

# **China-Laos Economic Integration in the Context of the Belt and Road Initiative: Evidence From Sign Restrictions**

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*This study empirically assesses the degree of business cycles synchronization and economic integration between Laos and China under the influence of the Belt and Road Initiative. We estimate a two-country structural VAR model and apply sign restrictions to identify the structural shocks for 1984-2022. We find that China's macroeconomic shocks have played a significant role in shaping Laos' GDP and price level and that China's influence is increasing over time. Our results suggest that Laos' business cycles have become more synchronized with China's under the influence of the BRI, consistent with the overall literature of BRI's impact on the developing countries.*

*Keywords: Belt and Road Initiative, sign restrictions, Laos, China, business cycle synchronization, economic integration*

## **INTRODUCTION**

Since its formal inception in 2013, China's Belt and Road Initiative (BRI) has been reshaping global economic landscapes, particularly through large-scale infrastructure investments designed to enhance cross-border connectivity and stimulate development. The BRI has emerged as a catalyst for developing macroeconomic interdependence between China and participating economies.

As one of the earliest adopters of the BRI framework, Laos presents a critical case study for analyzing how infrastructure-led economic integration influences business cycle synchronization between China and the BRI participating small economies. Over the past decade, economic integration between China and Laos has accelerated significantly, driven primarily by infrastructure connectivity, trade expansion, investment flows, and policy coordination, creating a test case for examining cross-border macroeconomic dynamics.

### Infrastructure-Led Integration: The Boten-Vientiane Railway

The Boten-Vientiane Railway project is a prime example of infrastructure connectivity that has influenced economic integration. Initially conceived through bilateral discussions beginning in 2001, formal plans for the railway were confirmed by Chinese and Laotian officials in 2009. After prolonged negotiations that resulted in more favorable financial terms for Laos, the two countries signed an intergovernmental railway cooperation agreement on November 13, 2015, establishing the foundation for this transformative infrastructure project. Construction officially launched with a groundbreaking ceremony in Luang Prabang on December 25, 2016. The railway construction progressed through significant milestones – including completion of the first tunnel in December 2017, the Luang Prabang Mekong Bridge in July 2019, and track-laying completion in October 2021 – culminating in its official opening on December 3, 2021, coinciding with Laos’ 46th anniversary (Railway Gazette International, 2021).

**FIGURE 1**  
**MAP OF THE CHINA-LAOS RAILWAY**



Source: Cai, Y. (2023).

As the first China-built railway in Southeast Asia and the only one that links to China’s expansive high-speed rail network, this railway dramatically improved Laos’ regional connectivity by connecting its capital Vientiane directly with Kunming in China’s Yunnan province (Kuik, 2021). The railway reduced transport costs between Laos and China by an estimated 40-50%, shortening travel time from approximately 12 hours by road to just 3.5 hours by rail (World Bank, 2020). With a total investment of approximately USD 6 billion – equivalent to about one-third of Laos’ GDP – the railway represents the largest infrastructure project ever undertaken in Laos (Lao News Agency, 2022). Consequently, Laos advanced from the last place to 28th globally – and first within ASEAN – in per capita railway mileage among 149 countries (Lao News Agency, 2022). As a flagship project of the BRI, this railway has transformed Laos from a landlocked country into a land-linked hub and further facilitates the economic integration of Laos with China.

**Trade Expansion**

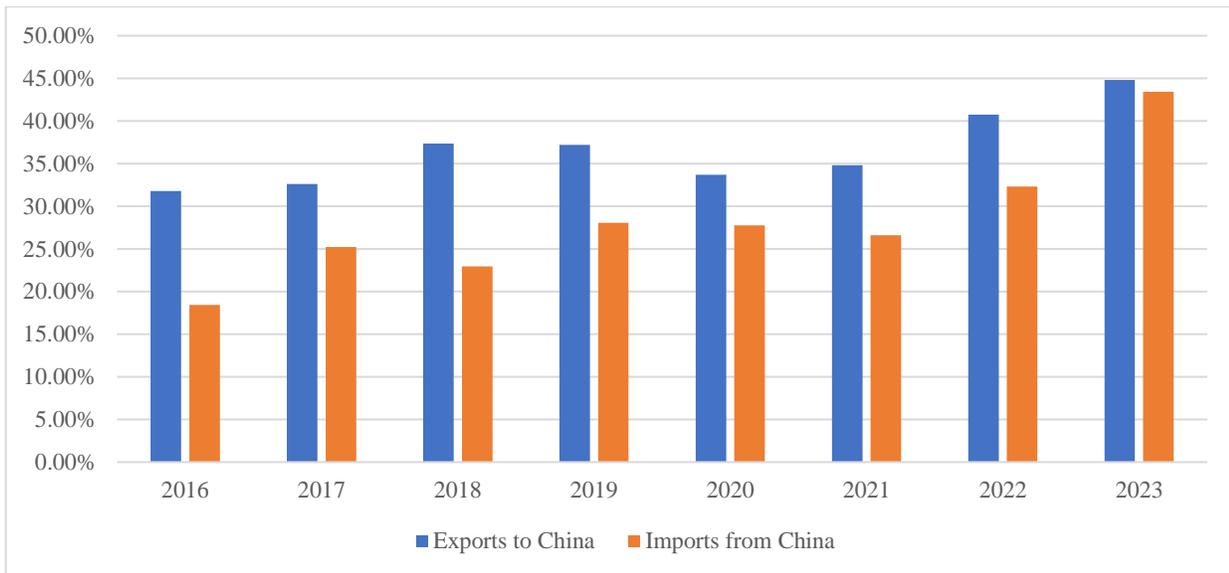
The railway significantly reshaped bilateral trade dynamics between China and Laos. Historically, China’s share of Laos’ exports remained below 1% during the period from 1997-2005 (Andersson et al., 2009). However, following intensified economic engagement with China under the BRI and particularly after construction began on the railway in late 2016, China’s share of Lao exports rose substantially. By 2016, China accounted for over 30% of Laos’ merchandise exports; by 2022, China emerged as Laos’ top export market and second largest trade partner. As of 2023, 45% of Laos’ exports were destined for China and 43.5% of its imports were sourced from China.<sup>[1]</sup>

**FIGURE 2  
LAOS-CHINA MERCHANDISE TRADE 2011-2024**



Source: General Administration of Customs of the People’s Republic of China (<http://stats.customs.gov.cn/>) and Ministry of Commerce of China

