Spillovers of U.S. Monetary Policy to East Asia: An Analysis Using Structural VARs Identified with External Instruments
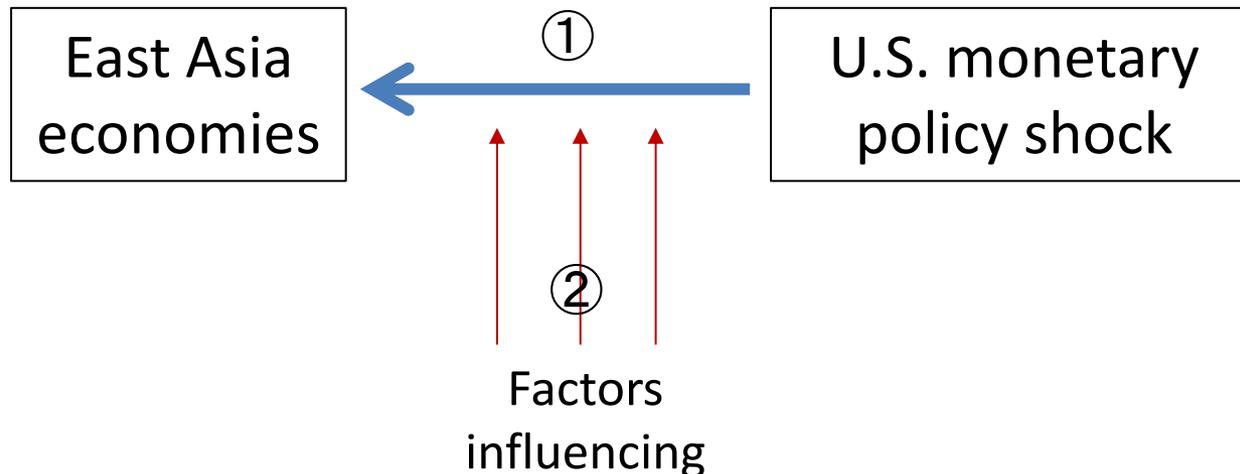
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I. Introduction

What I do

① Analyze the effects of U.S. monetary policy shocks on East Asian economies

– Employ structural VARs with external instruments to identify U.S. monetary policy shocks

② Analyze the factors influencing these effects

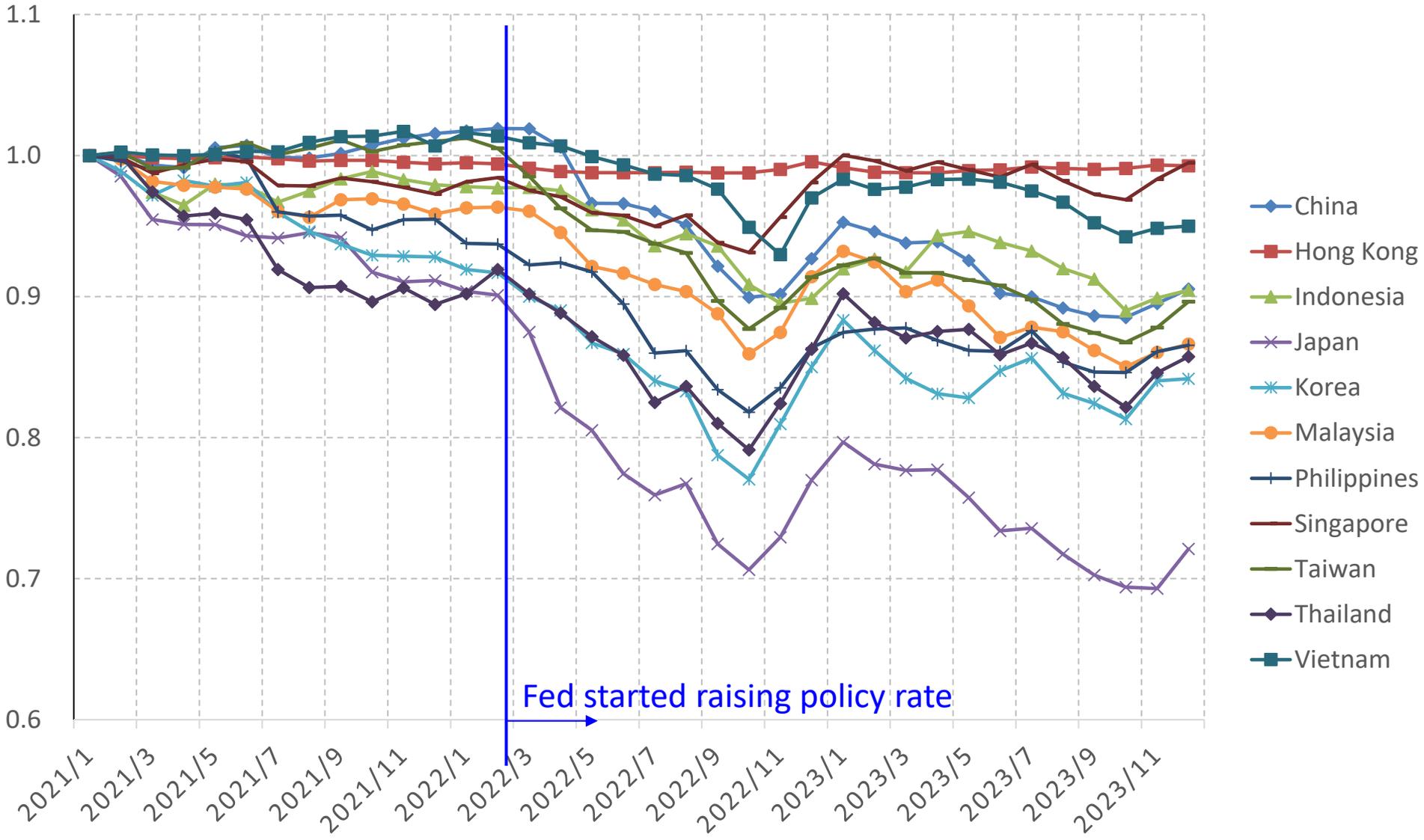| East Asia economies | ① ⟵ | U.S. monetary policy shock |

Factors influencing

Motivations

- Recent developments in the open economies of East Asia once again highlight the powerful effects of U.S. monetary policy on other countries.

    – US monetary tightening ⇒ East Asia: currency depreciation, interest rate rise, stock price decline, capital outflows.

    – Worried about inflation and default on external debt caused by currency depreciation.
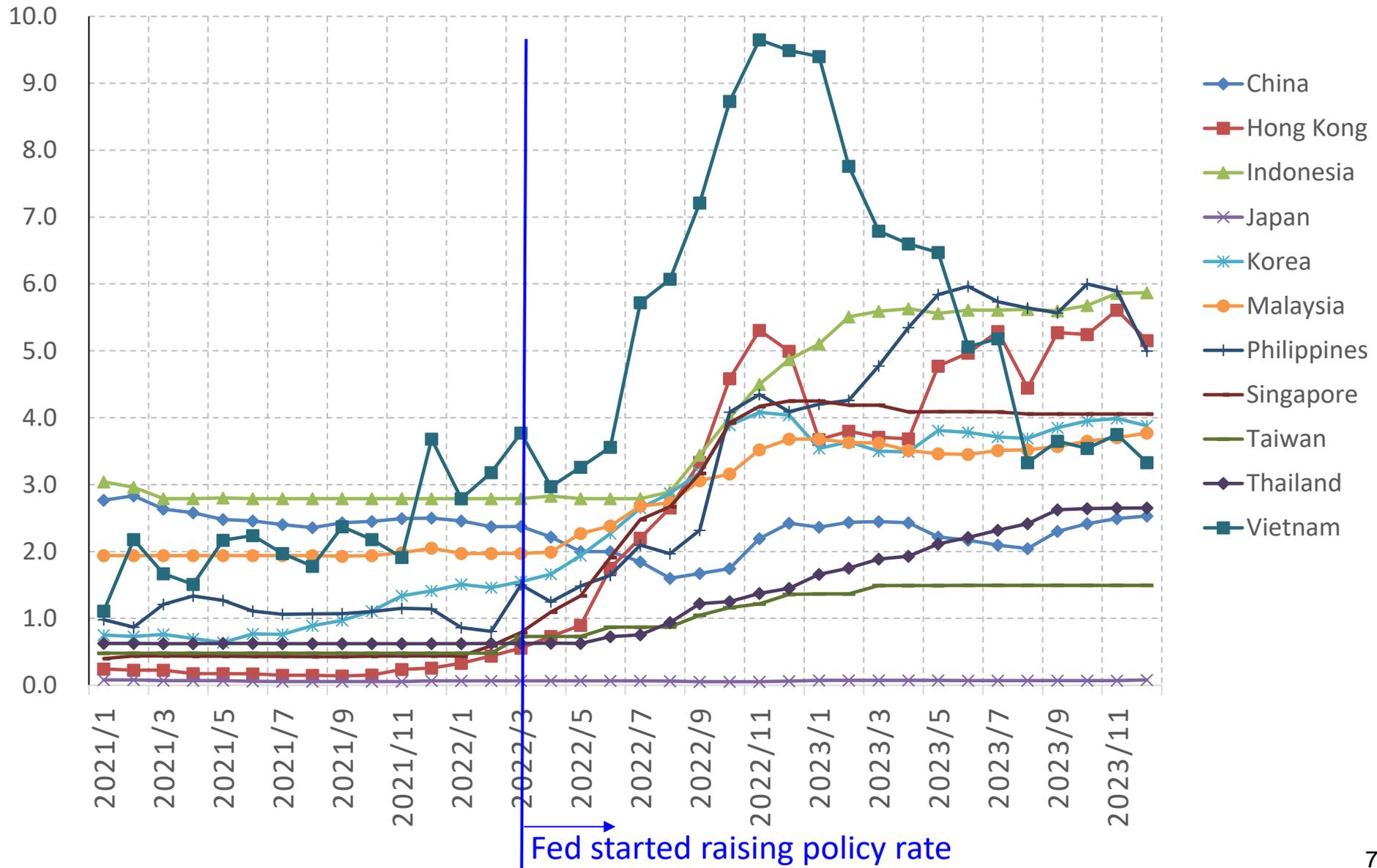
Recent monetary tightening of the Fed, USA

