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Abstract

Based on the limitations imposed by the trilemma, this paper examines the trade-offs faced by the Chinese economy. Taking into account the role of accumulation of foreign reserves we examine how binding the constraints are for the Chinese monetary authorities. Using a Panel VAR with dynamic and static interdependencies as well as cross-sectional heterogeneities, we examine the monetary spillovers from China to a series of Asian economies. In this way, we measure the degree to which the Chinese trilemma constraints are exported to other countries. Consistent with previous research, our empirical evidence suggests that China's trilemma configurations are unique as China manages to achieve exchange rate stability, along with moderate financial liberalization, without losing its monetary autonomy. Furthermore, there are no significant spillovers to regional economies. Overall, trilemma does speak Chinese, but only for a short period.

Keywords: Trilemma, international reserves, Panel VAR
JEL Classifications: F36, F41, O53

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1 Introduction

China's rising importance to the global economy in the last 30 years has attracted wide research interest in the fields of international trade and financial studies. It's role in the expansion of global economic integration is substantial. In a period of less than 15 years it is expected to be the world's largest economy (World Bank, 2013). One of the basic features of this dynamic process is the export-oriented development strategy of not only China, but of the whole Asia Pacific region[1]. For these countries the importance of high productivity and maintaining upward trends in demand has increased, given the slow recovery in the US and the current Eurozone recession.

Such facts must be viewed in association with the ongoing developments in the Chinese financial sector. Characterised by the dominance of state-controlled banks and financial institutions, along with a great number of regulations, Chinese financial sectors have an increasingly important role in the global economy. The nexus of policy decisions regarding the financial openness and exchange rate flexibility, as well as the Renminbi (Rmb) internationalization, have a significant influence on the world economy Ito (2017). Recent studies have stressed the increasingly tight financial linkages of China with its East Asian neighbours in particular (Jang et al., 2011; Li, 2012; **?**). This trend is also confirmed by Glick and Hutchison (2013). According to their analysis, investors awareness of China has increased significantly after the global financial crisis of 2008-9. Its key role in international finance has naturally raised new queries about the importance of Chinese shocks to other economies. Hoarding of international reserves by China and other developing countries in the aftermath of the Asian crisis of the late 1990s was viewed as a hedge against volatile financial flows, but extended the role of China ahead of the GFC (Aizenman et al., 2011). Combining high levels of reserves along with controlled financial openness and a stable exchange rate, China is viewed as an economy with the capability to significantly relax the constraints imposed

[1]Since China's accession to the WTO in 2001, its share of world trade has almost tripled (World Bank, 2013), while its share to the global GDP has doubled (OECD, 2013).

by trilemma.

This study seeks to empirically examine the degree of policy constraints imposed by the trilemma in the Chinese economy. Furthermore, we investigate the impact of Chinese foreign reserve shocks on the major Asian economies. Given the predominant exchange rate stability and the progress of financial liberalization, we evaluate the restrictions that policy imparts upon China's domestic economy. We further investigate how binding these constraints are for other Asian countries, that is we try to estimate the degree of international spillovers imposed by the trilemma configurations of the Chinese economy. Using a Panel Vector Autoregression (PVAR) model characterised by dynamic and static interdependencies, as well as heterogeneities among the examined countries, we quantify the impact of a shock in Chinese international reserves on Asian economies. The rest of the paper is structured as follows: in Section 2 we review the relevant empirical literature and highlight our contribution there against. Section 3 presents the data and the baseline model. Section 4 analyses the main results and provides robustness checks there to. Section **??** concludes.

2 Literature Review and Contribution

The present study builds on two branches of literature. The first part examines the process of shock transmission from China's (real and financial) sectors to other economies. For instance, Inoue et al. (2015) study the effects of Chinese negative growth shock. Working upon a GVAR model, their findings suggest that Asian economies are significantly affected. Interestingly the degree of interconnectedness between Asian economies and China has been increased over the last decade. This finding reflects the above-mentioned trends on the increasingly significant role of China. Using the same empirical framework, Cashin et al. (2014) report similar results regarding the ASEAN-5 economies which are the most strongly affected by a Chinese growth slowdown. Feldkircher and Korhonen (2014) studies a positive shock to the Chinese output, confirming the large influence on other economies. He also

examines the impact of a real appreciation of the RMB. His findings are consistent with a decrease of economic activity in both China and its major exporting partners. Cesa-Bianchi et al. (2012) compare the long-run impact of a Chinese and a US GDP shock. Among their outcomes, they support the view that due to the increased trade relations between Latin America and China, the role of the latter has become more important than the US influence. Quite similar results are reported by Dreger and Zhang (2011) who also confirm the role of China to the transmission of business cycle effects. At the same time, they provide evidence of the declining role of US and Euro area impact on Asian economies. Ahuja and Nabar (2012) examine global spillovers from an investment slowdown in China. According to their analysis, the economies that are significantly affected are those that belong to China's regional supply chain; Taiwan, Korea and Malaysia. Also, countries that have large exposures to China (like Chile and Saudi Arabia) experience a significant slowdown in their economic performance. The same outcomes are found by Ahuja and Myrvoda (2012) who study the international spillover effects from a downturn in Chinese real estate investment.