**FIGURE 3**  
**LAOS-CHINA TRADE AS A SHARE OF LAOS' TOTAL TRADE 2016-2023**

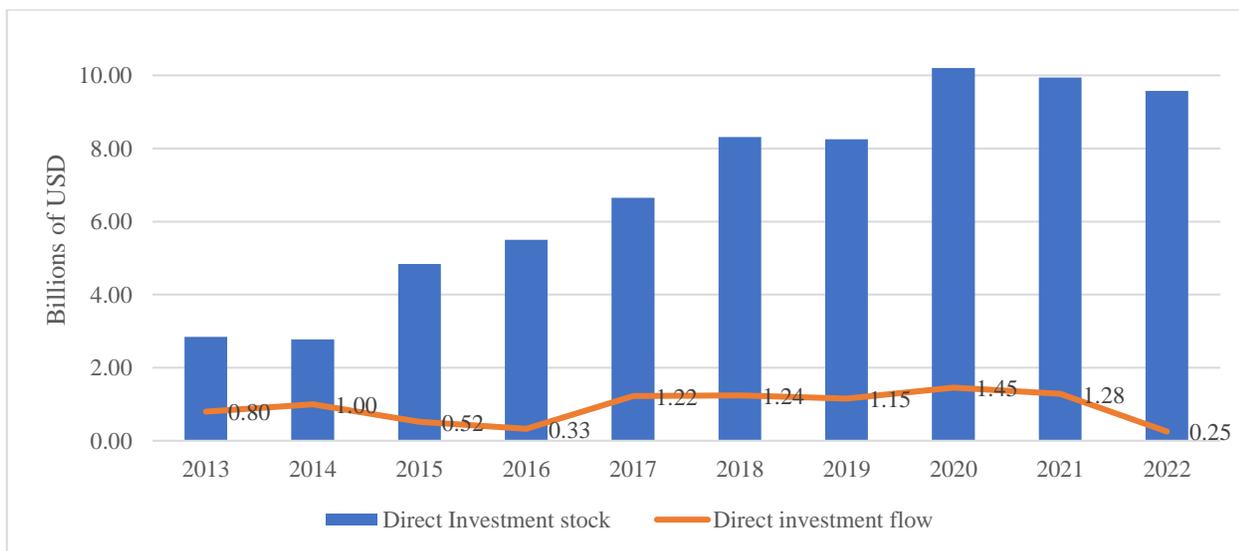


Source: General Administration of Customs of the People's Republic of China, Ministry of Commerce of China, and International Financial Statistics (IFS)

### Investment

The railway project catalyzed substantial Chinese foreign direct investment (FDI) inflows into Laos. In 2013, China overtook Thailand as the largest foreign investor in Laos (China Daily, 2014). By the end of 2022, Chinese FDI accounted for approximately USD 13.5 billion across more than 930 projects – representing around 36% of total FDI stock in Laos (Lao News Agency, 2023). Infrastructure-related sectors such as logistics services and construction activities, linked directly or indirectly to the railway, have attracted significant investment flows post-railway completion.

**FIGURE 4**  
**CHINA'S DIRECT INVESTMENT (NON-FINANCE SECTOR) IN LAOS 2013-2022**



Source: Ministry of Commerce of China and authors' calculation

## Policy Coordination

Financial integration has deepened through currency cooperation agreements. In January 2020, the People's Bank of China (PBC) and the Bank of Lao PDR signed an agreement promoting local currency settlements (International Monetary Institute, 2021). Subsequently, RMB clearing services officially launched in Laos on October 23, 2023 (Xinhua News Agency, 2023). These developments facilitated smoother bilateral transactions and reinforced monetary policy coordination between the two economies. Broader policy coordination includes joint initiatives across diverse sectors such as agricultural modernization, hydropower development, mining projects, digital economy integration, and customs cooperation agreements signed in October 2023 to build a China-Laos community with a shared future for the period of 2024-2028 (Xinhua Silk Road, 2023).

Given the unprecedented strengthening of economic cooperation between Laos and China under the BRI influence, a key question emerges: Has Laos' economy become more integrated with China's at the macroeconomic level; in particular, have Laos' business cycles become more synchronized with China's, after these many years of infrastructure-led economic integration?

In this article, we attempt to investigate this question empirically. We develop a five-variable two-country structural VAR model encompassing China's output and price level, Laos' output and price level, and the bilateral real exchange rate. We apply the model to annual data from 1984 to 2022, treating Laos as the small open economy and China as its large neighbor country that exerts significant influence on Laos. Using the Uhlig (2005) sign restriction approaches, we identify four structural shocks – China's aggregate supply shock and aggregate demand shock, Laos' aggregate supply shock and aggregate demand shock, and examine the relative importance of China's shocks on the Lao economy with the impulse response functions and variance decompositions. We find that China's macroeconomic shocks play a significant role in influencing Laos' output and price level, and that China's influence on Laos increases over time, suggesting that Laos' business cycles have become increasingly more synchronized with China over time under the influence of the BRI. These results have important policy implications with regards to future BRI management policies in Laos and potential monetary integration between China and the BRI-participating economies. To our best knowledge, our study is the first quantitative examination of the degree of economic integration and business cycle synchronization of the Lao economy with China, contributing to the literature which studies the impact of China's BRI on the economic development of participating countries.

The rest of the article is organized as follows. Section 2 reviews the literature. Section 3 describes the empirical method and the data. Section 4 presents and discusses the results. And Section 5 concludes.

## LITERATURE REVIEW

Recent empirical studies provide mixed evidence on the BRI's effects on business cycle synchronization between China and the BRI partner countries. Yu et al. (2023) investigate the role of global value chain (GVC) trade in explaining bilateral business cycle synchronization between China and 34 BRI countries using panel data of 2009-2019. They identify a positive and strong correlation of GVC trade with business cycle synchronization, particularly through the manufacturing and services channels, and document strong supply and demand spillover effects from China on the BRI partner countries. Li and Lu (2020) apply the panel Simultaneous Equations model and Three-Stage Least Squares analysis on panel data of 47 countries for 1991-2017. Their findings suggest that bilateral trade, financial integration, fiscal and monetary policy coordination, and the BRI intergovernmental agreements are the key drivers of enhanced business cycle co-movements between China and the BRI countries. Contrastingly, Qiu and Mai (2022) use the instantaneous quasi-correlation coefficient to measure the business cycle synchronization linkages among 53 BRI countries from 2000 to 2019. Their results reveal that BRI economies exhibit weak synchronization overall, with China's influence as a network hub remaining limited despite increased connectivity. However, most of these studies used panel data for which Laos may or may not be included, and none of the existing studies closely examine the bilateral business cycle synchronization between China and Laos.