Source: Board of Governors of the Federal Reserve System (US)   myf.red/g/1uuX2
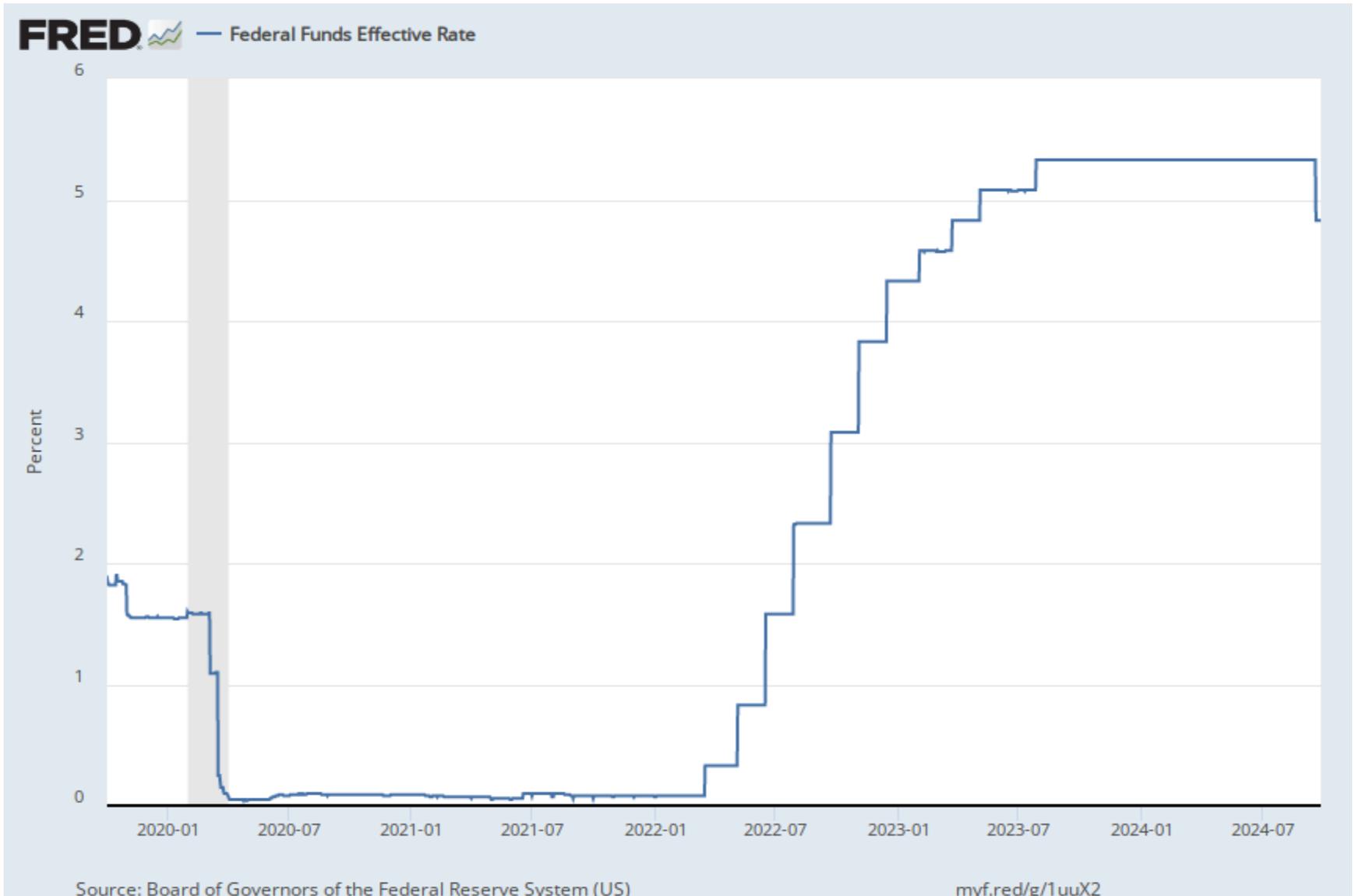
Nominal exchange rates of East Asian countries (USDs/LCU, 2021Jan=1)

Short-term nominal interest rates of East Asian countries (%)

Recent progress in identifying monetary policy shocks

- The existing literature analyzes the effects of the U.S. monetary policy shocks on individual East Asian countries at length.
  - Methods: SVARs identified by short run zero restrictions, long run zero restrictions, sign restrictions, or combinations of them.

- Recent progress in the literature: a new scheme to identify monetary policy shocks using external instruments (SVAR-IV).
  - Gertler and Karadi (2015); and Jarocinski and Karadi (2020).
  - Instrument: surprises in Fed Funds futures prices on FOMC days.
  - This scheme potentially yields more precise estimates of monetary policy shocks by incorporating additional information from external instruments.

- This paper employs this SVAR-IV method.

Another issue: Factors influencing the effects of U.S. monetary policy shocks

- Less attention is paid to the differences in the effects U.S. monetary policy shocks across East Asian countries and the underlying factors driving them.

  - Exception: Kim and Yang (2012) examine the role of exchange rate regimes and monetary policy rules in the countries hit by the shocks.

  - Lack of a formal econometric analysis of the issue.

- This paper: Addresses this issue by regressing the effects of U.S. monetary policy on a number of drivers.

II. Empirical framework and data

Three-step framework

1. SVAR-IV model to identify U.S. monetary policy shocks ($\epsilon_t^{us,mp}$)

2. ARDL model with $\epsilon_t^{us,mp}$ as independent variables to analyze their effects on variables of East Asian economies
   - These effects are captured by the impulse response function (IRF).

3. Regression model with the IRF the dependent variable and the driving factors the explanatory variables

Three-step framework

1. SVAR-IV model to identify U.S. monetary policy shocks

$$\boldsymbol{y}_t = B_0 + B_1 \boldsymbol{y}_{t-1} + \cdots + B_p \boldsymbol{y}_{t-p} + \boldsymbol{u}_t$$

- $\boldsymbol{y}_t = [i_t^{us}, IIP_t^{us}, CPI_t^{us}, NEER_t^{us}, StockPrice_t^{us}]'$
- Residuals & shocks: $\boldsymbol{u}_t = S\boldsymbol{\epsilon}_t$, with $\boldsymbol{\epsilon}_t$ containing the U.S. monetary policy shock $\epsilon_t^{us,mp}$.
- $\epsilon_t^{us,mp}$: identified using the surprises in Fed Funds futures prices on FOMC days as an instrumental variable.
  - ➤ Suppose without loss of generality that $\epsilon_t^{us,mp}$ is the first element in $\boldsymbol{\epsilon}_t$.
  - ➤ Then, we need to identify $\boldsymbol{s}_1$, the first column of S.
  - ➤ $\boldsymbol{s}_1 = \boldsymbol{\beta} / norm(C^{-1}\boldsymbol{\beta})$, where $C = chol(\text{cov}(\boldsymbol{u}_t))$, $\boldsymbol{\beta} = [1 \ \beta_2 \ \ldots \ \beta_n]'$, and β_i $(i = 2, \ldots, n)$ are coefficients in the regressions of u_{it} on u_{1t} using the instrument.