A subgroup of empirical studies focuses analysis on the inflationary and commodity price dynamics. Côté and De Resende (2008) examine the transmission channels of Chinese economic fluctuations to inflation in OECD countries. They find that the most prominent channel comes from the supply side. Specifically, price- and wage-setting conditions in China have reduced OECD inflation rates. Furthermore, Osorio and Unsal (2013) analyse the inflation dynamics for Asia and they identify spillovers from China to the rest of the regional economies. The sources lay in both demand and supply shocks, while the contribution of monetary ones is limited. Eickmeier and Kühnlenz (2016) emphasise the equal importance of both direct (export and import prices) and indirect channels (exposure to foreign competition). On the contrary, Roache (2012) finds an increasing, but still limited, role of Chinese activity to world commodity prices. Overall, this branch of literature seems to confirm a rising importance of the Chinese economy to the rest of the world.

A second branch of related literature examines the strictness of trilemma constraints

in China. China's emphasis on exchange rate stability is integral to this strand. Given the movements towards financial liberalization, a key question is the degree of independent monetary policy. Both academia and policy institutions have shown interest in the restrictions imposed by trilemma. Aizenman et al. (2013) study the trilemma configurations for the two Asian giants; China and India. Among other findings, they empirically support the view that Chinese configurations differ from those of India and other emerging markets. Kawai and Liu (2015) and Humpage et al. (2015) conclude likewise, despite using different empirical settings. Both studies stress the fact that Chinese monetary authorities are facing a trade-off; the remaining of exchange rate stability with the cost of losing monetary independence or adopting a more flexible regime and retaining the control of monetary policy.

A proper understanding of the macroeconomic choices in terms of trilemma configurations would require the examination of international reserves. Their role and implications for the international macroeconomic policy have been extensively examined. Obstfeld et al. (2010) view the reserves as a tool that can counteract the negative effects of sudden and volatile capital flows. Aizenman et al. (2010a,b, 2013) suggest that foreign reserves can give the chance of middle ground trilemma policy choices. In other words, reserves can relax the trilemma constrains. In this paper we provide further evidence for this. Examining the role of international reserve accumulation from China, we evaluate how binding the constraints imposed by the impossible trinity are for Chinese monetary authorities. Based on the empirical model of Glick and Hutchison (2009), we examine the strictness of these constraints in an, as yet, untested way for the unique Chinese position. Given the above-stressed important role of the Chinese financial sector, we estimate the spillovers of the trilemma configurations to the major Asian countries. In other words we test for the presence of binding constraints (if any) for China and how such affect the monetary policies of other Asian economies.

Our contribution against the extant literature is twofold. Firstly, we shed new empirical light on trilemma configurations, identifying the degree of constraints imposed by the

impossible trinity. Here we estimate the degrees of freedom left for Chinese monetary authorities. Even when the RMB depreciation pressures during 2015-17 compelled Chinese authorities to spend a huge amount of reserves, China's stand over international-financial constraints remains unique (Aizenman and Sengupta, 2013). Secondly, our paper adds new empirical insights to the importance of China in a wide area that covers a significant amount of emerging markets. According to our results, a positive shock to Chinese reserves creates inflationary spillovers to almost all the examined economies[2]. However, these effects are short-lived. Their identification offers consideration to policy-makers and illuminates important channels critical to the Chinese trilemma configuration.

3 Empirical Methodology and Data

The present analysis is based on a Panel VAR methodology. In general, PVARs are increasingly becoming a popular tool for examining the interactions of several entities. The main advantage over traditional structural VAR is the addition of cross-sectional structure. Compared with other VAR modelling approaches, like GVARs (Pesaran et al., 2004), that impose a particular structure on the interdependencies, PVARs are able to capture greater variety of potential interlinkages. This is a significant property that allows us to assess and test the potential interconnectivity and spillovers among the examined countries. The terminology that we use thereafter is based on Canova and Ciccarelli (2013) who provide an excellent survey of the recent advances in PVARs.

Assuming y_{it} as a vector of G dependent variables captured for country i, $i = (1, ..., N)$ at time t, $t = (1, ..., T)$ with l lags ($l = 1, ..., L$), we can compactly define the panel VAR as:

$$y_{it} = A^1_{i1t} y_{1t-1} + ... + A^L_{i1t} y_{1t-L} + A^1_{i2t} y_{2t-1} + ... + A^L_{i2t} y_{2t-L} + ... \\ + A^1_{iNt} y_{Nt-1} + ... + A^L_{iNt} y_{Nt-L} + e_{it} \quad (1)$$

[2]Focusing on the international linkages among certain countries has become increasingly popular, see for instance Dekle and Hamada (2015) and Pang and Siklos (2016)

Where A_{it}^{L} are $G \times NG$ matrices and e_{it} are the uncorrelated over time error terms. These error terms are distributed $N(0, \Sigma_{ii})$ with Σ_{ii} $G \times G$ covariance matrices. More precisely the model can be written as:

$$\begin{pmatrix} y_{1t} \\ y_{2t} \\ \vdots \\ y_{Nt} \end{pmatrix} = \begin{pmatrix} A_{11t}^{1} & A_{12t}^{1} & ... & A_{1Nt}^{1} \\ A_{11t}^{1} & A_{12t}^{1} & ... & A_{1Nt}^{1} \\ \vdots & \vdots & \ddots & \vdots \\ A_{N1t}^{1} & A_{N2t}^{1} & ... & A_{NNt}^{1} \end{pmatrix} \begin{pmatrix} y_{1t-1} \\ y_{2t-1} \\ \vdots \\ y_{Nt-1} \end{pmatrix} + ...+ \\ \begin{pmatrix} A_{11t}^{L} & A_{12t}^{L} & ... & A_{1Nt}^{L} \\ A_{21t}^{L} & A_{22t}^{L} & ... & A_{2Nt}^{L} \\ \vdots & \vdots & \ddots & \vdots \\ A_{N1t}^{L} & A_{N2t}^{L} & ... & A_{NNt}^{L} \end{pmatrix} \begin{pmatrix} y_{1t-L} \\ y_{2t-L} \\ \vdots \\ y_{Nt-L} \end{pmatrix} + \begin{pmatrix} e_{1t} \\ e_{2t} \\ \vdots \\ e_{Nt} \end{pmatrix} \tag{2}$$

