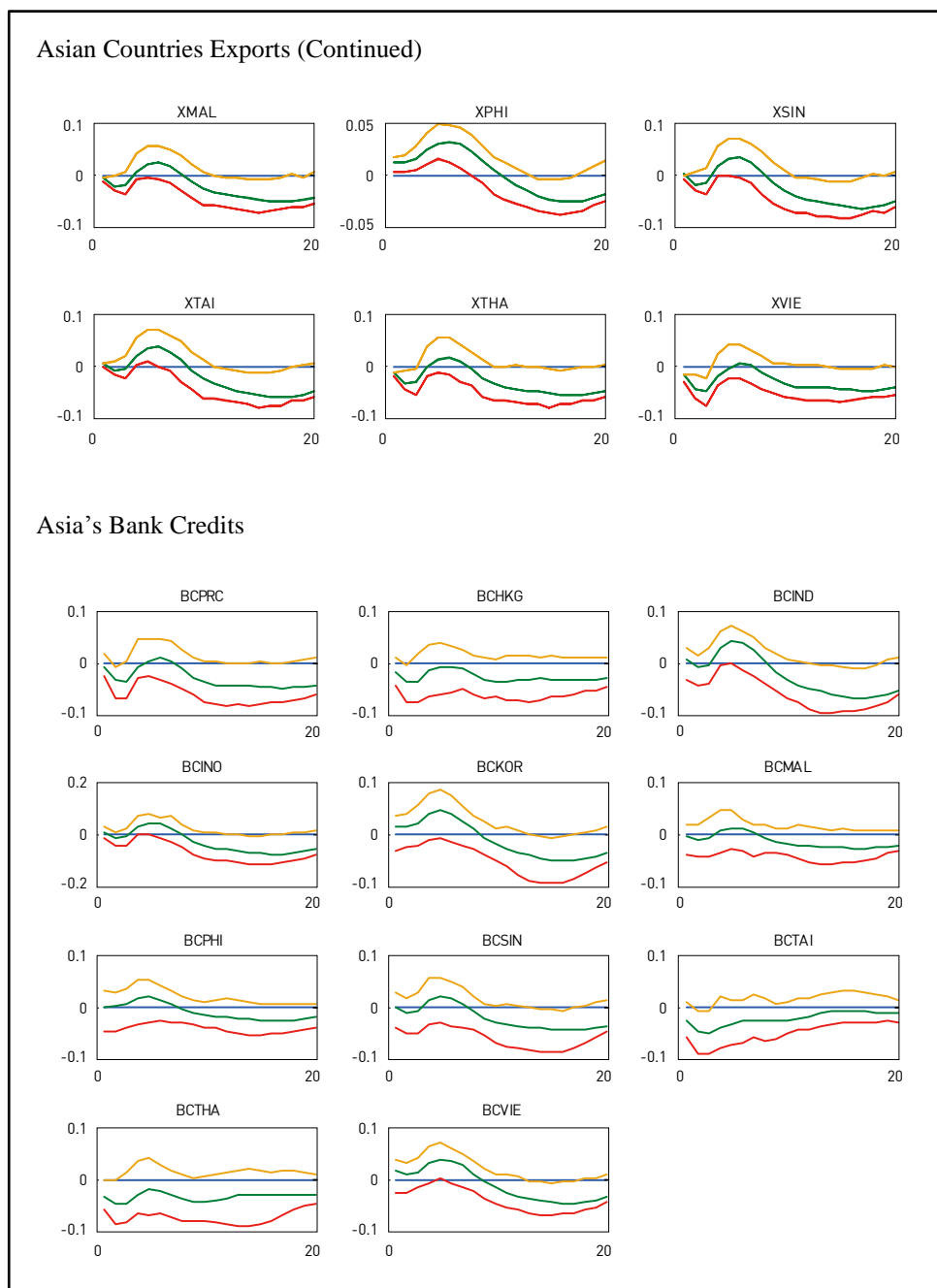


Figure 6 shows the impulse responses of Asia's trade to a positive G7 GDP growth rate shock. The positive effects of higher G7 GDP growth to Asia's export is not greater than expected. Most Asian economies' exports and imports increase in response to G7 GDP growth, but the effect dies out quickly (in less than 2 quarters) and more importantly is statistically insignificant. Interestingly, Asia's bank credits decrease after the G7 growth rate shock.