Three-step framework

2. ARDL model to gauge the effects of U.S. monetary policy shocks on East Asian economies

$$x_t = b_0 + \sum_{i=1}^{r} b_i x_{t-i} + \sum_{j=0}^{q} d_j \epsilon_{t-j}^{us,mp} + e_t$$

- x_t: an economic variable of an East Asian economy
- $\epsilon_t^{us,mp}$: U.S. monetary policy shock identified in Step 1

- Dynamic effects of $\epsilon_t^{us,mp}$ on $\{x_{t+s}\}_{s=0}^{\infty}$ are captured by the $IRF(s)$

Three-step framework

3. Regression analysis of the drivers of the effects of U.S. monetary policy

$$IRF_{it} = \alpha_0 + \alpha_1 z_{1,it} + \cdots + \alpha_m z_{m,it} + e_{it}$$

- i: an East Asian economy
- t: a sample period
- z_j: drivers of the effects of U.S. monetary policy
- Three drivers: capital account restriction, exchange rate regime, and trade openness.
  - ➢ The first two are often discussed in the literature. Theoretical background: The trilemma of open economies.
  - ➢ I add the third.

Data and estimation

- ## SVAR-IV model
  - Monthly data spanning 1979m1-2024m1 for the U.S.
  - Data sources: FED and Jarocinski and Karadi (2020).
  - Estimated with the variables in levels and with twelve lags.

- ## ARDL model
  - Monthly data spanning 2000m1-2024m1 for eleven East Asian economies: CHN, HKG, IDN, JPN, KOR, MYS, PHL, SGP, TWN, THA, and VNM.
  - Data sources: World Bank, CEIC, and East Asian national statistical agencies.
  - Lag length for U.S. monetary shock set to 36, while that for the autoregressive part set based on the Schwarz information criterion.

- ## Regression model
  - Split the ARDL sample into two subsamples: 2000M1-2009M12 and 2010M1-2019M12 to increase the sample size.
  - Data sources: Chinn and Ito (2006); Ilzetzki et al. (2021); & DOTS, IMF.

III. Empirical Results

IRFs of U.S. variables to a U.S. monetary policy tightening shock
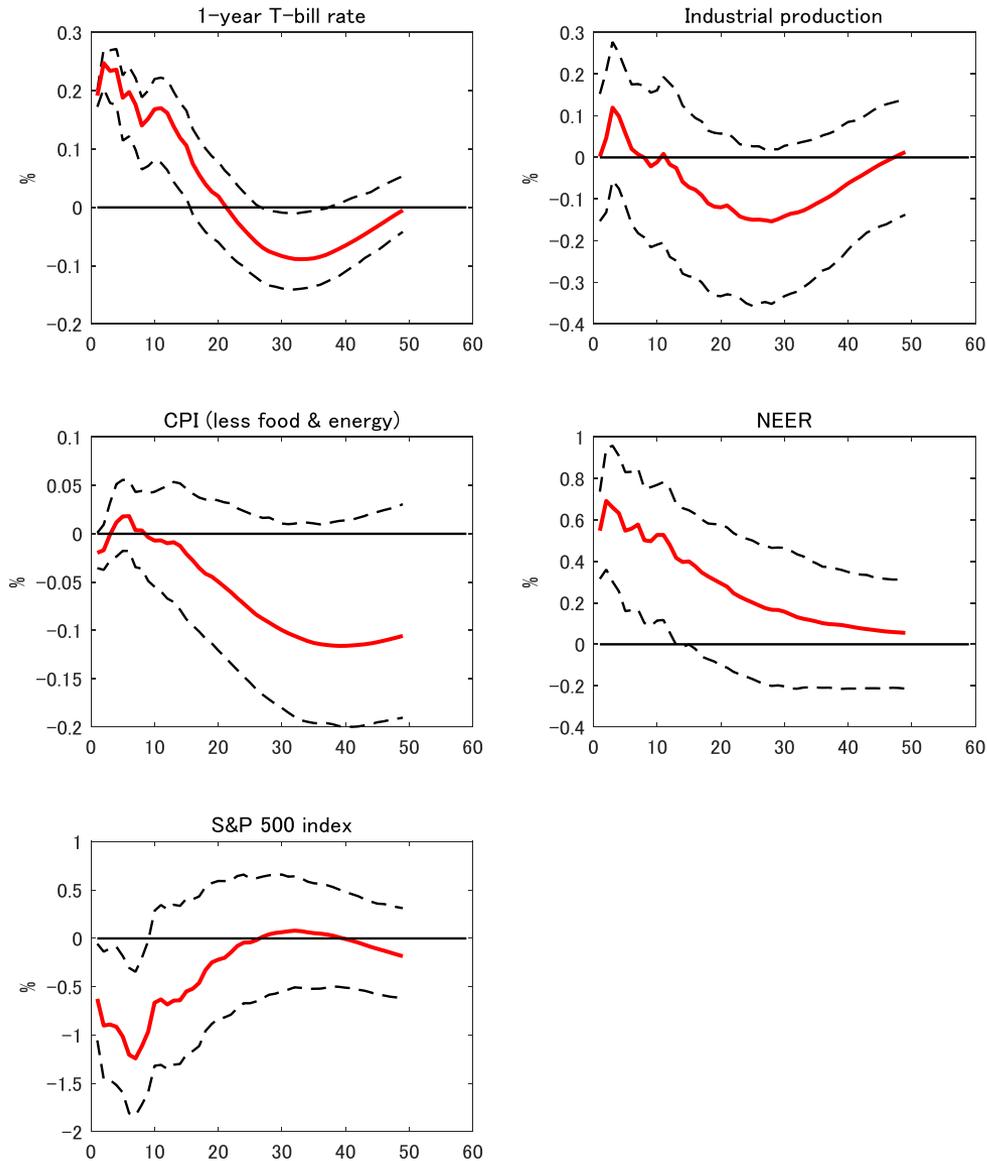
Note: Horizontal axis = months, vertical axis = % changes. Solid lines = point estimates, dashed lines = 90% error bands.

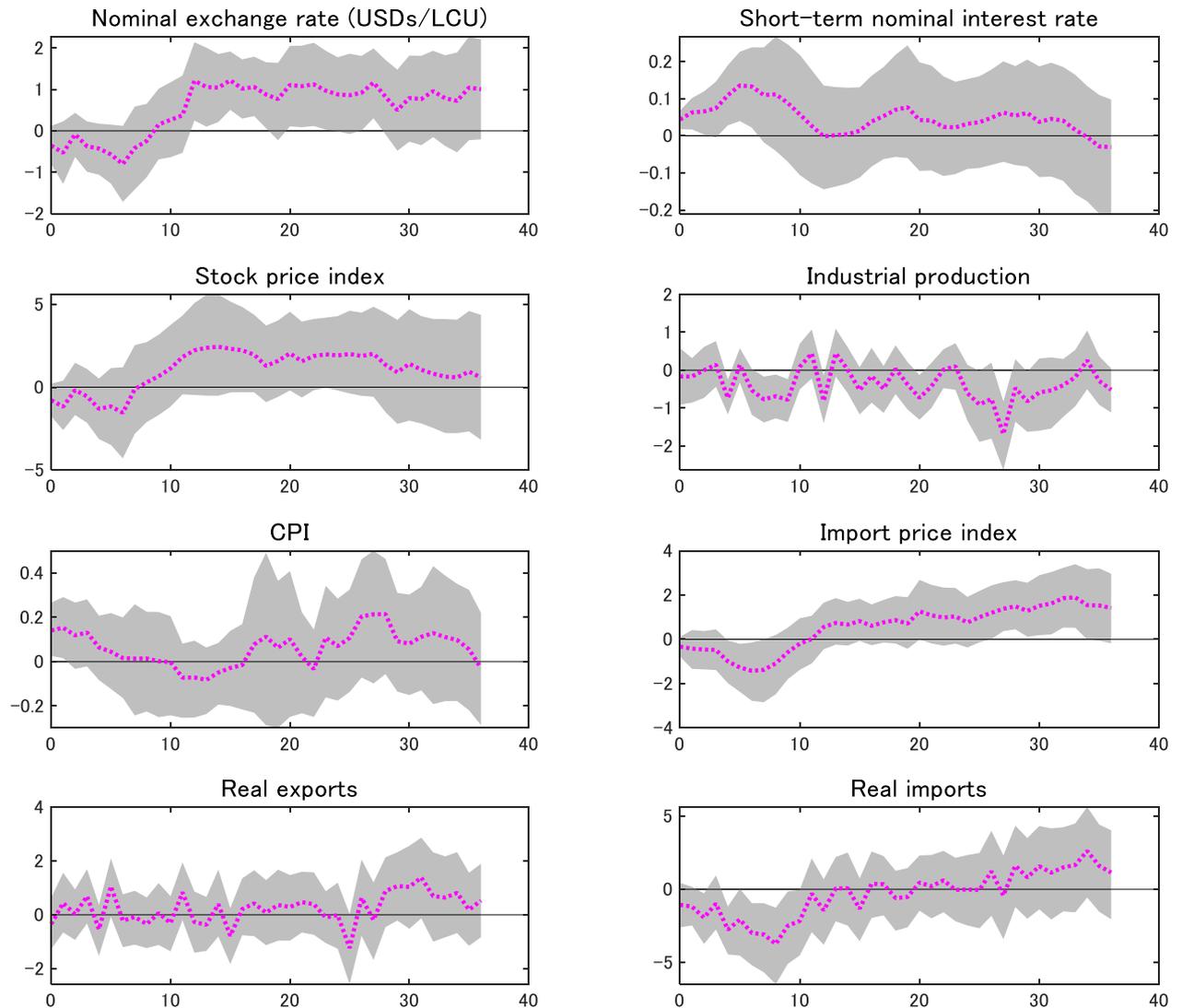# IRFs of East Asian variables to a U.S. mon. pol. tightening shock