where e_t $N(0, \Sigma_t)$ and covariance is captured through the matrix:

$$\Sigma_t = \begin{pmatrix} \Sigma_{11t} & \Sigma_{12t} & \dots & \Sigma_{1Nt} \\ \Sigma_{21t} & \Sigma_{22t} & \dots & \Sigma_{2Nt} \\ \vdots & \vdots & \ddots & \vdots \\ \Sigma_{N1t} & \Sigma_{N2t} & \dots & \Sigma_{NNt} \end{pmatrix}$$

Such a specification suffers from over-parameterization due to the fact that even a small PVAR is characterised by a high parameter-space dimensionality. Working with an unrestricted PVAR, this means that $(NG)^2 L$ autoregressive coefficients and $NG(NG+1)/2$ parameters in the error covariance matrix have to be estimated. As we discuss later, in our case of $G = 4$, $N = 10$ and $L = 1$, we would have to estimate 1,600 VAR parameters and 820 error variances and covariances. Furthermore, the inference based on an unrestricted PVAR lacks solid economic interpretation. The way of overcoming this problem is by the imposition of structural restrictions. Following Canova and Ciccarelli (2013), we focus on

four groups of restrictions; i) cross-sectional heterogeneities, ii) dynamic interdependencies, iii) static interdependencies and iv) dynamic heterogeneities.

The first category refers to the possibility of having homogeneous coefficients across different units. Assuming that there are cross-sectional homogeneities, this means that $A^l_{1kt} \neq A^l_{jkt}$ for some $j \in \{1, .., N\}$ and $k \in \{1, ..., L\}$ and $\Sigma_{iit} \neq \Sigma_{jjt}$ when $i \neq j$. In the present study, it would be quite unrealistic to assume homogeneity amongst the examined economies. Therefore we do not impose this kind of restrictions, letting cross-sectional heterogeneities. Computationally, this is equivalent to computing a domestic VAR for each country.

The second type of potential restrictions are related to the lagged coefficients of each unit. More specifically, assuming the existence of dynamic interdependencies is equivalent to allowing the endogenous variables of each country to depend on the lags of the endogenous variables of every other country. Using the above notation, this is equivalent to letting $A^l_{ijt} \neq 0$ when $i \neq j$. Due to the fact that we are interested in grasping all the potential cross-sectional linkages among the examined economies, we decide not to impose this kind of restriction; we assume that our system is characterised by dynamic interdependencies.

Static interdependencies are related to the variance-covariance matrix. Mathematically, $\Sigma_{ijt} \neq 0$ when $i \neq j$. This means that we let a shock in one unit be transmitted to another unit. Given the close economic ties among the economies, we also allow this type of interdependency to facilitate representative modelling of the region.

Finally, dynamic heterogeneity allows $A^l_{ijt} \neq A^l_{ijs}$ and $\Sigma_{ijt} \neq \Sigma_{ijs}$ when $s \neq t$ and $t, s \in \{1, ..., T\}$. Given the relatively short period of our analysis time-span, it seems reasonable to assume homoskedasticity (dynamic homogeneity). Hence this set of restrictions is imposed within our PVAR. Even though the dimensionality is still high, the advantage of this specification is that it allows for direct dynamic interactions among countries. In this way, our model differs from single VARs that are estimated using either data from one country or panel data (pooled estimates). We estimate our model following the methodol-

ogy developed by Canova and Ciccarelli (2013) using the BEAR programme developed by Dieppe et al. (2016).

As mentioned in Section 2, we study the cross-border spillovers stemming from China to its most important Asian partners. Apart from China, we include the ASEAN-6 (Indonesia, Malaysia, Philippines, Thailand, Singapore, Vietnam). We also add to our analysis India, Japan and South Korea due to their importance on the global stage and the significant economic ties among these economies. For computational purposes, we assume one lag. Stacking over the N units, the model is compactly written as:

$$y_t = A_t^1 y_{t-1} + e_t \text{with} y_t = (r_T, y_t, \pi_t, m_t) \tag{3}$$

where y_t, the vector of endogenous variables, is composed of the four variables discussed earlier; log of total amount of reserves (r), log real GDP (y), CPI inflation rate (π), growth rate of money growth (m) for the period. All other properties from the generalised L lag model continue to apply with $L = 1$[3].

4 Results

4.1 Evidence from PVAR

Critical to understanding the export of the Trilemma is the impact that Chinese shocks have in China and the wider Asia-Pacific region. For this purpose we consider a shock to Chinese foreign reserve holdings and explore the response of inflation and M2 money supply growth in China and her neighbours. Figure 1 plots the response of the inflation rate in each country to a 1% positive shock to Chinese foreign reserves. Figure 2 charts the impact of the same