As China-Laos economic integration rapidly increases under the BRI, another related strand of research concerning the overall effects of the BRI on Laos' general economic development emerged. Goto (2011) provides a detailed review of the impacts of regional integration in Southeast Asia on Laos' economy and the evolving position of Laos in the regional integration process, for which China has served as a key driving force through trade and foreign direct investment. Goto (2011) concludes that continuing regional integration through the ongoing Great Mekong Subregion initiative and the ASEAN-China Free Trade Agreement would increasingly integrate Laos' economy with the Chinese economy.<sup>[2]</sup> Using a computable general equilibrium (CGE) model and simulations, Kyophilavong et al. (2017) conclude that Chinese FDI has positive impacts on Laos' GDP, exports, employment, government revenue, technological advances, and poverty reduction. However, they also note that due to the concentration in primarily resource sectors such as mining and hydropower, Chinese FDI could also potentially cause economic instability through real exchange rate appreciation and declining productivity in the non-resource sectors. Souvannarath (2018) examines the Laos-China collaborations under the BRI through the lens of Laos and concludes that participating in the BRI has brought positive impacts to Laos economically, politically, socially, and technologically and that the benefits far outweigh the potential risks and challenges. In particular, the BRI partnership with China could potentially lead to a substantial reduction in poverty in Laos, among other advantages to Laos' long-term development, and serves as the new engine of economic growth. Gu (2024) documents that China and the BRI are playing a critical role in supporting Laos development toward achieving the Sustainable Development Goals through contributing financial infrastructural investment; corporate expertise and project management know-how; knowledge-sharing and lesson-learning cooperation; skills enhancement programs; social development infrastructure and human resource collaborations. Using the GMM and ARDL methods on data of 1995-2020, Keothephar and Srithilat (2024) document the paramount importance of infrastructure investments to Laos' economic growth and development, particularly in the sectors of agriculture, energy, telecommunications, transportation, and human capital development, which, in echo with Souvannarath (2018) and Gu (2024), are the main areas of China's positive impacts to Laos under the BRI. Kuik (2021) uses an asymmetry-authority framework to explore the economic and political reasons behind Laos' embrace and promotion of China's BRI despite the controversies and concerns associated with the program. Most of these studies took a more qualitative approach to the various impacts brought about by the BRI on Laos and none of them empirically assessed the macroeconomic integration or formally modelled and quantified the business cycle synchronization between Laos and China. We will take a macroeconomic quantitative approach and model the relationship in the next section.

## DATA AND EMPIRICAL METHOD

Following the seminal work of Sims (1980), structural vector autoregression (SVAR) models have become a popular tool in gauging the dynamics of interactions within open economic systems. Both China and Laos started transitioning from centrally planned economies into open-market systems in the early to mid-1980s, making the SVAR model applicable to their economies for the studied period (Heytens and Zebregs, 2003; Wang, 2005; Andersson et al., 2009; Sun, 2017). Traditionally, studies of an asymmetric system between a small open economy, like Laos, and its large, influential neighbor, like China, usually formulate the variables of interest as relatives to the corresponding variables of the large neighbor (Wang, 2005; Clarida and Gali, 1994). This may incur several problems, as documented widely in the literature. A system based on relative variables can only identify asymmetric shocks and cannot capture the true dynamics of country-level variables to specific country-level macroeconomic shocks; the relative variables assume identical propagation mechanisms of shocks across countries, in fact different countries can respond to these shocks in varying ways, and the transmission channels of macroeconomic shocks can differ across countries. Alternatively, more recent SVAR models are designed to analyze the dynamic economic interactions and transmission of macroeconomic shocks between countries or economies using country-level variables. (Farrant & Peersman, 2006; Peersman, 2011; Sun, 2017).

Assume that the China-Laos economic system can be summarized in the reduced-form VAR:

$$X_t = \Gamma_0 + B(L)X_{t-1} + e_t \quad (1)$$

$X_t = (cy, cp, ly, lp, rer)$  is the 5x1 vector of variables encompassing China's real GDP (*cy*), China's GDP deflator (*cp*), Laos' real GDP (*ly*), Laos' GDP deflator (*lp*), and the bilateral Laos-China real exchange rate (*rer*).<sup>[3]</sup>  $B_i$ 's are 5x5 coefficient matrices,  $e_t$  is the one-step ahead prediction error with variance-covariance matrix  $\Sigma$ , and  $\Gamma_0$  is the intercept. Our data are annual for 1984-2022, collected from the *World Development Indicators* and *FRED* databases. Estimation of the reduced-form VAR is done with log levels of the data and lag length of 1, determined by standard likelihood ratio and AIC information criterion tests.

Our interest lies in how the variables in  $X_t$  respond to structural shocks. Let  $\varepsilon_t = (\varepsilon_{CN}^s, \varepsilon_{CN}^d, \varepsilon_{LA}^s, \varepsilon_{LA}^d, \varepsilon^{er})_t$  be the vector of structural shocks, including China's supply shock, China's demand shock, Laos' supply shock, Laos' demand shock, and exchange rate/nominal shock.  $E(\varepsilon_t \varepsilon_t') = I$ . Let  $e_t = C\varepsilon_t$ , and  $\Sigma = E(e_t e_t') = CE(\varepsilon_t \varepsilon_t')C' = CC'$ , then the structural counterpart to Eq. (1) in moving average form is given by:

$$X_t = (I - \sum_{i=1}^p B_i L^i)^{-1} C \cdot \varepsilon_t \quad (2)$$

Let  $D(L) = (I - \sum_{i=1}^p B_i L^i)^{-1} C$ , thus

$$X_t = (D_0 + D_1 L + D_2 L^2 + \dots) \varepsilon_t \quad (3)$$

The commonly used strategies to identify structural shocks for SVAR models fall into two main categories: the zero restrictions – recursive or non-recursive, contemporaneous or in the long run or combinations of the two, and sign restrictions. The first group, strategies with zero restrictions, is subject to key drawbacks. Faust and Leeper (1997) show that substantial distortions in the estimations are possible due to small sample biases and measurement errors when using zero restrictions in the long run. Moreover, some equilibrium growth models (for instance many overlapping generations models) allow for permanent real effects of nominal shocks because they can affect the steady state level of capital. The zero restrictions on the contemporaneous impact of shocks might not be consistent with a large class of general equilibrium models (Canova and Pina, 1999). The zero assumptions, both stringent and arbitrary, may be developed over time in a data-mining manner when researchers look for restrictions that can provide sensible results (Rudebusch, 1998).