China
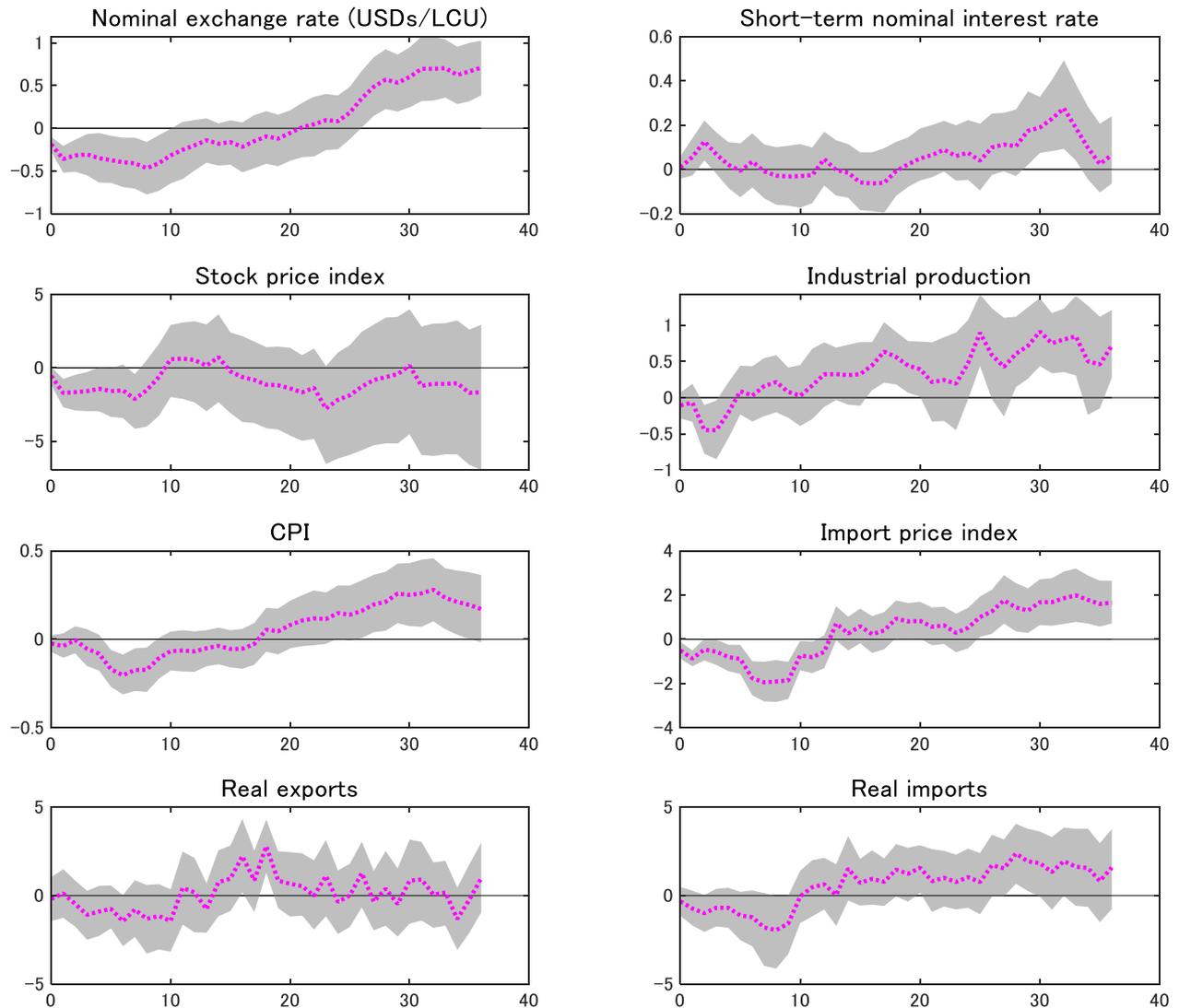
Note: Horizontal axis = months, vertical axis = % changes. Solid lines = point estimates, shaded areas = 90% error bands.

IRFs of East Asian variables to a U.S. mon. pol. tightening shock

Hong Kong
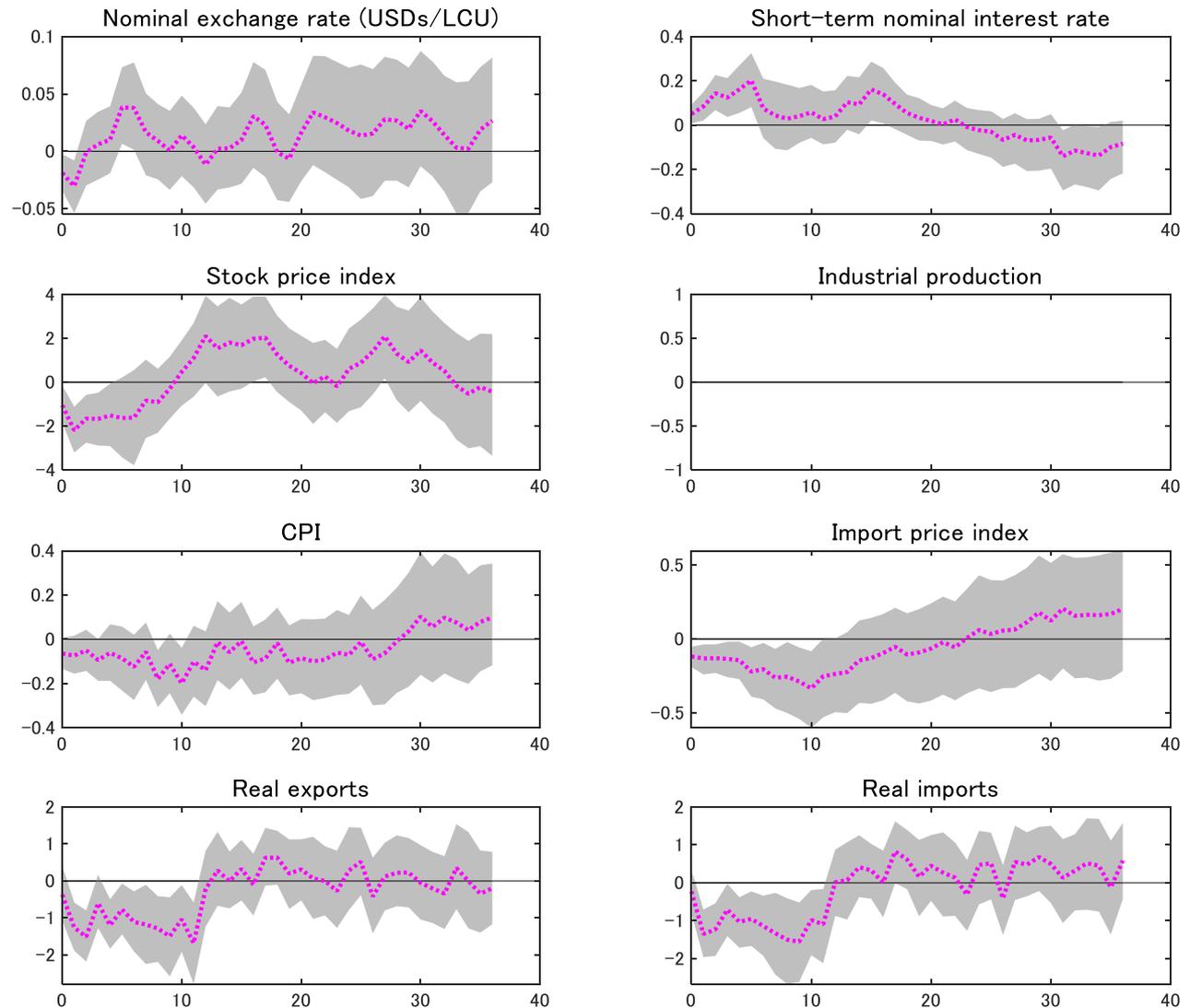
Note: Blank panel: data unavailable.