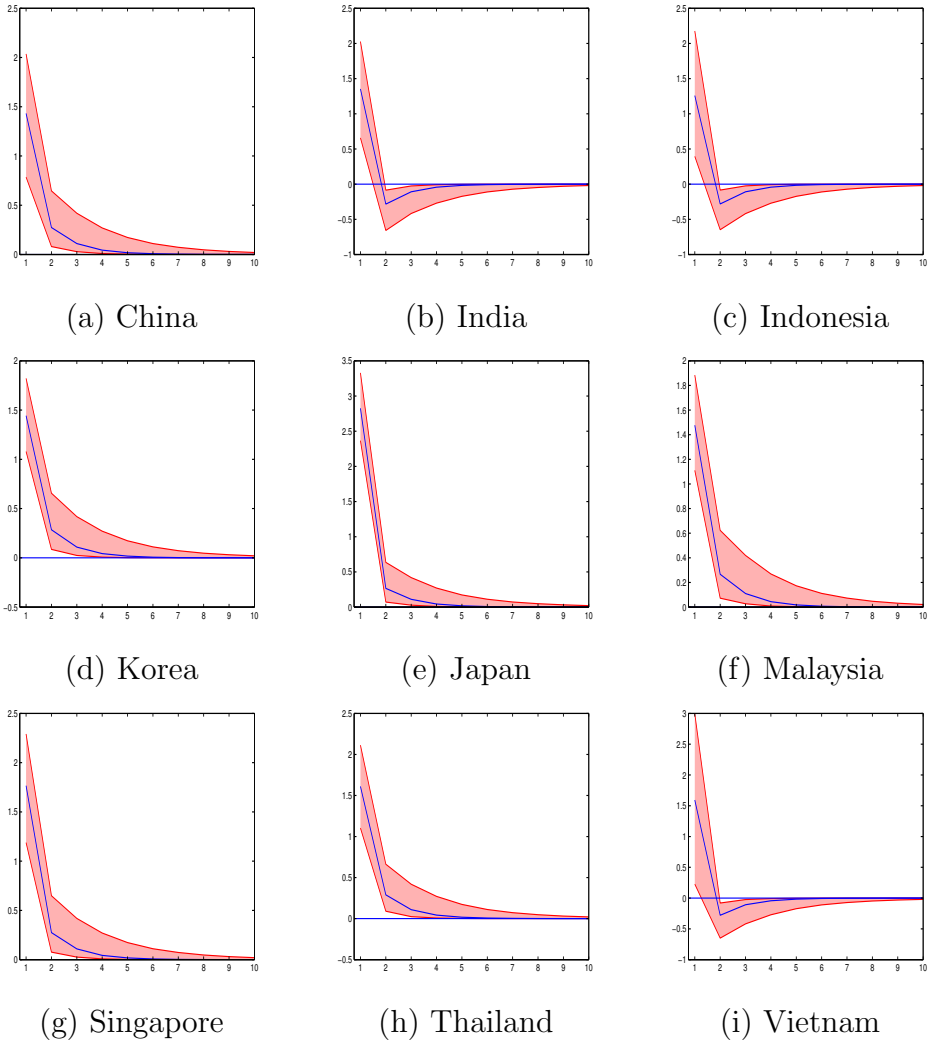
[3]All variables are stationary. The choice of form for the selected variables is based upon the empirical literature (Sims et al., 1990; Lin and Tsay, 1996; Choi, 2017) that suggests that it is feasible to include variables in levels in a VAR system even if they have unit roots.

increase in Chinese reserves on M2 money supply growth across our set of studied nations. In both figures a solid dark line is used to denote the projected value of the respective series following the shock, with shaded areas forming 95% confidence intervals. Consequently we can see the time period, in quarters, over which the impact of the shock dissipates and at each period the significance of the deviation from the original pre-shock expected value.

Beginning with the origin country, China, an increase of its reserves causes a 1.5% increase in the Chinese inflation rate. This is in accordance with our expectations. A huge trade account surplus, along with the attempts to keep the exchange rate fixed, means that the monetary authorities have to offer extra liquidity; they must purchase foreign money in exchange for domestic currency. However, this inflationary reaction is short-lived as it dies out after two quarters. Consequently, a sudden foreign reserve accumulation is not able to create a rapid and a long-run increase in the inflation rate. This may reflect the efficiency of sterilisation policies like sales of central bank bills and increased reserve requirements. These policies are designed to mop up the excess liquidity. Furthermore we see reflection in the response of monetary growth, which is initially increased by 0.8% and reduced to pre-shock level after 2 quarters. Chinese authorities thus appear to be quite successful at sterilizing the effects of reserve accumulation in a timely fashion. This result is added to the existing evidence according to which China has managed to relax the trilemma constraints through reserve accumulation (Aizenman et al., 2010a).

Turning our attention to international spillovers, we observe a quite similar picture; the remaining panels of Figure 1 showing the response of each country's inflation rate to a shock to Chinese reserve money. In all nine examined countries we find positive inflation spillovers; the inflation rates increase (a maximum of 1.7% in Korea and a minimum of 0.5% in Vietnam) and their effects die out after almost 2 quarters. The same pattern is observed for the case of monetary growth depicted in Figure **??**. Even though China's contribution in explaining global inflation dynamics has increased recently (Eickmeier and Kühnlenz, 2016), this increase does not seem to come from the international reserves channel. Our modelling