On the other hand, sign restrictions (Faust, 1998; Uhlig, 2005; Peersman, 2005) can help avoid the above issues. There are several advantages to the sign restriction approach. First, it eliminates the needs to impose zero restrictions on the contemporaneous impact matrix or on the long-run effects of the shocks. With the zero restriction strategies, signs of impulse responses are used implicitly to check against conventional views for the validity of the identification assumptions. With the sign restriction identification strategy, signs consistent with conventional views are explicitly imposed on the impulse responses. Peersman (2005) found that impulse responses based on traditional zero restrictions are often located in the tails of, and thus can be seen as a single solution of, a whole distribution of possible impulse responses, rendering any policy conclusions based on zero restrictions potentially misleading. Second, with the sign restriction approach, a VAR model does not need to be fully identified; only structural shocks of interest can be identified, making it more flexible to cope with various data limitations. And third, estimation of the sign restriction approach uses Bayesian Monte Carlo integration, which accounts for both data and identification uncertainty and makes differencing of variables unnecessary (Sims, 1988).

Our study uses the Uhlig (2005) sign restriction strategies to identify the structural shocks. Because we are only interested in four structural shocks – China's supply shock, China's demand shock, Laos' supply shock, and Laos' demand shock – we impose identifying restrictions only to columns of matrix  $C$  corresponding to these four shocks.

The Bayesian Monte Carlo procedure involves “outer-loop draws” and “inner-loop draws”. Both the prior and posterior belong to the Normal-Wishart family. In the first step of the simulation,  $n_1$  random draws

are taken from the posterior distribution of the reduced form VAR parameters of  $B_i$  and  $\Sigma$ . Each draw from the posterior distribution of the VAR parameters is decomposed with the Cholesky decomposition. In the second step, the “inner loop draws”,  $n_2$  draws are randomly taken from the unit sphere assuming a flat prior. Thus,  $n_1 \times n_2$  corresponding sets of impulse responses to each shock are generated. Only the impulse responses that are compatible with the sign restrictions are kept for inferences. Further, the time over which the sign restrictions apply is set at  $k=0, 1$  given our annual data. For the impulse responses, we calculate and report the 16<sup>th</sup>, 50<sup>th</sup>, and 84<sup>th</sup> percentile values.

**TABLE 1**  
**IDENTIFYING SIGN RESTRICTIONS**

	China’s GDP	China’s Price Index	Laos’ GDP	Laos’ Price Index
China Supply Shock	+	-	+	
China Demand Shock	+	+	+	
Laos Supply Shock			+	-
Laos Demand Shock			+	+

Table 1 summarizes the sign restrictions imposed to identify the four structural shocks. Because the main purpose is to evaluate the business cycle synchronization of Laos with China, it is necessary to know how significantly the Laos’ economy is influenced by China’s macroeconomic shocks. Consistent with the AD-AS model, we assume that for both countries, a positive domestic supply shock has a positive (+) effect on its GDP and negative (-) effect on its price level; and a positive domestic demand shock has a positive (+) effect on both its GDP and price level. Assuming that Laos is a small open economy relative to China – its large neighbor, we add two more sign constraints to identify China’s shocks: we assume that China’s positive supply shock and demand shock both have positive (+) effects on Laos’ GDP. The latter assumptions are consistent with the literature in which the large anchor economy often exerts an influence on the small economy but not the other way around (Chow & Kim, 2003; Farrant & Peersman, 2006; Sun, 2017).

## RESULTS

Uhlig (2005) proposed the “pure sign restriction” and the “penalty function” approaches, based on a Bayesian method, to deal with the issue of non-exact identification of the impulse vector and the sampling uncertainty in the OLS estimate of  $B$  and  $\Sigma$ .<sup>[4]</sup> In the “pure-sign-restriction approach”, all impulse vectors satisfying the impulse response sign restrictions are considered equally likely. In the “penalty-function approach”, additional criteria are used to select the best of all impulse vectors, and thus it has smaller standard errors and are effectively a subset of the results from the “pure sign restriction” approach. Both approaches have their merits. The use of one over the other is subject to personal preference. In this section, we present results from both approaches.

### Pure Sign Restriction Approach

Figures 5-8 illustrate the impulse responses of the five variables to a one standard deviation positive China supply shock, China demand shock, Laos supply shock, and Laos demand shock, respectively. The 16th, 50th, and 84th percentile values are presented for the predicted future ten years.

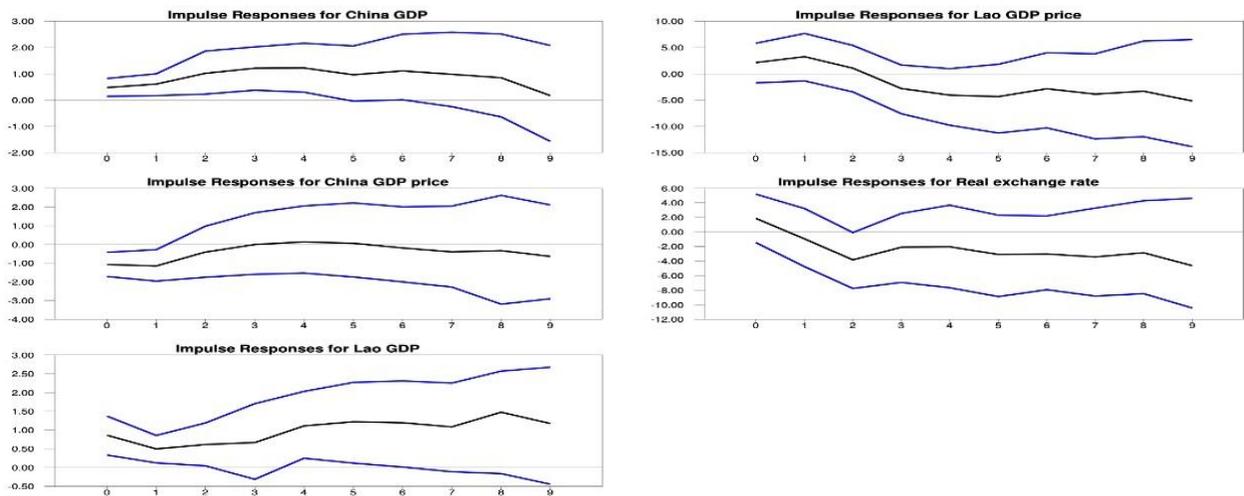
A positive aggregate supply shock in China increases China’s GDP and decreases China’s price level. It also increases Laos’ GDP as well as its price level. According to standard macroeconomic theory, given that China is Laos’ major trade partner, an increase in China’s income will increase Laos’ exports to China, thus increasing Laos’ aggregate demand, resulting in an increase in Laos’ GDP and price level. A positive aggregate demand shock in China increases both China’s GDP and the price level. It also leads to a

statistically significant increase in Laos' GDP. However, the effects of both shocks on Laos' price level are statistically insignificant.