Indonesia

Japan
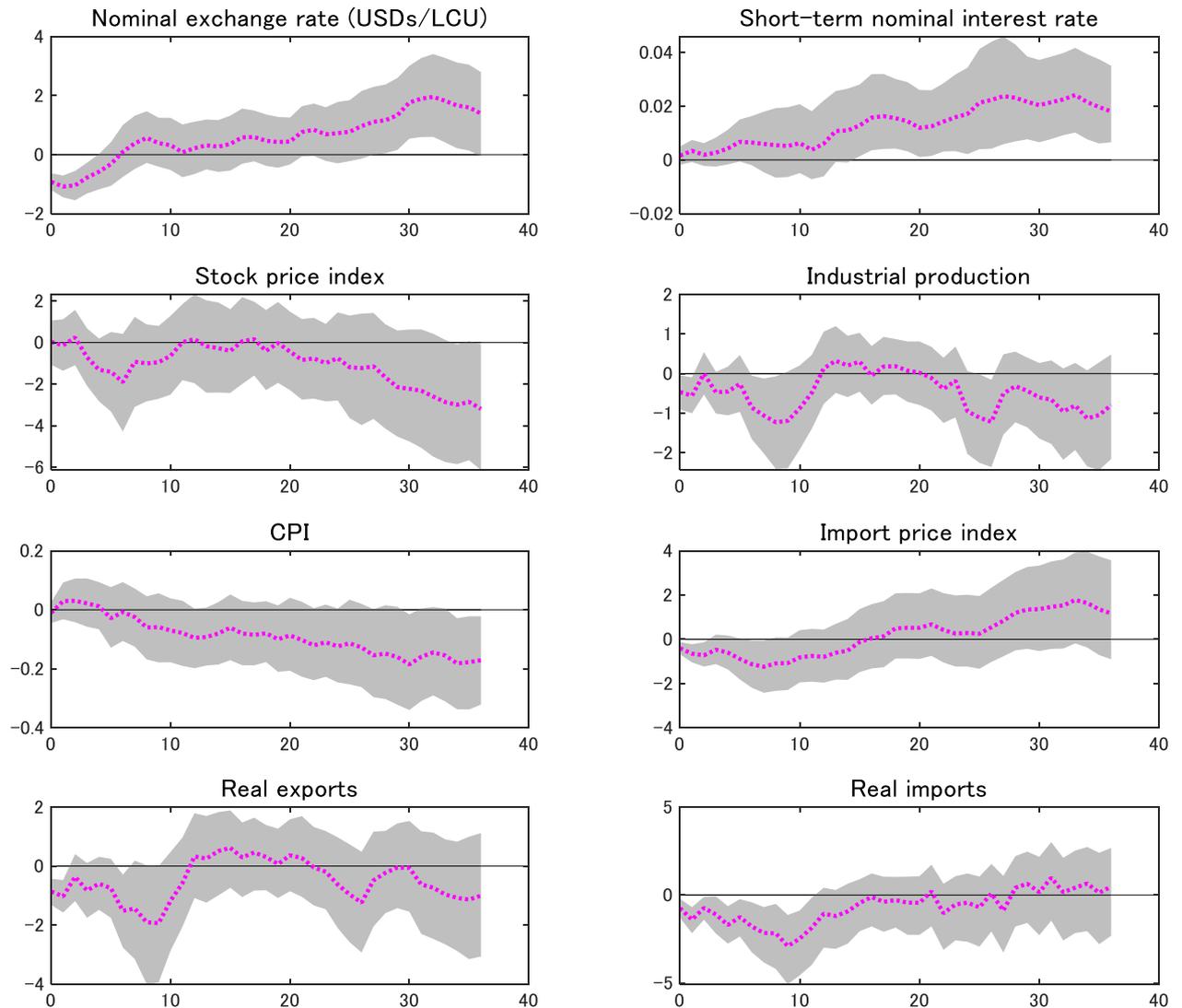
IRFs of East Asian variables to a U.S. mon. pol. tightening shock