Figure 6. Impulse Responses to G7 Growth Rate Shocks

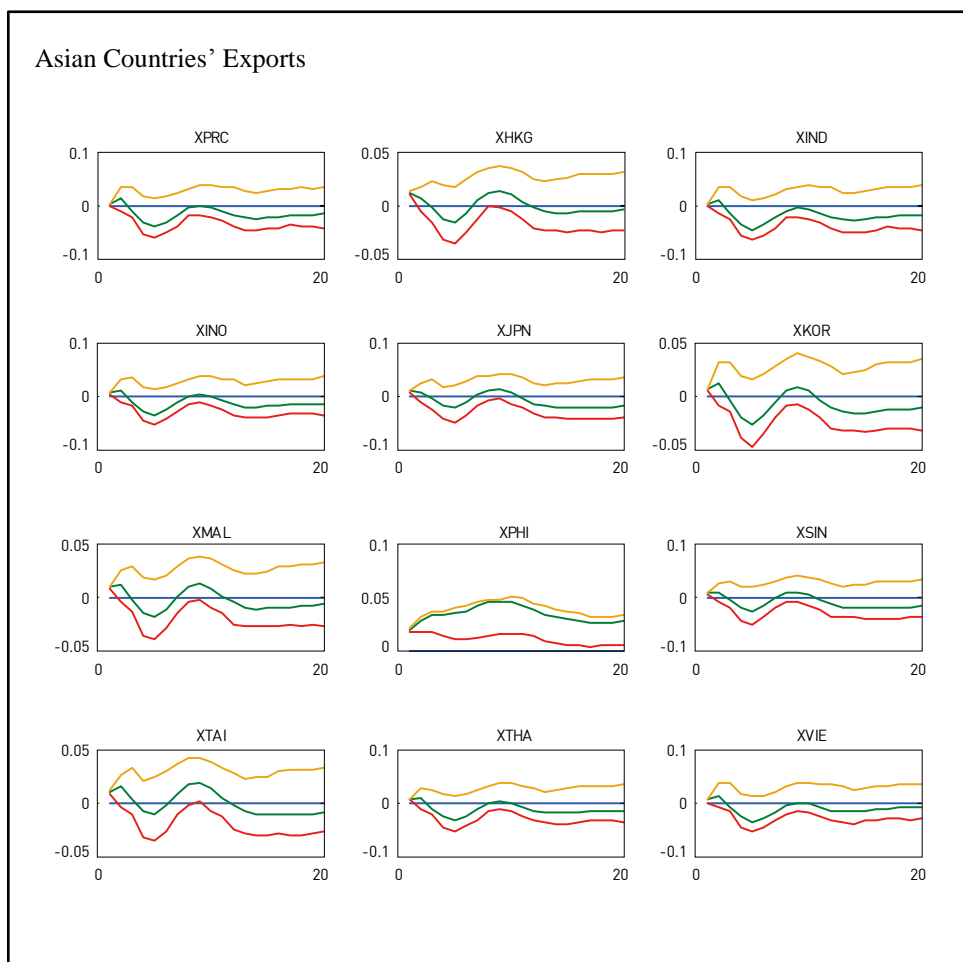
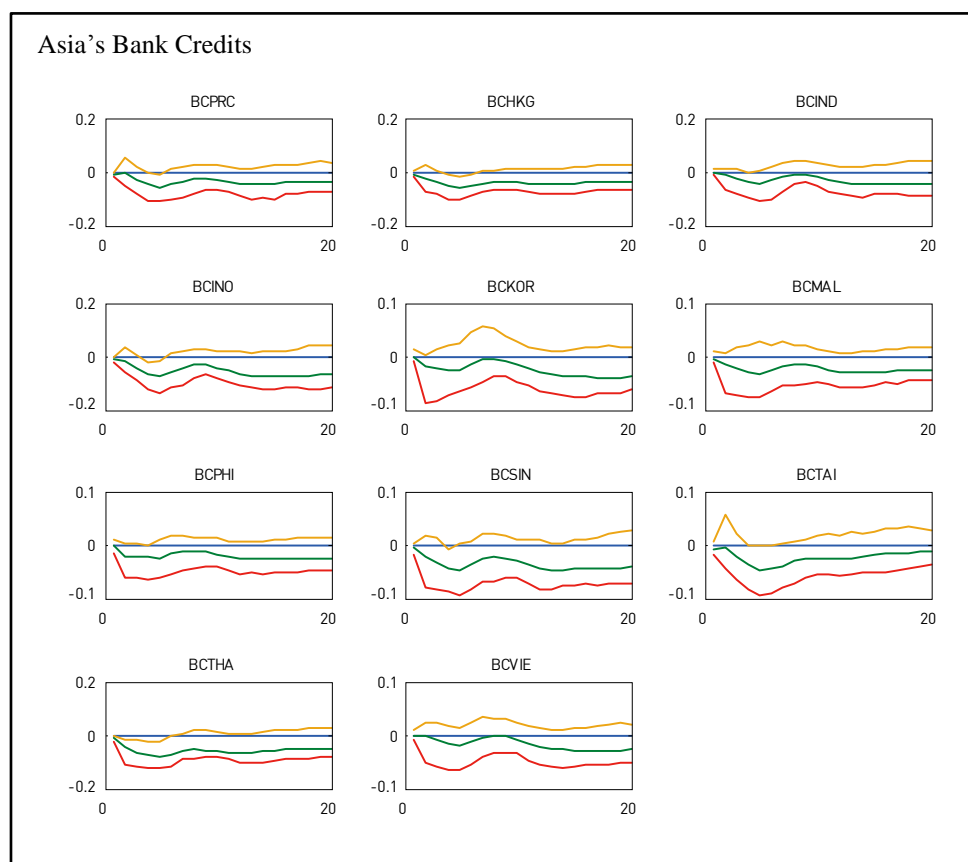