Figure 1: Response of Inflation to 1% Shock to Chinese Foreign Reserves



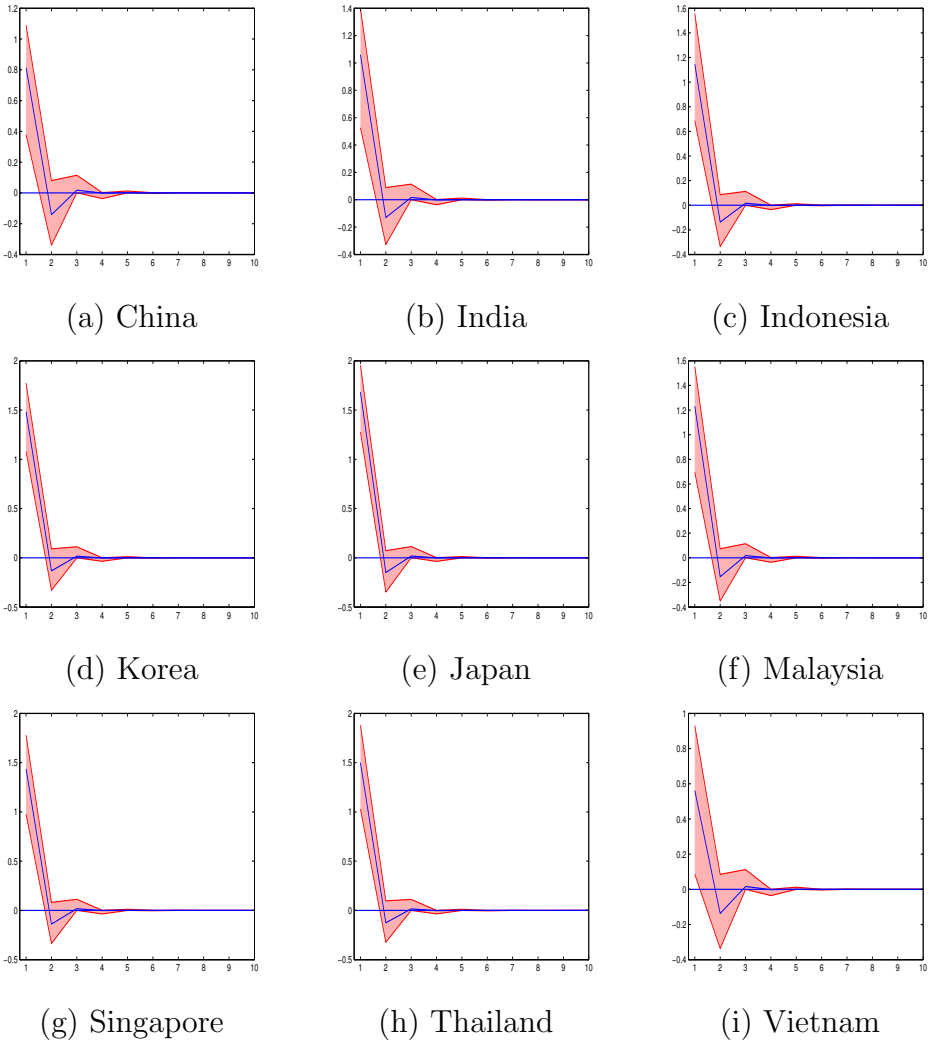
(a) China (b) India (c) Indonesia

(d) Korea (e) Japan (f) Malaysia

(g) Singapore (h) Thailand (i) Vietnam

Notes: Solid lines are used to plot coefficients, shaded areas the associated 95 per cent confidence intervals. A horizontal dashed line is added at 0 to indicate significance.

Figure 2: Response of M2 Growth to 1% Shock to Chinese Foreign Reserves



(a) China (b) India (c) Indonesia

(d) Korea (e) Japan (f) Malaysia

(g) Singapore (h) Thailand (i) Vietnam

Notes: Solid lines are used to plot coefficients, shaded areas the associated 95 per cent confidence intervals. A horizontal dashed line is added at 0 to indicate significance.

thus shows that neither China, nor any of the other regional economies, endure any lasting effects from a change in the reserve holdings of China. Given the large, and growing, levels of Chinese reserves it is of particular interest that this shock has no long-run effects for any economy. The trilemma constraints seem to be non-binding for the Chinese economy. Inflation is not raised permanently giving a reasonable degree of freedom to the Chinese monetary authorities. At the same time, international spillovers seem to be short-lived as well. For now at least there is little evidence of China facing the trilemma problems that have been identified for the United States.

4.2 Testing the validity of PVAR restrictions

The above results were based on a structural PVAR with certain assumptions. As we explained in Section 3, we allowed for static and dynamic interdependencies as well as cross-sectional heterogeneities, while we kept dynamic homogeneity. The next step is to test whether it is reasonable to assume such a structure. Given that there is no standard testing procedure regarding the validity of these restrictions, we employ the Stochastic Search Specification Selection (S^4) proposed and developed by Koop and Korobilis (2016). The S^4 algorithm is an extension of the Bayesian Model Averaging (BMA) technique to a PVAR framework. Due to the fact that a minimum amount of restrictions is necessary for a mindful economic inference, we take as given the dynamic homogeneity restrictions and we test the validity of the three remaining groups; dynamic interdependencies, static interdependencies and cross-sectional heterogeneities[4].

In our case we have N=10 examined countries, G=4 dependent variables and we impose 1 lag (L=1) using T=69 observations. This exercise allows us to identify which restrictions are valid to be imposed and which are not. In other words, the outcome of this procedure gives us the chance to evaluate the assumptions imposed on our PVAR. Table 1 reports the results for the case of Dynamic Interdependencies (DI). The maximum amount of such

[4]Another reason for focusing on these three groups of restrictions is the code developed by Koop and Korobilis (2016) hosts only these three kinds of restrictions.