Korea
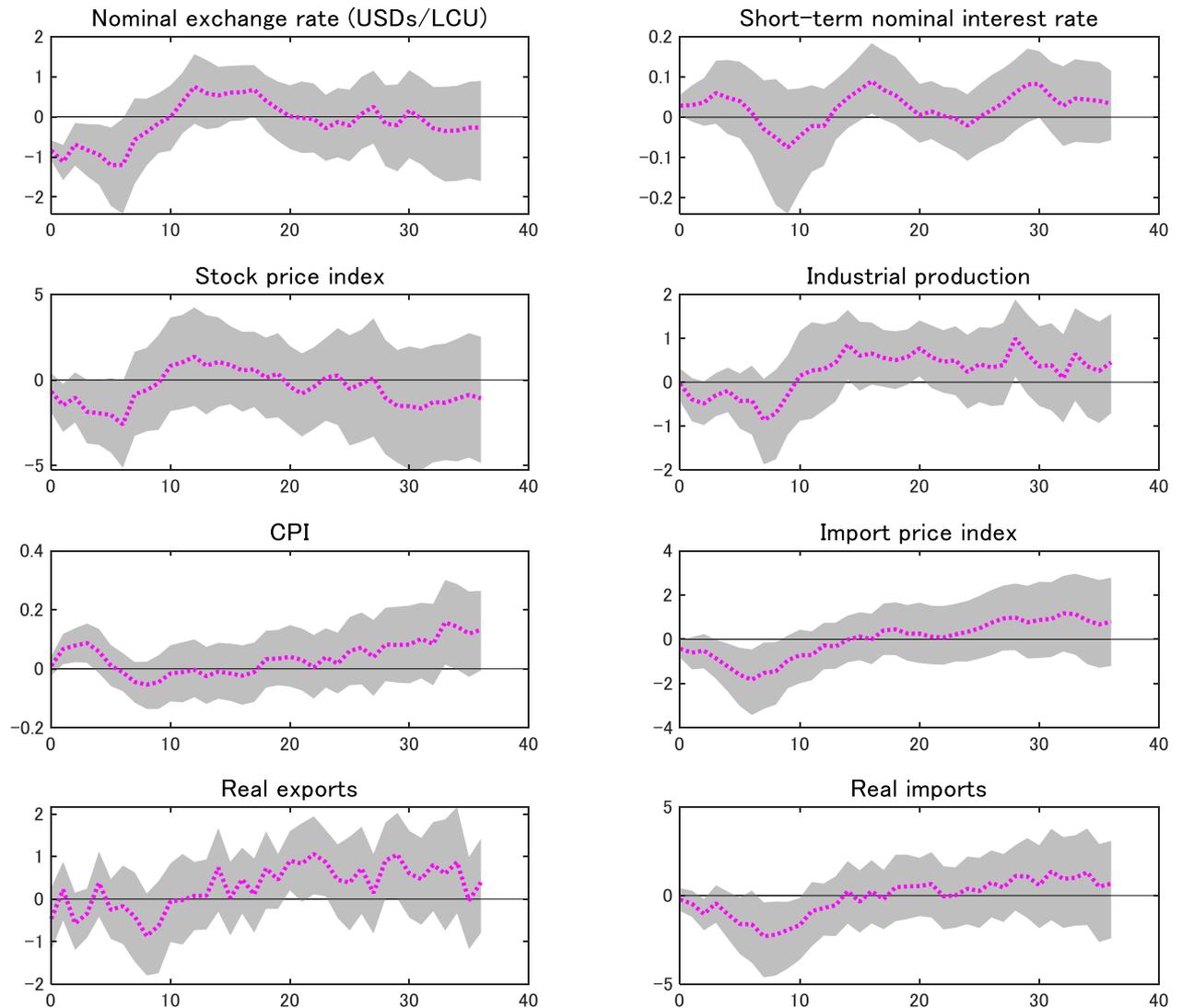
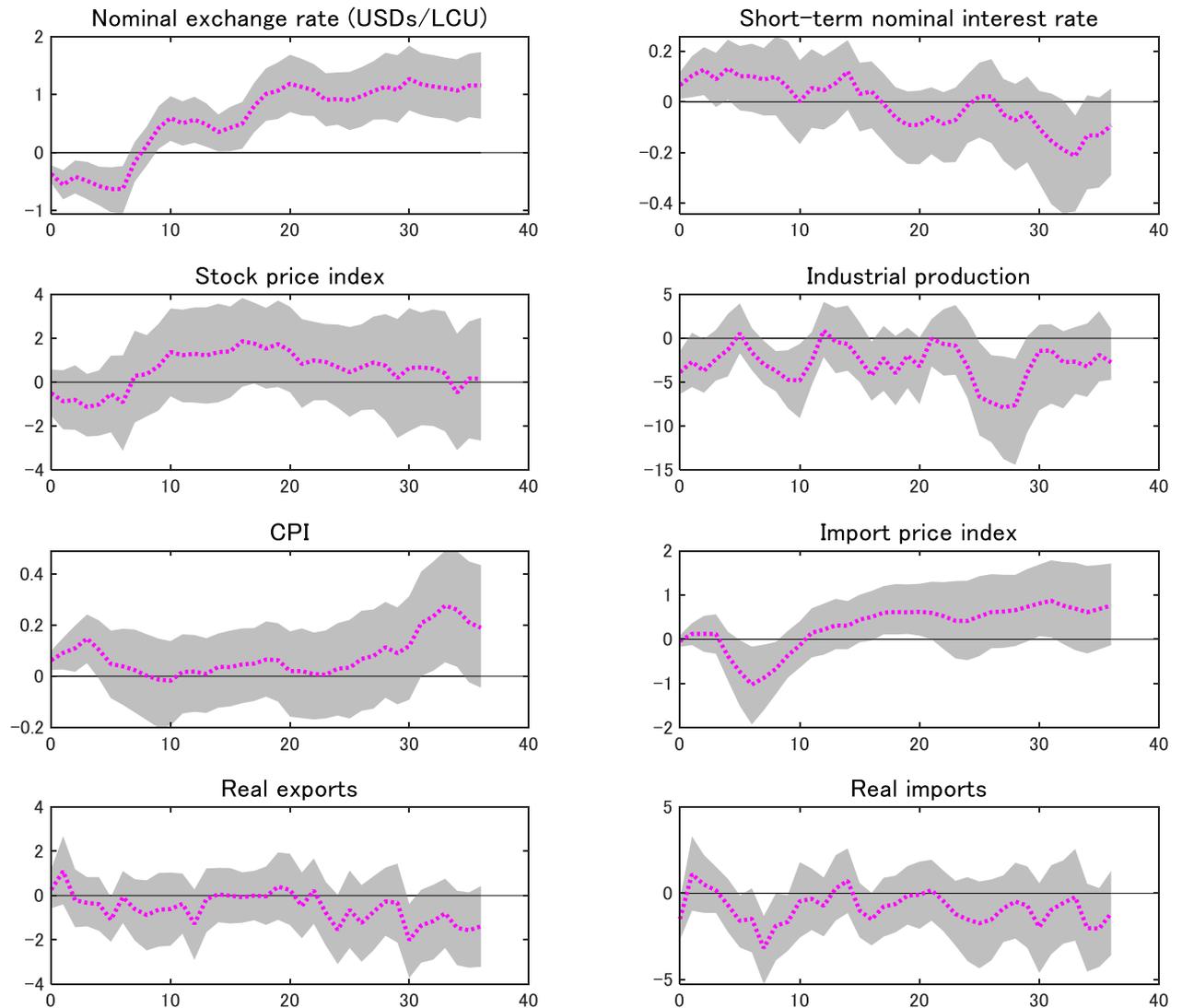# IRFs of East Asian variables to a U.S. mon. pol. tightening shock
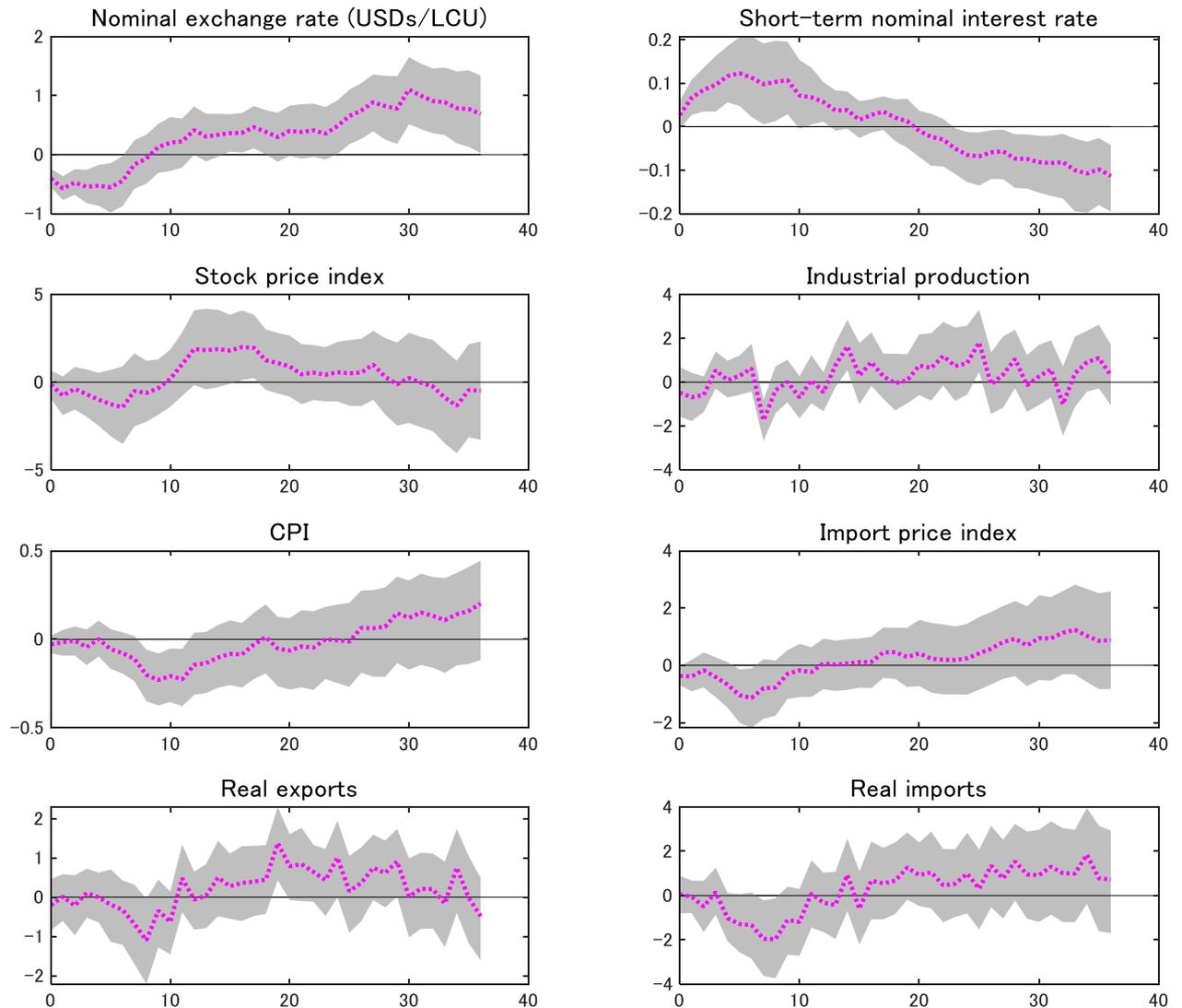
Malaysia
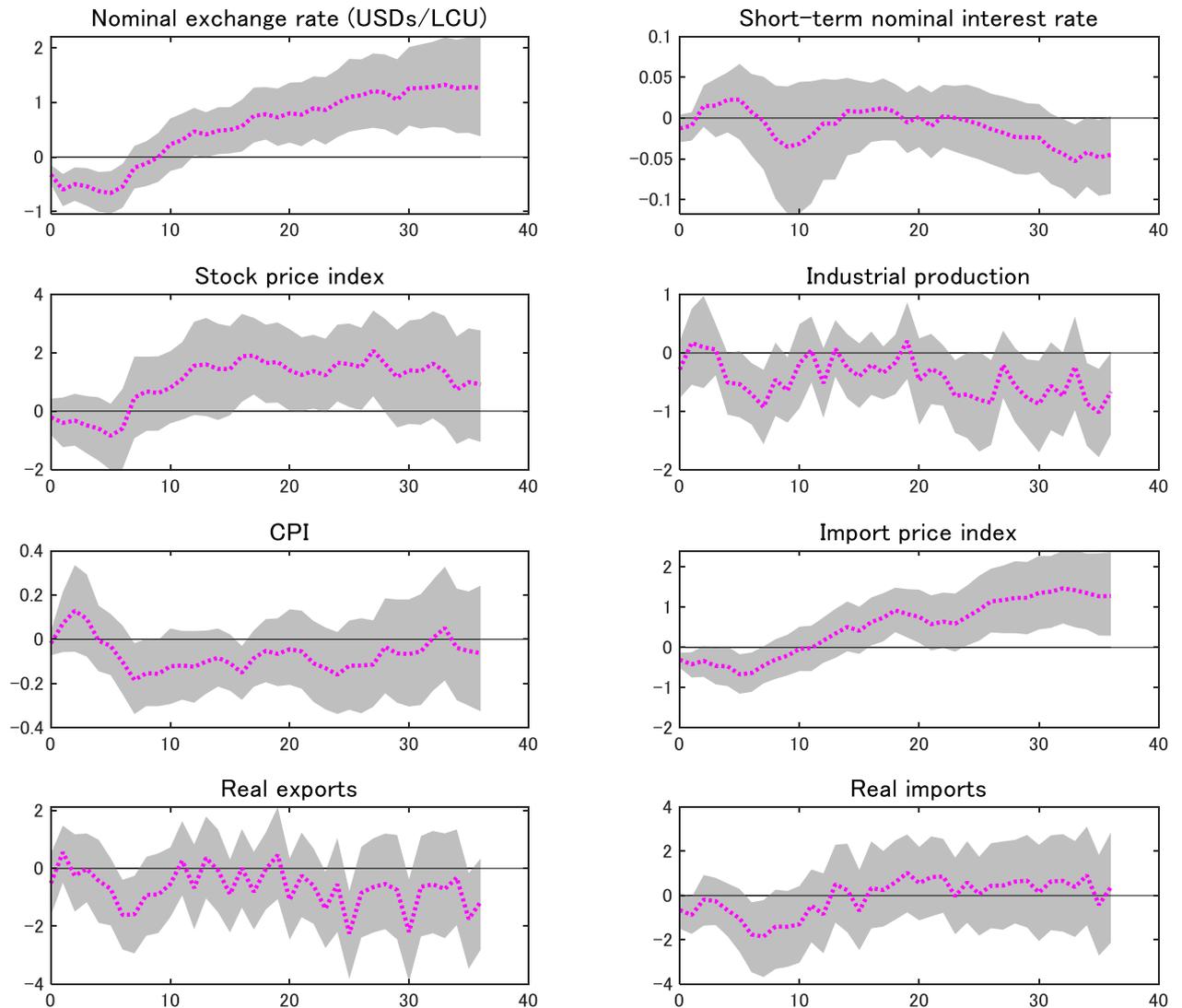
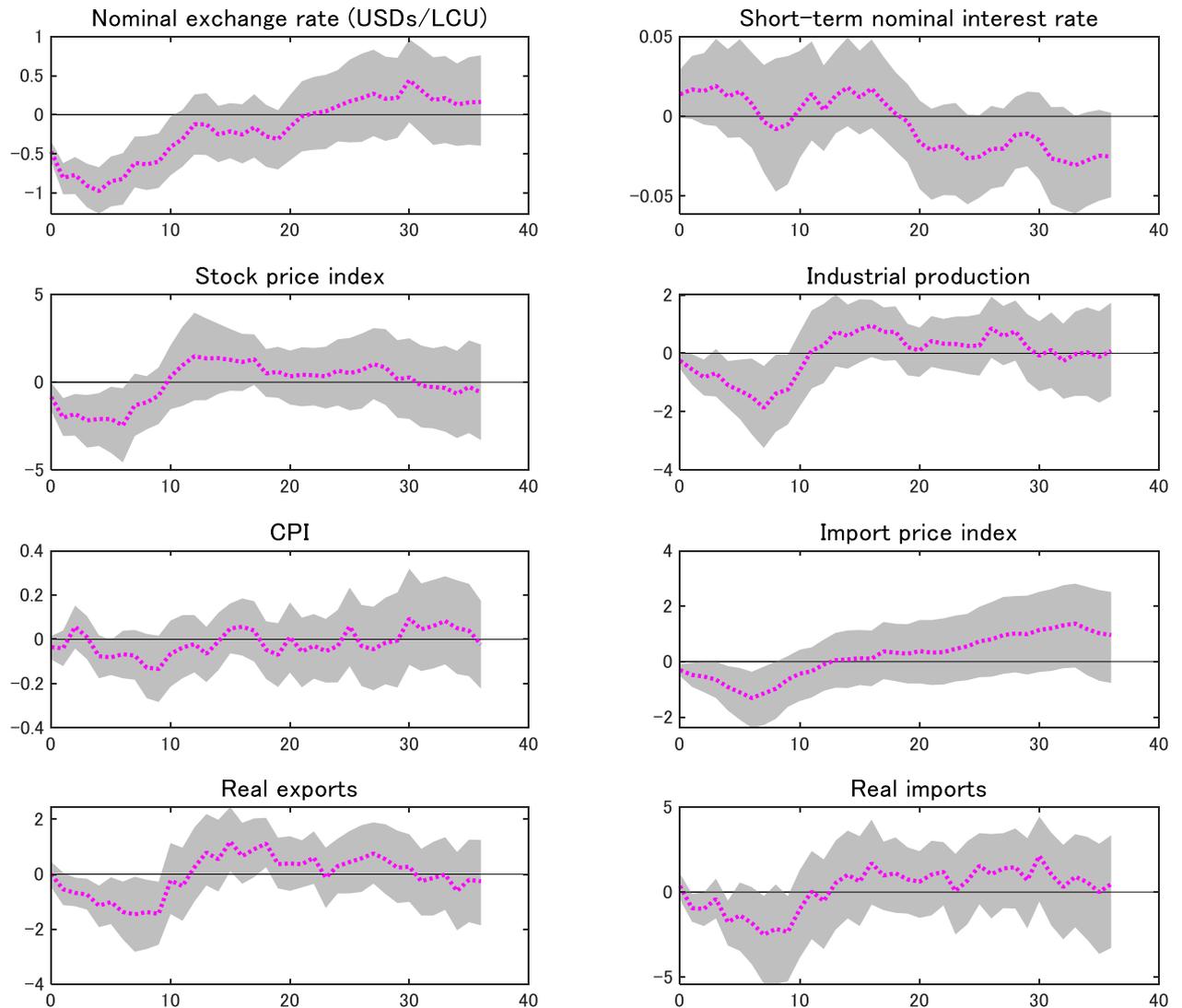# IRFs of East Asian variables to a U.S. mon. pol. tightening shock