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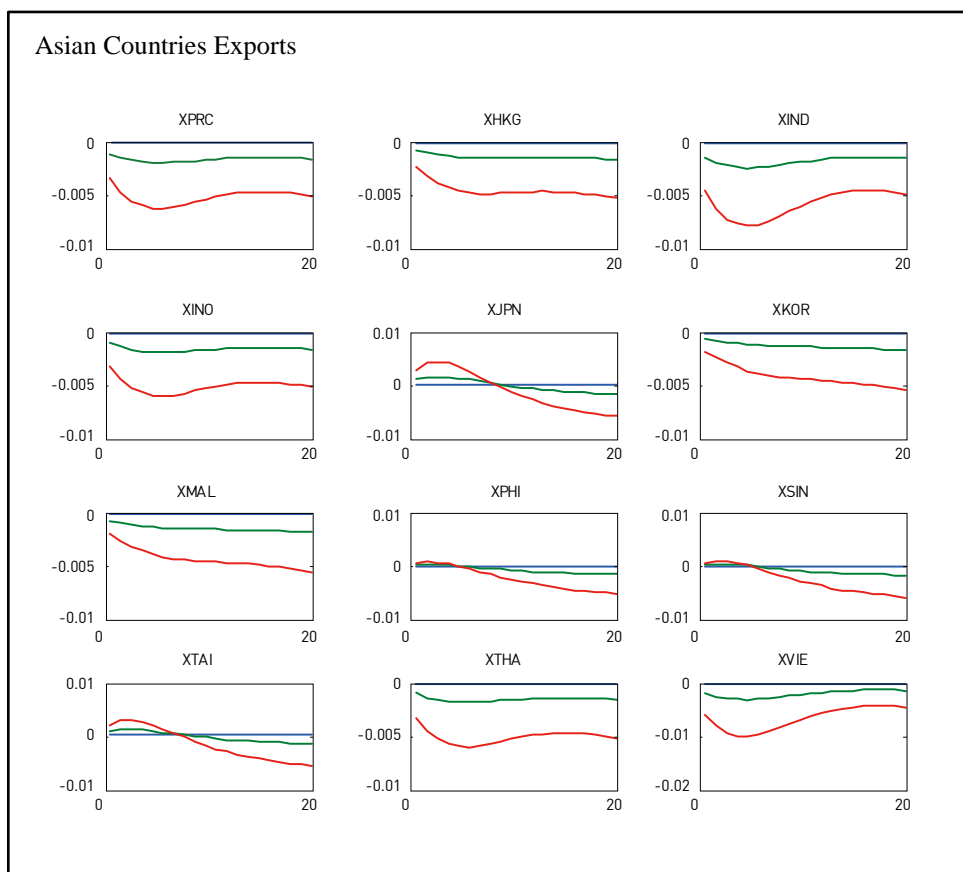