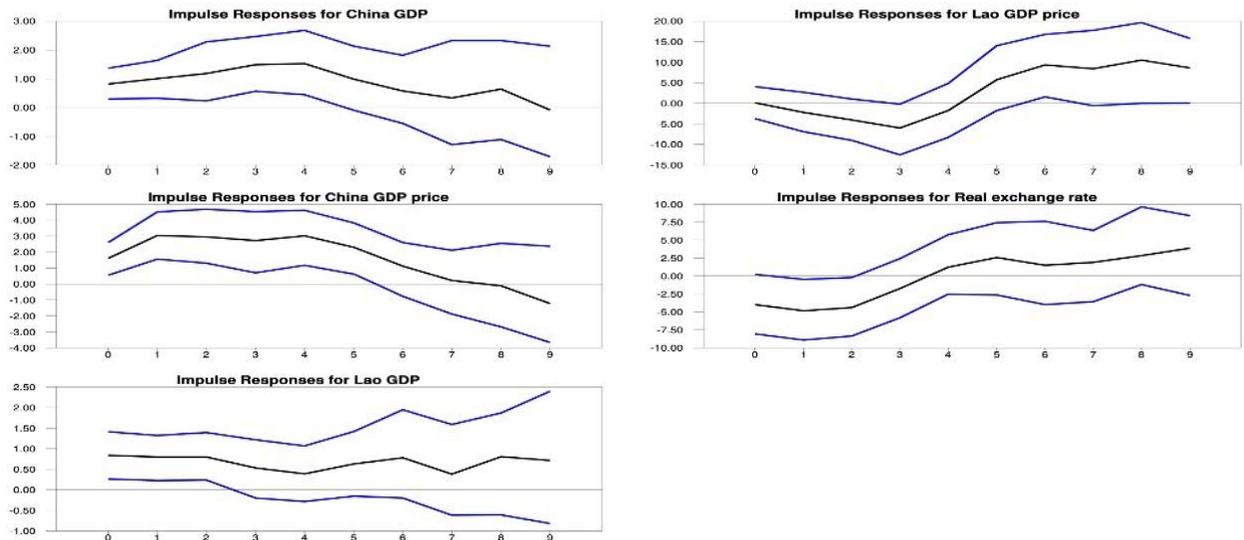
A positive aggregate supply shock in Laos causes Laos' GDP to rise and its price level to fall, but its impact on China's GDP and price level are minimal and statistically insignificant. A positive aggregate demand shock in Laos causes a rise in both Laos' GDP and its price level but has little and statistically insignificant effects on China's GDP and price level. These latter findings are consistent with the small open economy theory, under which the small open economy exerts little influence on but can be significantly influenced by its large trade partner economy.

These results are consistent with both the AD-AS model and the conventional views of the dynamics between a small open economy and its large neighbor, suggesting that our model is properly identified.

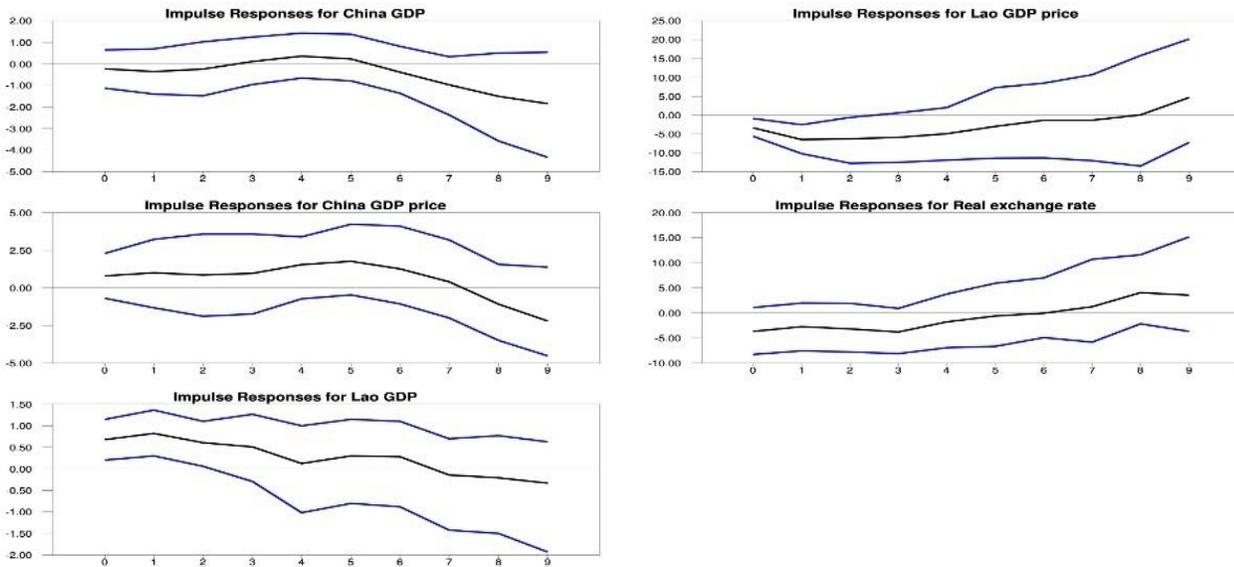
**FIGURE 5**  
**IMPULSE RESPONSES TO A POSITIVE CHINA SUPPLY SHOCK WITH PURE SIGN RESTRICTION APPROACH**



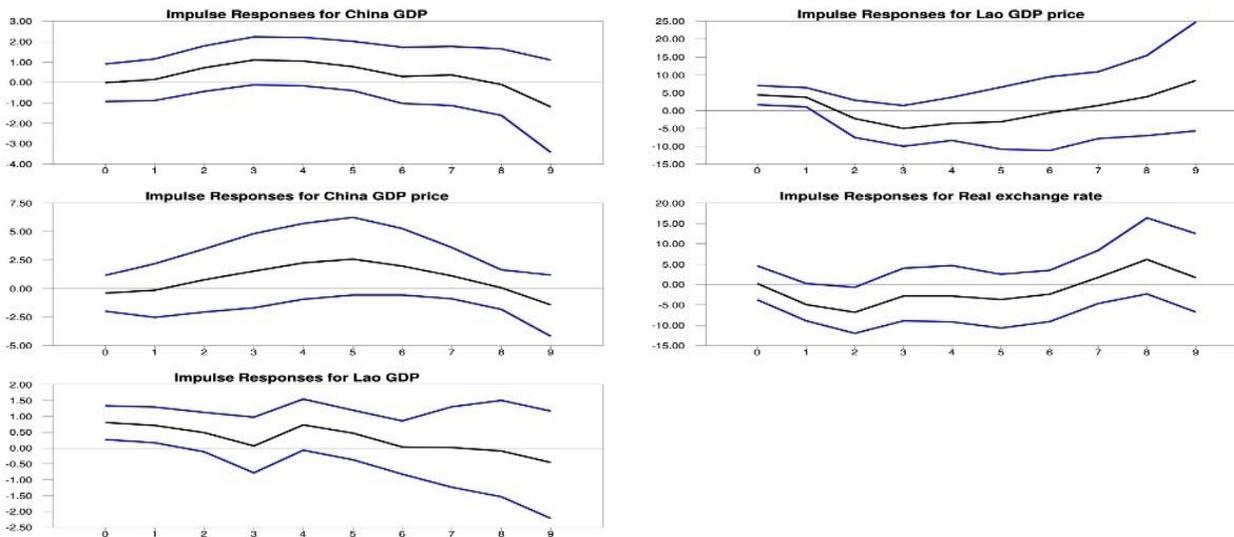
**FIGURE 6**  
**IMPULSE RESPONSES TO A POSITIVE CHINA DEMAND SHOCK WITH PURE SIGN RESTRICTION APPROACH**