Philippines

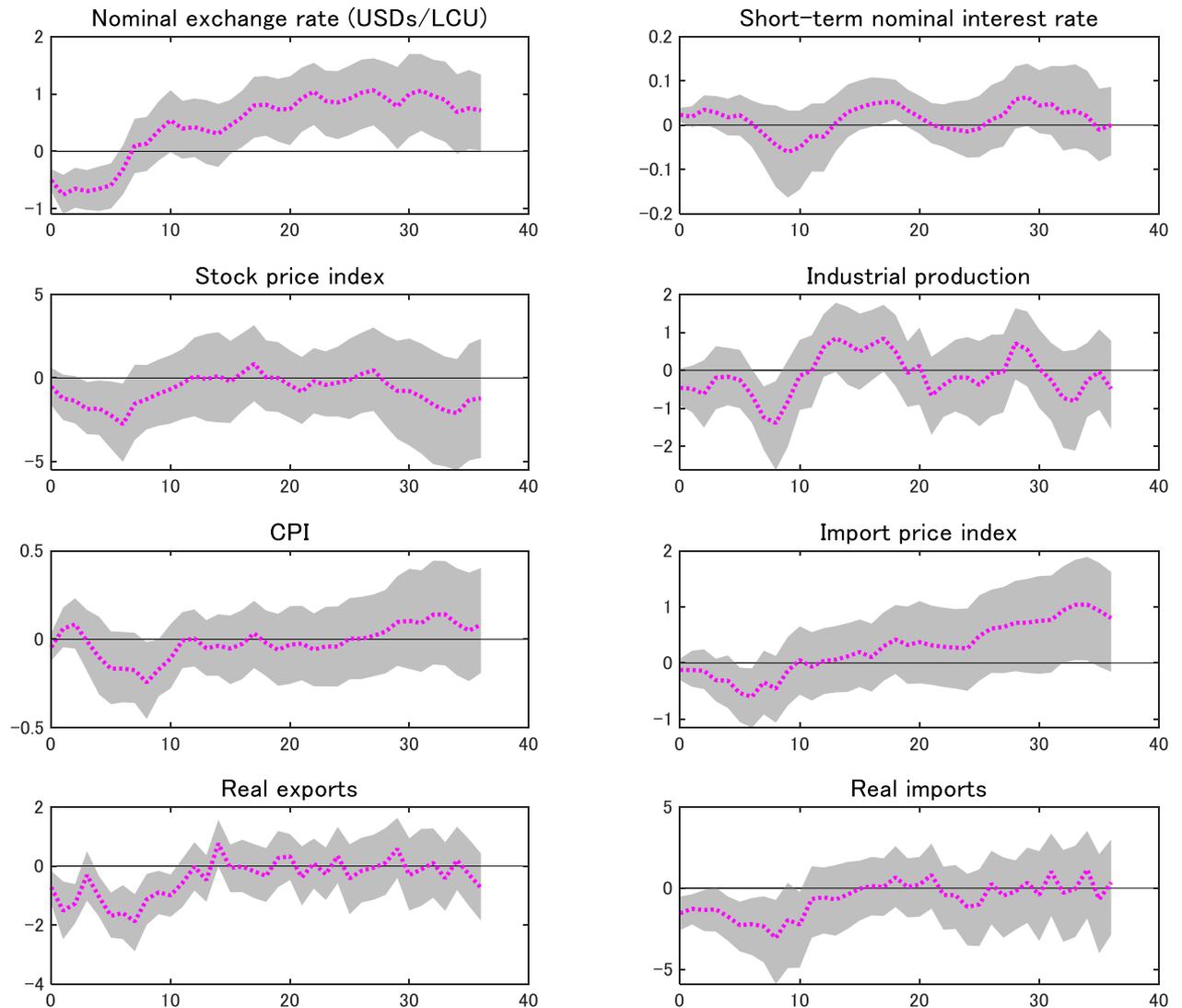# IRFs of East Asian variables to a U.S. mon. pol. tightening shock