2) Markov Switching FAVAR Approach

As indicated in the previous section, the impacts of liquidity and real shocks on Asia's trade are not clear in the simple FAVAR. Therefore we introduce the Markov switching FAVAR to identify the transmission of liquidity and real shocks on Asia's trade. Figures 7 and 8 present the impulse response functions of Asian economies' trade to FFR and G7 growth shocks based on the Markov switching FAVAR. Figure 7 shows the impact of FFR shocks on the Asian trade. Exports from Asia decrease more in the crisis period than the normal liquidity period. This explains why Asia's export

dramatically dropped in 2008. Trade finance shows a mixed sign. Bank credit decreases after the FFR shock in Hong Kong, Taiwan, and Thailand, but other countries increase bank credits.

Figure 7. Impulse Responses of Trade to FFR Shock: Regime Switching
FAVAR Approach⁹



⁹ Red line indicates the crisis period while green line for the normal period

Figure 7. Continued

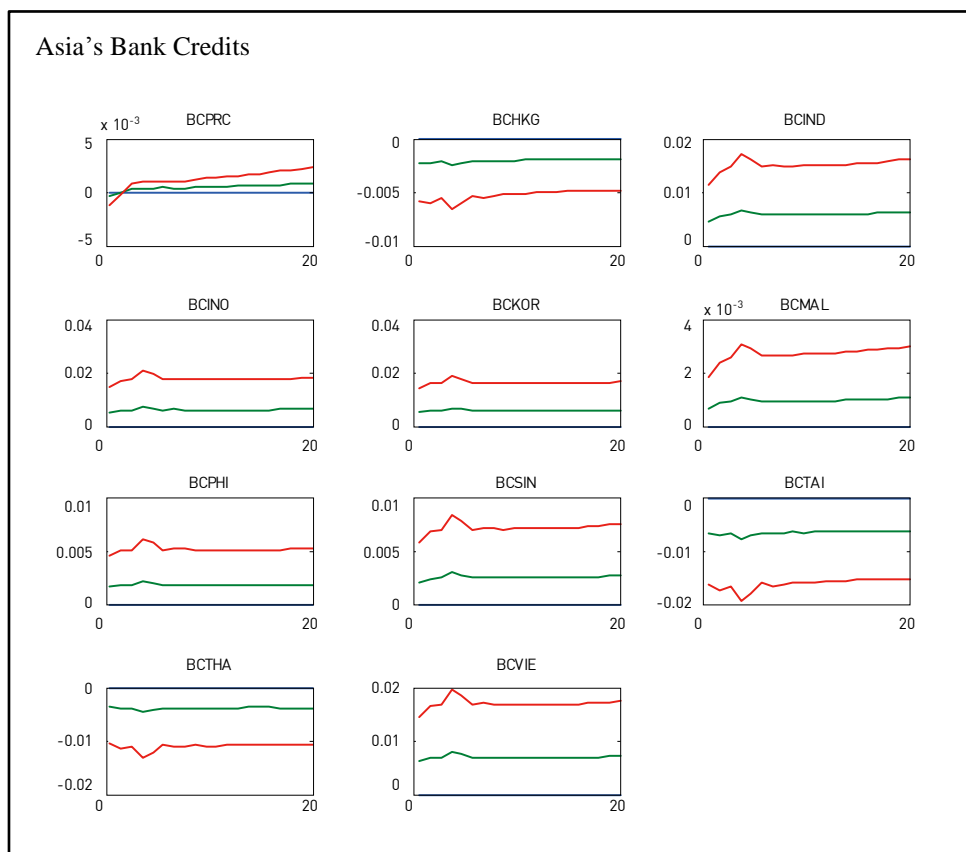
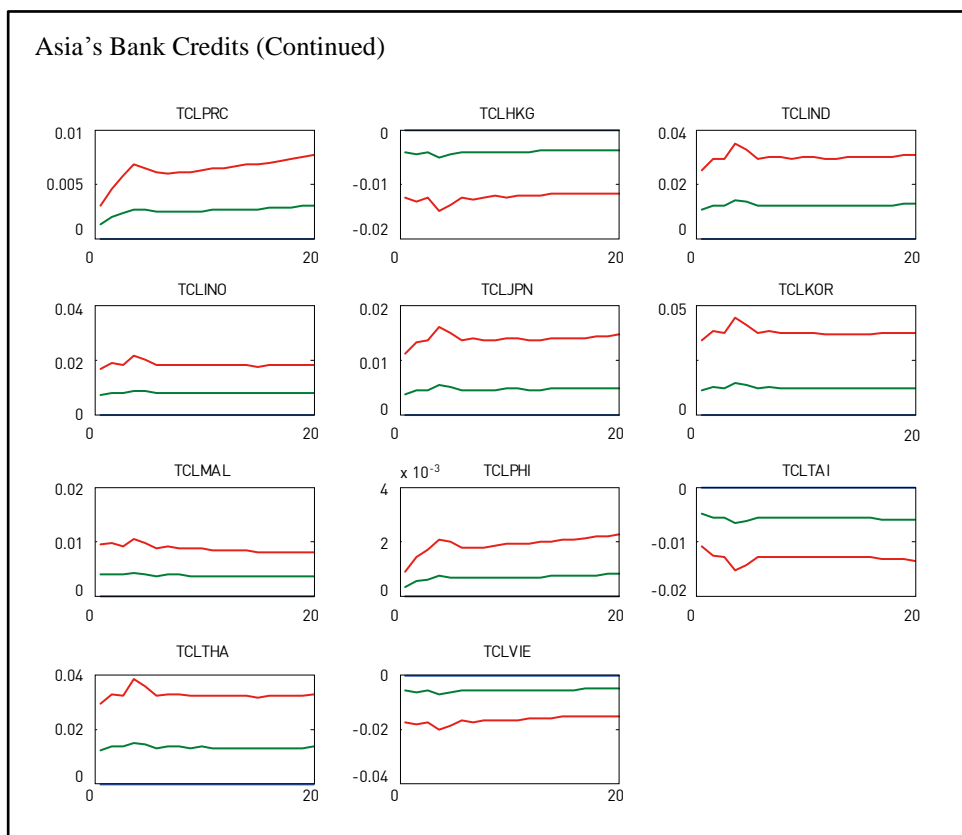


Figure 7. Continued



The responses of trade to the G7 growth rate shocks (Figure 8) also depend on the state of the global liquidity conditions. The increases in trade are smaller in time of the crisis period than the normal period in general after the positive G7 growth shock. It is interesting to note that the G7 growth shock is less persistent than the FFR shock. Moreover, the differences between two periods are smaller than that of the liquidity shocks. Bank credits decrease after the G7 growth shock.