**FIGURE 7**  
**IMPULSE RESPONSES TO A POSITIVE LAO SUPPLY SHOCK WITH PURE SIGN RESTRICTION APPROACH**



**FIGURE 8**  
**IMPULSE RESPONSES TO A POSITIVE LAO DEMAND SHOCK WITH PURE SIGN RESTRICTION APPROACH**



This paper examines the extent to which Laos' economy is influenced by China's macroeconomic shocks to gauge the Laos-China business cycle synchronization. Table 2 presents the forecast error variance decompositions of Laos' GDP and price level to the four structural shocks over the time horizons of 2, 5, and 10 years.

**TABLE 2**  
**FORECAST ERROR VARIANCE DECOMPOSITION – PURE SIGN RESTRICTION**

Steps	China supply shock	China demand shock	Laos supply shock	Laos demand shock	<i>Total China shocks</i>	<i>Total Laos shocks</i>
<b>Laos GDP:</b>						
2	21.1	19.2	15.9	18.1	40.3	34.0
5	20.0	19.9	18.4	18.7	39.9	37.1
10	18.6	19.8	18.8	19.2	38.4	38.0
<b>Laos Price Level:</b>						
2	19.4	16.9	21.6	17.9	36.3	39.5
5	19.3	18.7	20.0	19.3	38.0	39.3
10	19.1	19.0	19.4	19.1	38.1	38.5

China's aggregate supply shock explains 18.6-21.1% of the forecast error variance of Laos' GDP and 19.1-19.4% of that of Laos' price level. China's aggregate demand shock explains 19.2-19.9% of the forecast error variance of Laos' GDP and 16.9-19.0% of that of Laos' price level. Jointly, China's shocks explain 38.4-40.3% of the forecast error variance of Laos' GDP and 34-38% of the forecast error variance of Laos' price level. Laos' aggregate supply shock explains 15.9-18.8% of the forecast error variance of Laos' GDP and 19.4-21.6% of that of Laos' price level. Laos' aggregate demand shock explains 18.1-19.2% of the forecast error variance of Laos' GDP and 17.9-19.3% of that of Laos' price level.

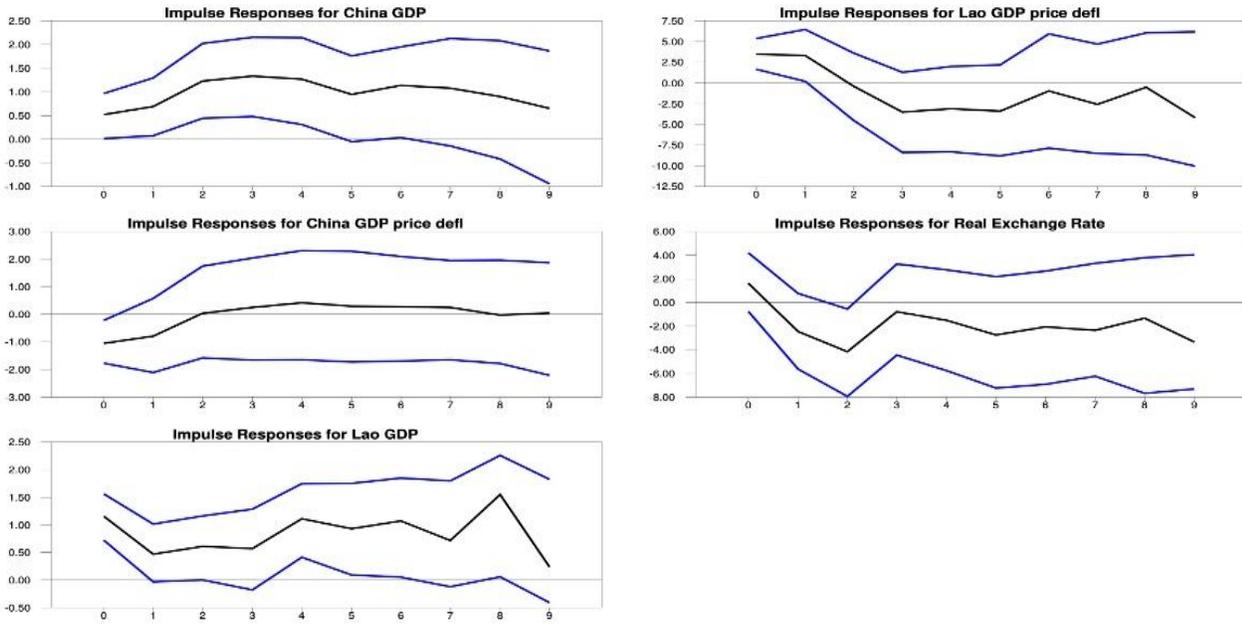
It is noticeable that China's total shocks explain a higher percentage of the forecast error variance in Laos' GDP than total Laos' shocks – 38.4-40.3% vs. 34-38%, while total Laos' shocks have a greater explanatory power in the forecast error variance of Laos' price level – 38.5-39.5% vs. 36.3-38.1%. These results suggest that Laos' business cycles are highly synchronized with China's.