Table 1: Country pairings with dynamic interdependencies (DI)

No	To	From	No	To	From	No	To	From
1	CHINA	India	26	South Korea	Philippines	51	Singapore	Japan
2	CHINA	Indonesia	27	South Korea	Singapore	52	Singapore	South Korea
3	CHINA	Japan	28	South Korea	Thailand	53	Singapore	Malaysia
4	CHINA	Thailand	29	South Korea	Vietnam	54	Singapore	Philippines
5	CHINA	Vietnam	30	Malaysia	CHINA	55	Singapore	Thailand
6	India	CHINA	31	Malaysia	India	56	Singapore	Vietnam
7	India	Indonesia	32	Malaysia	Indonesia	57	Thailand	CHINA
8	India	Japan	33	Malaysia	Japan	58	Thailand	India
9	India	Thailand	34	Malaysia	South Korea	59	Thailand	Indonesia
10	India	Vietnam	35	Malaysia	Philippines	60	Thailand	Japan
11	Indonesia	CHINA	36	Malaysia	Singapore	61	Thailand	Malaysia
12	Indonesia	India	37	Malaysia	Thailand	62	Thailand	Philippines
13	Indonesia	Japan	38	Malaysia	Vietnam	63	Thailand	Singapore
14	Indonesia	Thailand	39	Philippines	CHINA	64	Thailand	Vietnam
15	Indonesia	Vietnam	40	Philippines	India	65	Vietnam	CHINA
16	Japan	CHINA	41	Philippines	Indonesia	66	Vietnam	India
17	Japan	India	42	Philippines	Japan	67	Vietnam	Indonesia
18	Japan	Indonesia	43	Philippines	South Korea	68	Vietnam	Japan
19	Japan	Thailand	44	Philippines	Malaysia	69	Vietnam	Korea
20	Japan	Vietnam	45	Philippines	Singapore	70	Vietnam	Malaysia
21	South Korea	CHINA	46	Philippines	Thailand	71	Vietnam	Philippines
22	South Korea	India	47	Philippines	Vietnam	72	Vietnam	Singapore
23	South Korea	Indonesia	48	Singapore	CHINA	73	Vietnam	Thailand
24	South Korea	Japan	49	Singapore	India			
25	South Korea	Malaysia	50	Singapore	Indonesia			

Notes: China is capitalised within the table for clarity. Pairings identified following the testing procedures for PVAR of Koop and Korobilis (2016).

inter-linkages is $N(N-1) = 90$. Table 1 provides the nation pairs for which these linkages exist. According to the results, 73 out of 90 DI, i.e., more than 80% are valid. This means that the majority of the restrictions do not hold. In this way it is a legitimate strategy to assume the existence of dynamic interdependencies. Interestingly, China seems to be quite interdependent. More precisely, Chinese variables seem to appear in the VARs of all the remaining countries[5].

In a similar fashion, Table 2 shows the corresponding results for static interdependencies (SI). With a maximum amount of $N(N-1)/2 = 45$, the S^4 procedure informs us that 30 combinations of SI exist. This means that more than 66% of our sample is composed of countries that are interlinked through the error covariance matrix. We interpret this finding as evidence in favour of assuming static interdependencies among the examined countries.

Finally, Table 3 reports the outcome for the $N(N-1)/2 = 45$ cross-sectional heterogeneities. In this case, the assumption of homogeneous VAR models for each economy is rejected. More precisely, 78% (35 out of 45) of the combinations reject the assumption of homogeneity. Like in the previous two cases, we also interpret this evidence as a validation

[5]See From column in Table 1. For every country there is a CHI entry. This means that the coefficients of current and lagged Chinese variables are statistically significant in each country VAR-block.

Table 2: Country pairings with static interdependencies (SI)

No	C1	C2	No	C1	C2	No	C1	C2
1	CHINA	Indonesia	11	India	Japan	21	Malaysia	Philippines
2	CHINA	India	12	India	Thailand	22	Malaysia	Singapore
3	CHINA	Japan	13	India	Vietnam	23	Malaysia	Thailand
4	CHINA	South Korea	14	Japan	Thailand	24	Malaysia	Vietnam
5	CHINA	Thailand	15	Japan	Vietnam	25	Philippines	Singapore
6	CHINA	Vietnam	16	South Korea	Malaysia	26	Philippines	Thailand
7	Indonesia	India	17	South Korea	Philippines	27	Philippines	Vietnam
8	Indonesia	Japan	18	South Korea	Singapore	28	Singapore	Thailand
9	Indonesia	Thailand	19	South Korea	Thailand	29	Singapore	Vietnam
10	Indonesia	Vietnam	20	South Korea	Vietnam	30	Thailand	Vietnam

Notes: China is capitalised within the table for clarity. Pairings identified following the testing procedures for PVAR of Koop and Korobilis (2016).

Table 3: Countries where cross-sectional homogeneity (CS) restrictions do not hold

No	C1	C2	No	C1	C2	No	C1	C2	No	C1	C2
1	CHINA	Indonesia	10	Indonesia	South Korea	19	India	Philippines	28	South Korea	Philippines
2	CHINA	India	11	Indonesia	Malaysia	20	India	Singapore	29	South Korea	Singapore
3	CHINA	Japan	12	Indonesia	Philippines	21	India	Thailand	30	South Korea	Thailand
4	CHINA	South Korea	13	Indonesia	Singapore	22	Japan	South Korea	31	South Korea	Vietnam
5	CHINA	Malaysia	14	Indonesia	Thailand	23	Japan	Malaysia	32	Malaysia	Philippines
6	CHINA	Philippines	15	Indonesia	Vietnam	24	Japan	Philippines	33	Malaysia	Singapore
7	CHINA	Singapore	16	India	Japan	25	Japan	Singapore	34	Malaysia	Vietnam
8	Indonesia	India	17	India	South Korea	26	Japan	Thailand	35	Philippines	Singapore
9	Indonesia	Japan	18	India	Malaysia	27	South Korea	Malaysia			

Notes: China is capitalised within the table for clarity. Pairings identified following the testing procedures for PVAR of Koop and Korobilis (2016).

for our earlier choice to assume that each country VAR block is different from the others.