Figure 8. Impulse Responses to G7 Growth Rate Shock

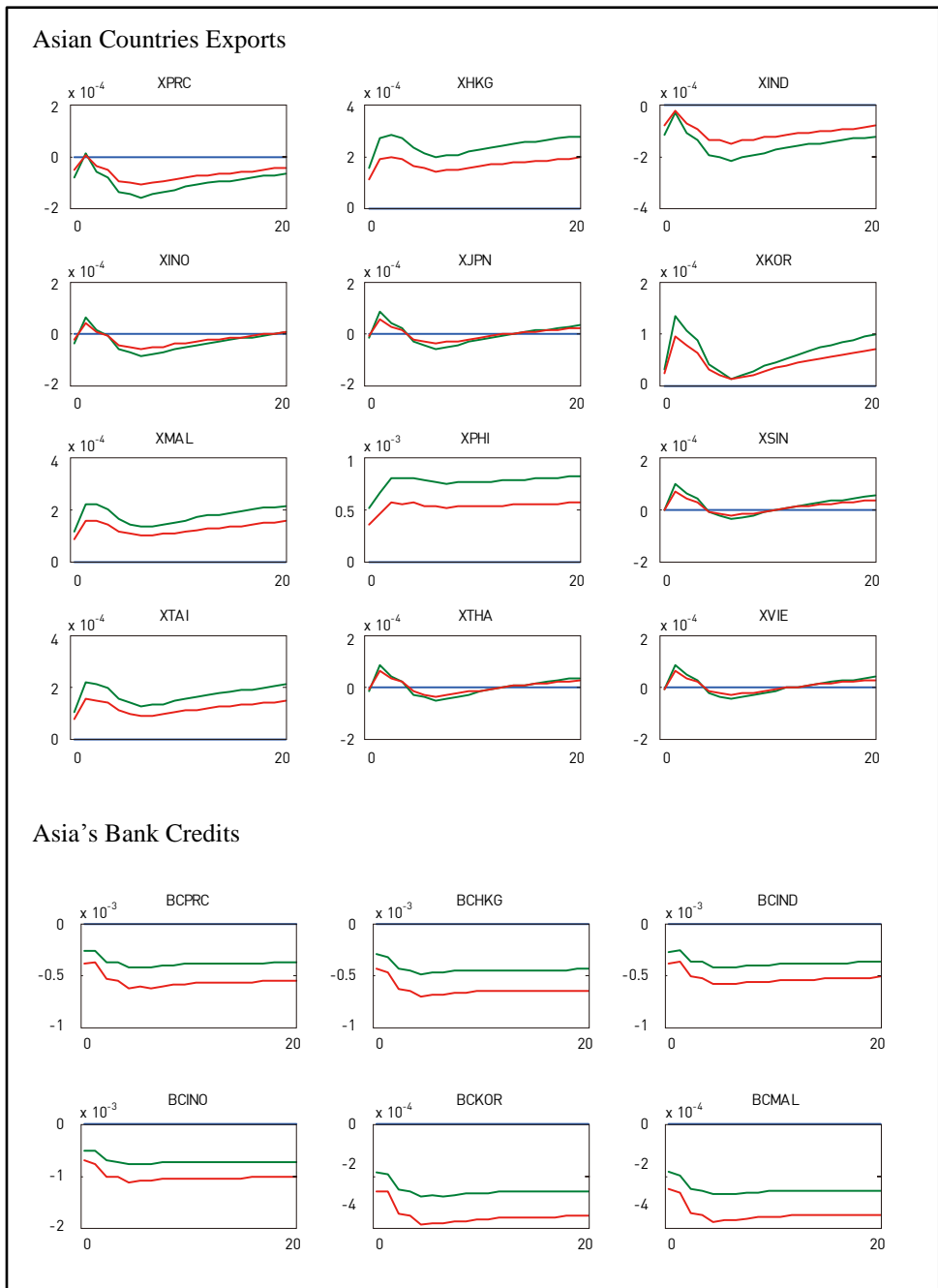
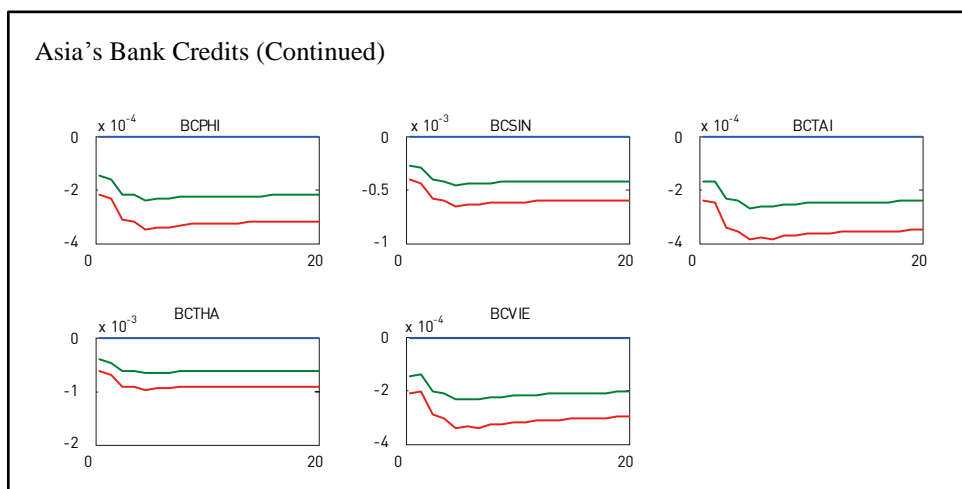