### **Penalty Function Approach**

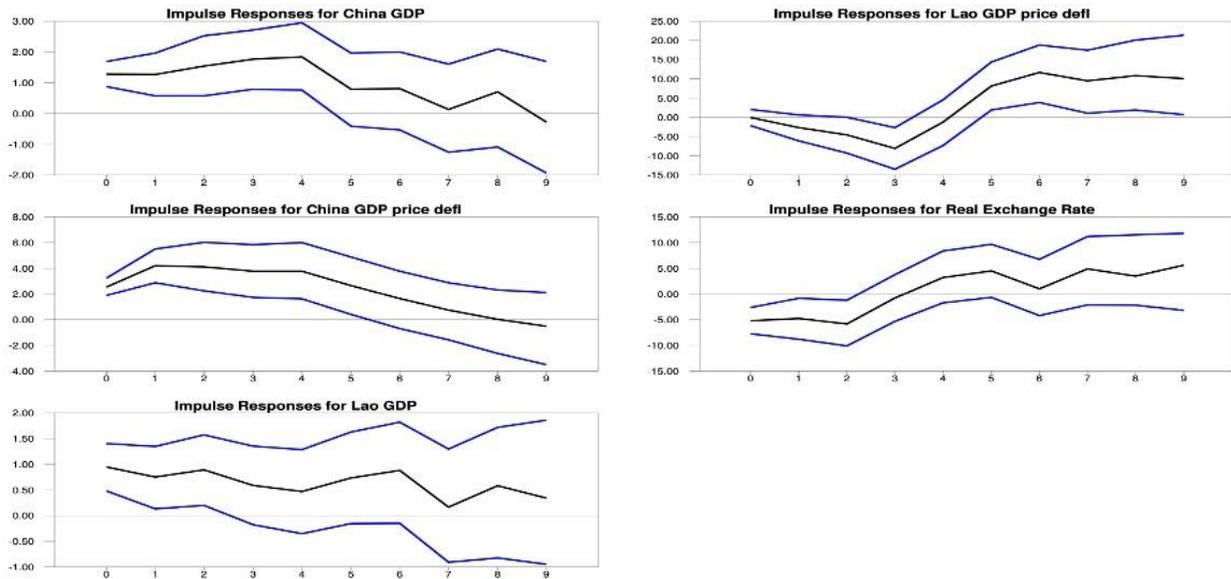
Figures 9-12 present the impulse responses from the penalty function sign restriction approach. All results are highly aligned with those from the pure sign restriction approach.

A positive aggregate supply shock in China increases both China's GDP and Laos' GDP; it decreases China's price level, but the positive income effect drives up Laos' price level. A positive aggregate demand shock in China increases both countries' GDP and China's price level. A positive aggregate supply shock in Laos increases Laos' GDP and decreases Laos' price level; a positive aggregate demand shock in Laos increases both Laos' GDP and price level. As a small open economy relative to China, Laos' macroeconomic shocks have little and statistically insignificant effect on China's economy. These results suggest that our model is properly identified.

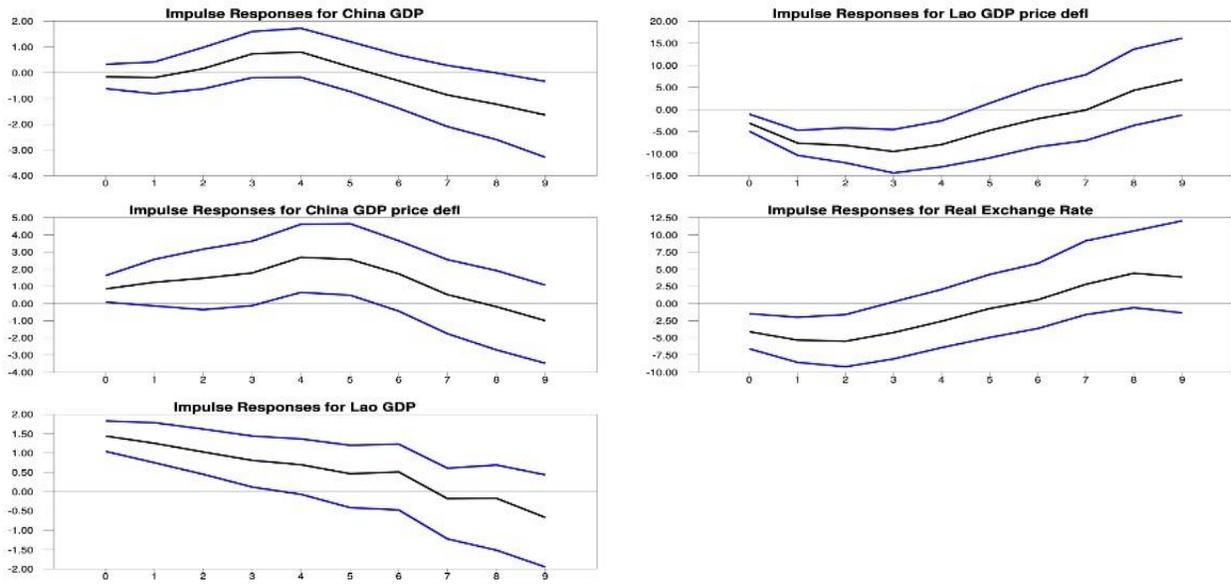
**FIGURE 9**  
**IMPULSE RESPONSES TO A POSITIVE CHINA SUPPLY SHOCK WITH PENALTY**  
**FUNCTION APPROACH**



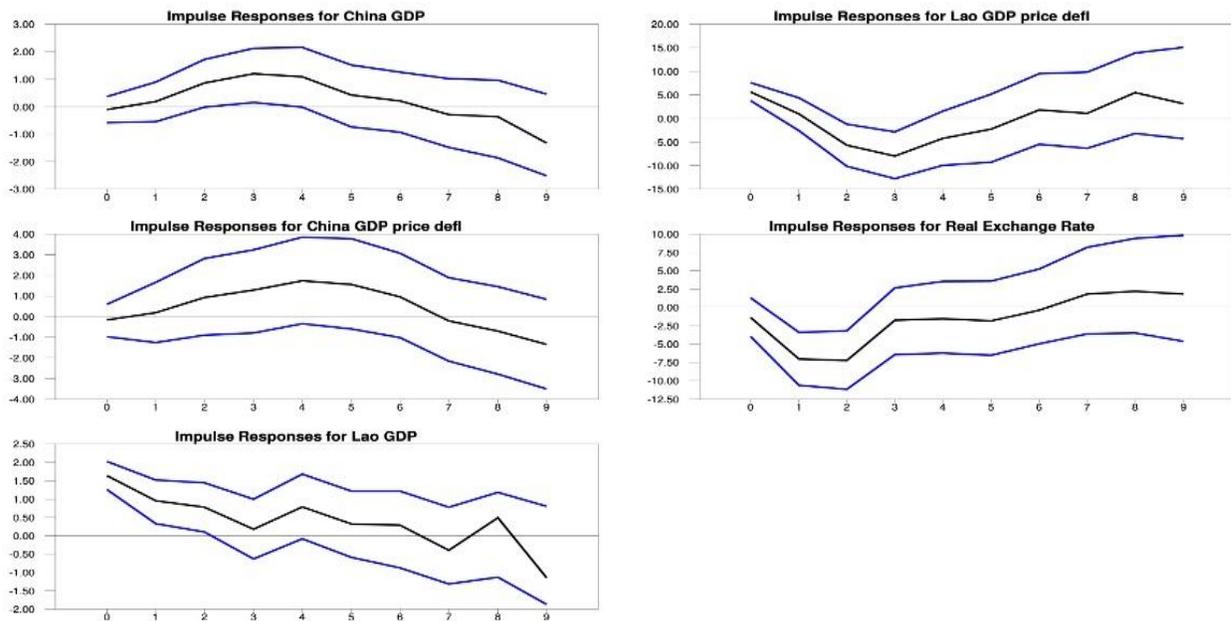
**FIGURE 10**  
**IMPULSE RESPONSES TO A POSITIVE CHINA DEMAND SHOCK WITH PENALTY**  
**FUNCTION APPROACH**