4.3 Robustness

In order to test the robustness of the main results, we estimate individual country VARs. In this context, there is no need to assume anything about the above kind of restrictions as there can not be spillovers among the examined economies. In order to study the effect of a shock to Chinese foreign reserves on other countries, we include this variable in the 10 individual VAR models. This means that the VAR for China is a simple four-variable model that can be written as:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + ... + A_L y_{t-L} + e_t \tag{4}$$

with $y_t = (r_t, y_t, \pi_t, m_t)$. Here r_t is the logarithm of foreign reserves, y_t is the logarithm of real GDP, π_t it the inflation rate, and m_t is the growth of the money supply. For the

remaining nine economies we estimate the same four-variable VAR. The only difference is that we include the Chinese foreign reserves instead of each country's reserves. The individual models are almost identical to the model described in (4):

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + ... + A_L yt - L + e_t \tag{5}$$

Where $y_t = \left(r_t^{china}, y_{it}, \pi_{it}, m_{it}\right)$ In order to test the robustness of the results, we estimate individual country VARs. In this context there is no need to assume anything about the above kind of restrictions as there are no longer spillovers among the examined economies. In order to study the effect of a sudden shock in Chinese foreign reserves on other countries, we include this variable in the 10 individual VAR models. This means that the VAR for China is a simple four-variable model that can be written as:

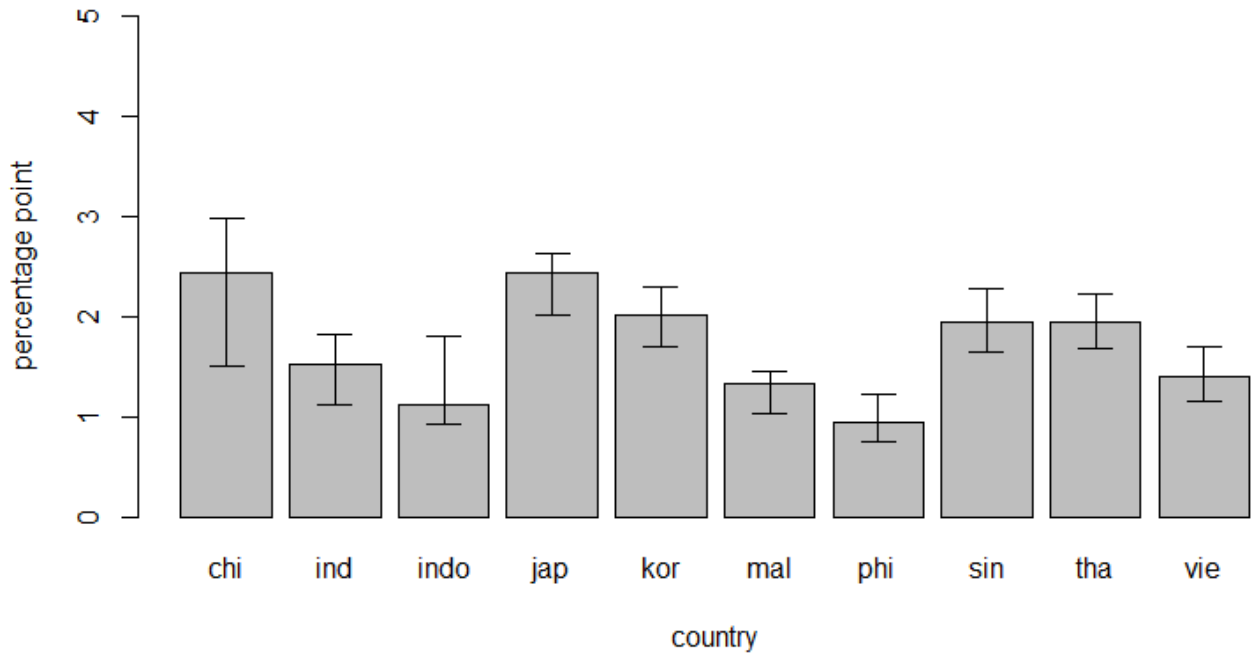
$$y_{it} = A_{1t} y_{it-1} + A_{2i} y_{it-2} + ... + A_{iL} yit - L + e_t \tag{6}$$

with $i = 1, ..., 9$ for the remaining nine examined economies and $y_{i,t} = \left(r_t^{china}, y_{i,t}, \pi_{i,t}, m_{i,t}\right)$ where r_T^{China} is the Chinese foreign reserves, $y_{i,t}$, $\pi_{i,t}$ and $m_{i,t}$ are the logarithm of real GDP, inflation rate and monetary growth of country i, respectively. The technical details are described in the appendix. To save space, we report the impulse responses on impact (Figure 3) and the responses 3 quarters after the shock (Figure 4). The results remain quantitatively the same with the ones obtained from PVAR. The effect of a one percentage point increase is a moderate positive inflation response in almost all of the examined economies. However, these inflationary effects die out after 3 quarters, consistent with earlier evidence