Figure 8: Continued



IV. CONCLUSION

Asia's exports dramatically decreased during the period of the 2008 global financial crisis. Beginning in the first quarter of 2008, there was a huge drop in trade which continued throughout the year. Asia suffered from the huge declines in export demand from developed countries and the increase in cost of finance in 2008. Trade finance, defined as a combined figure of BIS short-term bank loans and export credits, also shows a similar pattern to trade transactions, with export credit decreasing from \$370 billion to \$100 billion during the second half of 2007 and the first half of 2008 leading the decrease in trade.

The question is why the global financial crisis in 2008 brought about the abrupt and deep collapse in world trade, while other world-wide recessions since the Great Depression had only moderate effects on world trade. A few studies (Ronci, 2004; IMF, 2003; Auboin and Meier-Ewert, 2003) indicated that during the 1998 crises in Asia and Russia, trade finance declined as a result of financial crisis and caused a decline in trade. During the recent global financial crisis, IMF (2009) found a very small effect of reduced

trade finance on trade. Ronci (2004) found strong causality running from trade finance to trade while a more recent study by Thomas (2009) suggested that the impact was far less than earlier suggested.

This paper challenges the previous empirical results. We show that the state of liquidity conditions (normal or stressed) is an important factor in answering the question. More specifically, the state of global liquidity is an important factor for Asia's trade activities in the crisis period. This paper also shows that the impact of the FFR shock on exports was stronger and more persistent than the G7 income shock in Asia.

The causality has important implications for policy making. Is it possible to sustain trade by providing counteractive trade finance support through government agencies? Anecdotal evidence indicates this could be the case for Singapore and Hong Kong where export credit guarantee systems were well in place. It is important for small open economies that depend on export to keep the trade finance stable to reduce the negative effects of the global financial crunch. In particular, the small and medium enterprises are vulnerable to financial stresses. Therefore, the government should foster the export credit system for SMES in the time of credit crunch in the global scale. The decline in trade credit was more the result of a fall in export demand than supply in countries where financial and banking institutions and markets are competitive and government credit support systems are available and effective.

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