**FIGURE 11**  
**IMPULSE RESPONSES TO A POSITIVE LAO SUPPLY SHOCK WITH PENALTY**  
**FUNCTION APPROACH**



**FIGURE 12**  
**IMPULSE RESPONSES TO A POSITIVE LAO DEMAND SHOCK WITH PENALTY**  
**FUNCTION APPROACH**



**TABLE 3**  
**FORECAST ERROR VARIANCE DECOMPOSITION – PENALTY FUNCTION APPROACH**

Steps	China supply shock	China demand shock	Laos supply shock	Laos demand shock	<i>Total China shocks</i>	<i>Total Laos shocks</i>
Laos GDP:						
2	38.1	21.8	37.5	51.6	59.9	89.1
5	28.5	23.5	28.4	35.5	52.0	63.9
10	23.4	27.7	20.8	22.6	51.1	43.4
Laos Price Level:						
2	18.6	17.3	24.2	17.5	35.9	41.7
5	23.2	22.6	24.0	23.5	45.8	47.5
10	21.8	27.2	19.8	18.0	49.0	37.8

Table 3 presents the forecast error variance decompositions from the penalty function approach. Both China’s supply shock and demand shock have considerable influence on Laos’ economy. China’s supply shock (Laos’ supply shock) explains 23.4-38.1% (20.8-37.5%) of the forecast error variance of Laos’ GDP and 18.6-23.2% (19.8-24.2%) of that of Laos’ price level. China’s demand shock (Laos’ demand shock) explains 21.8-27.7% (22.6-51.6%) of the forecast error variance of Laos’ GDP and 17.3-27.2% (17.5-23.5%) of that of Laos’ price level. While China’s supply shock has a dominant effect on Laos’ GDP, it is Laos’ domestic shocks that have more influence on its price level. These results are consistent with those from the pure sign restriction approach. Over a ten-year horizon, total China shocks explain 51.1% of the variance in Laos’ GDP and 49% of that in Laos’ price level, exceeding Laos’ own shocks of 43.4% and 37.8%, respectively, suggesting that China’s economic influence on Laos’s economy is increasing over time.

We found that China’s macroeconomic shocks have become a significant to dominant factor in shaping Laos’ GDP and price level for the period of 1984-2022, suggesting that Laos’ business cycles have become more synchronized with China’s under the BRI. Our findings are consistent with Li and Lu (2020) and Yu et al. (2023), which document strong supply and demand spillover effects from China on the BRI partner countries and that the BRI acts as a key driver promoting the business cycle synchronizations of the BRI partner countries with China.

## CONCLUSION

As one of the pioneering countries that enthusiastically engaged with the BRI, Laos has experienced extensive collaborations and a significant increase in trade and financial ties with China in recent decades. The Boten-Vientiane Railway project exemplifies how infrastructure-led integration catalyzes macroeconomic synchronization. Our empirical investigation into business cycle synchronizations and economic integration between these economies yields clear evidence of increasing integration and interdependence that carries significant implications for both economies and the broader BRI framework. We develop a two-country structural VAR model for the period 1984-2022, assuming Laos as a small open economy subject to influences from its large neighbor, China. We employ the Uhlig (2005) sign restriction approaches to identify the structural shocks and examine the relative importance of China’s supply and demand shocks on the Lao economy. Our findings indicate that China’s macroeconomic shocks have significantly shaped Laos’ GDP and price level, with China’s influence growing increasingly dominant over the studied period. These results clearly demonstrate that China is becoming a main force driving Laos’ business cycles.

This paper represents one of the first empirical analyses explicitly examining the degree of economic integration between Laos and China under the ubiquitous influence of the BRI in Southeast Asia. Our research contributes to the broader literature on the economic impacts of the BRI on participating

developing countries by providing empirical macroeconomic evidence from a critical yet understudied country. The increasing synchronization of business cycles between Laos and China carries important implications for Laos' future exchange rate management, foreign-policy guidance, and strategic planning for further economic and monetary integration with the region.<sup>[5]</sup>

These implications extend beyond this single case study of Laos: Numerous small economies participating in the BRI have similarly undertaken transformative infrastructure projects relative to their economic size – including Djibouti's Free Trade Zone or Ethiopia-Djibouti Railway, among others – suggesting broader relevance for understanding asymmetric synchronization dynamics under infrastructure-led economic integration initiatives like China's Belt and Road Initiative.

## ENDNOTES

1. Calculated by China-Laos exports/imports data from General Administration of Customs of the People's Republic of China divided by Laos' total exports/imports data from International Financial Statistics (IFS).
2. The Great Mekong Subregion initiative, with a focus on cross-border infrastructure development projects connecting and involving China, Vietnam, Thailand, Myanmar, Laos, and Cambodia through the North-South Economic Corridor and the East-West Economic Corridor, was started in 1992 to promote regional economic cooperations and was supported mainly by the Asian Development Bank. (Goto, 2011)
3. The bilateral real exchange rate is constructed as the cross rate using the Lao kip and the Chinese yuan exchange rates relative to the U.S. dollar, adjusted by each country's GDP deflator. It is in units of Lao kip per Chinese Renminbi yuan. An increase in this bilateral real exchange rate represents a real depreciation of the Lao kip and a corresponding real appreciation of the Chinese yuan.
4. See Uhlig (2005) for technical details.
5. Laos' de facto exchange rate regime is a crawl-like arrangement. The Lao kip has been showing a depreciating trend relative to the U.S. dollar since September 2016, which has accelerated since 4Q2021 despite trade surplus. In June 2024, the kip hit the record low of LAK22077 to the dollar, a nearly tripling from 2020. The World Bank recommends fiscal reforms to improve Laos' external position. The Lao central bank established a new Foreign Exchange Management Department and introduced more exchange control measures (Laotian Times, 2023).

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