5 Conclusion

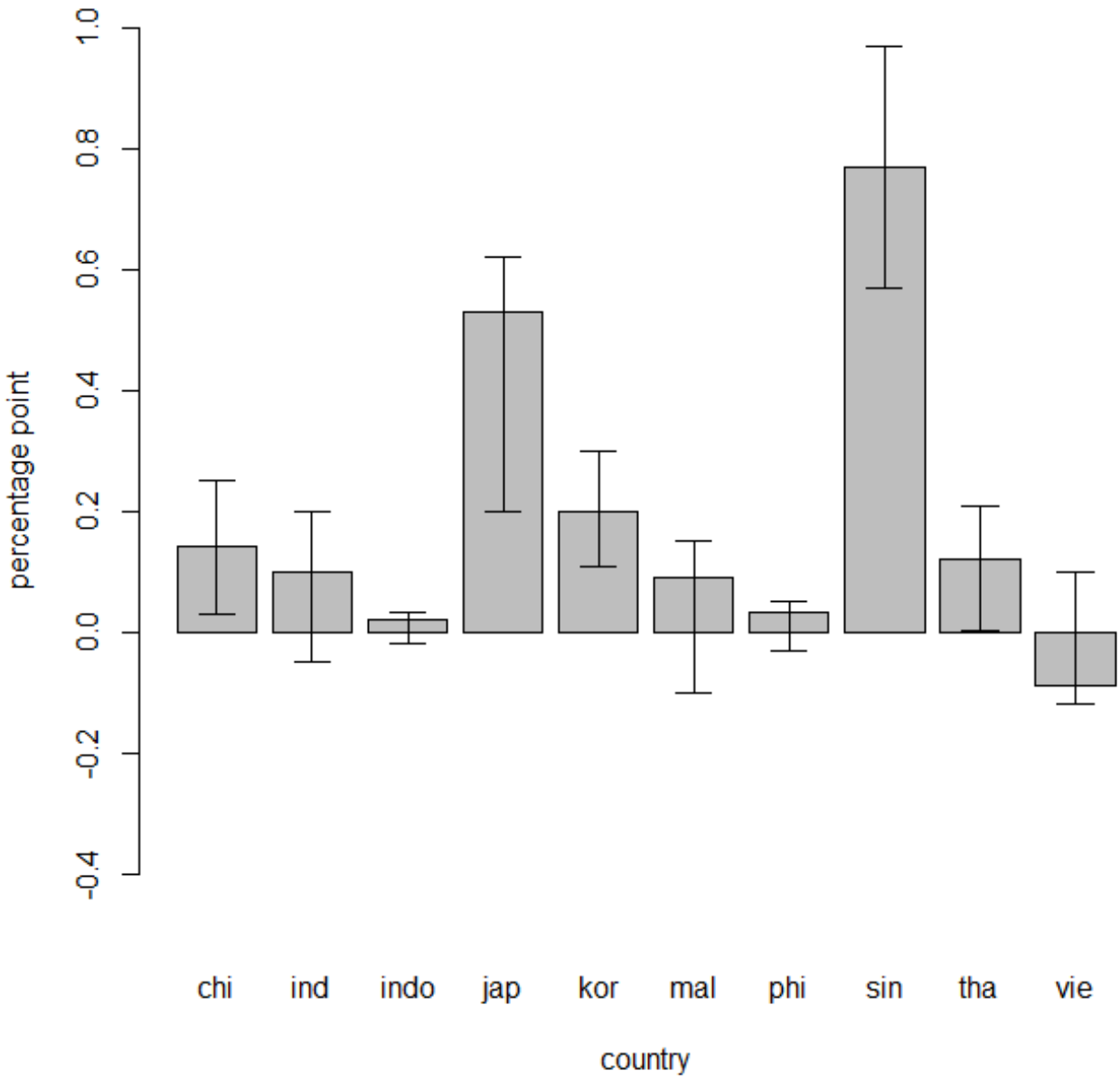
The prominent role of China in international markets has spurred a new empirical research. Part of it focuses on the trilemma constraints faced by the Chinese economy; the limiting

Figure 3: Response on impact to 1% Shock to Chinese Foreign Reserves: Individual VARs



Notes: Bar heights indicate estimated shock with whiskers added to denote the 95% confidence interval. Countries are denoted as follows: chi -China, ind - India, indo - Indonesia, jap -Japan, kor - South Korea, mal - Malaysia, phi - Philippines, sin - Singapore, tha - Thailand, and vie - Vietnam

Figure 4: Response after three quarters to 1% Shock to Chinese Foreign Reserves: Individual VARs



Notes: Bar heights indicate estimated shock with whiskers added to denote the 95% confidence interval. Countries are denoted as follows: chi -China, ind - India, indo - Indonesia, jap -Japan, kor - South Korea, mal - Malaysia, phi - Philippines, sin - Singapore, tha - Thailand, and vie - Vietnam

exchange rate flexibility along with growing international capital flows raises concerns about the independence of monetary policy. Given the potential important role of foreign reserves in relaxing these constraints, the present study examines the inflationary spillovers from an increase in Chinese foreign reserves. Specifically, we look into the response of inflation rates not only in China, but also in nine Asian economies. Building upon a PVAR framework that takes into account the tight trade and financial links among the examined economies, our evidence shows an inflation increase across countries. This effect is accompanied by an increase in the money growth. Both reactions prove to be short-lived as it dies out after approximately three quarters in all the examined economies. An interesting extension for future research will be to examine the effect at the sectoral level, especially the responsiveness of the housing sector.

Overall this evidence suggests that the trilemma constraints are not binding for China. Its unique configurations, a combination of fixed exchange regime with a moderate and controlled process of financial liberalization, gives significant degrees of freedom to Chinese monetary authorities. This freedom is not restricted even in the case of a sudden increase in its foreign reserves as is shown by the quantitatively small increase of inflation in China. The fact that this increase is also small for the other Asian economies gives the answer to the title question of the present study; the trilemma does speak Chinese, but only for a short period of time.

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