Singapore

Taiwan

Nominal exchange rate (USDs/LCU)

Short-term nominal interest rate

Stock price index

Industrial production

CPI

Import price index

Real exports

Real imports

IRFs of East Asian variables to a U.S. mon. pol. tightening shock

Thailand

IRFs of East Asian variables to a U.S. mon. pol. tightening shock

Vietnam
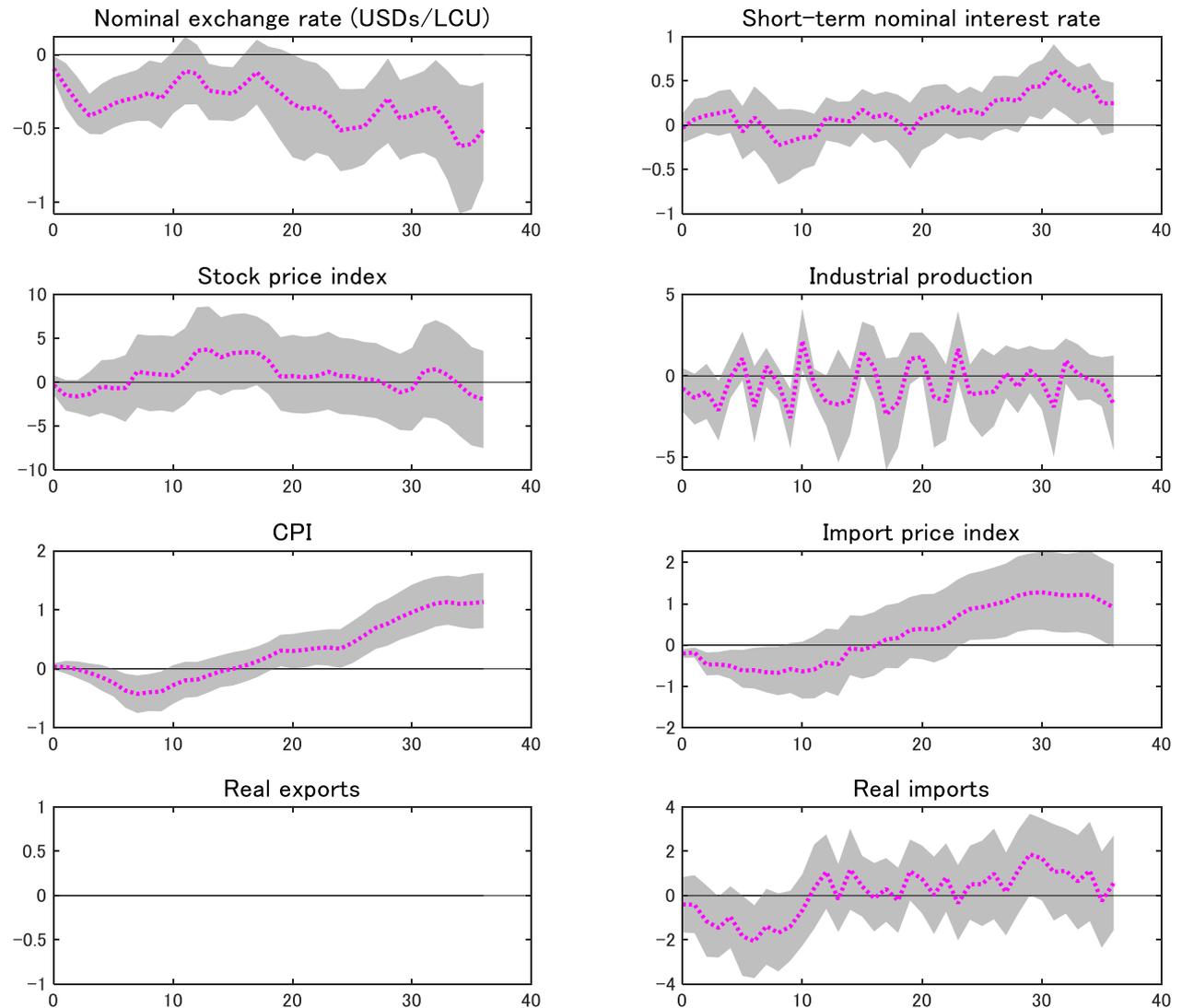
Factors influencing the effects of U.S. mon. pol. shocks

Dependent variable: IRF to the U.S. monetary policy tightening shock of the nominal exchange rate (USDs/LCU)

Independent variable	Coef	Stderr	t-stat	P-value
Capital control index	0.03	0.20	0.15	0.88
Peg dummy	0.29	0.15	1.94	0.07
Trade openness	-0.04	0.07	-0.52	0.61
Const.	-0.31	0.12	-2.65	0.02

Adj. R2 = 0.364

Observations = 20

Dependent variable: IRF to the U.S. monetary policy tightening shock of the short-term nominal interest rate

Independent variable	Coef	Stderr	t-stat	P-value
Capital control index	0.05	0.08	0.70	0.49
Peg dummy	-0.12	0.06	-2.09	0.05
Trade openness	0.05	0.03	1.60	0.13
Const.	0.04	0.04	0.92	0.37

Adj. R2 = 0.390

Observations = 20

Factors influencing the effects of U.S. mon. pol. shocks

Dependent variable: IRF to the U.S. monetary policy tightening shock of the stock price index

Independent variable	Coef	Stderr	t-stat	P-value
Capital control index	-3.77	2.66	-1.42	0.17
Peg dummy	1.33	1.99	0.67	0.52
Trade openness	-1.10	0.99	-1.11	0.28
Const.	-3.05	1.53	-2.00	0.06

Adj. R2 = 0.393

Observations = 20

Note:
- IRFs = mean IRF(horizons 1-3) for exchange rate, interest rate, & stock price
- IRFs = mean IRF(horizons 1-24) for industrial production index & CPI

Factors influencing the effects of U.S. mon. pol. shocks

Dependent variable: IRF to the U.S. monetary policy tightening shock of industrial production

Independent variable	Coef	Stderr	t-stat	P-value
Capital control index	-1.16	0.85	-1.36	0.19
Peg dummy	0.72	0.64	1.13	0.28
Trade openness	-0.17	0.32	-0.52	0.61
Const.	-1.10	0.49	-2.24	0.04

Adj. R2 = 0.032

Observations = 20

Dependent variable: IRF to the U.S. monetary policy tightening shock of the CPI

Independent variable	Coef	Stderr	t-stat	P-value
Capital control index	-0.62	0.41	-1.51	0.15
Peg dummy	0.34	0.31	1.10	0.29
Trade openness	-0.16	0.15	-1.05	0.31
Const.	-0.43	0.24	-1.81	0.09

Adj. R2 = 0.038

Observations = 20

IV. Concluding remarks

Main findings

- A U.S. monetary policy tightening shock leads to a depreciation of home currencies, an increase in nominal interest rates, and a decline in stock prices in most East Asian countries.

- The shock reduces output in many East Asian countries.

- The responses of the price level to the shock vary across countries and time horizons. For example, the shock raises the price level in Korea, while reduces that in many other East Asian countries.

Main findings

- When controlling for country characteristics such as capital control stringency, exchange rate regime, and trade openness, a U.S. monetary policy tightening shock statistically significant causes home currencies to depreciate, nominal interest rates to rise, stock prices to fall, and the price level and output to decrease in East Asian countries.

- Among the factors influencing the effects of U.S. monetary policy, a peg regime helps mitigate the depreciation of the home currency and the rise in the nominal interest rate.

- Capital controls and trade openness do not have statistically significant influences.

Future research

- Add non-East Asian countries to increase the sample size for the analysis of drivers of U.S. monetary policy shocks.

- Add more drivers.

- Try a different method: Interacted panel VAR.

Appendix

Exchange rate regime classification, 2000-2020

| Country	Classification
China	De facto peg (～2005M7); Pre-announced horizontal band within ±2% (2005M7～)
Hong Kong	Currency board
Indonesia	Managed floating (～2007M6); De facto crawling band within ±2% (2007M7～)
Japan	Freely floating
Korea	Moving band within ±2% (～2015M3); Managed floating (2015M4～)
Malaysia	Pre-announced peg (～2005M6); Moving band within ±2% (～2015M12, 2017M1～); Managed floating (2016M1-12)
Philippines	De facto crawling band within ±2%
Singapore	Moving band within ±2% (～2016M3); De facto crawling peg (2016M4～)
Taiwan	Data not available
Thailand	Moving band within ±2%
Vietnam	De facto crawling peg

Source: Ilzetzki, Reinhart and Rogoff (2021)

Capital account openness, 2000-2020
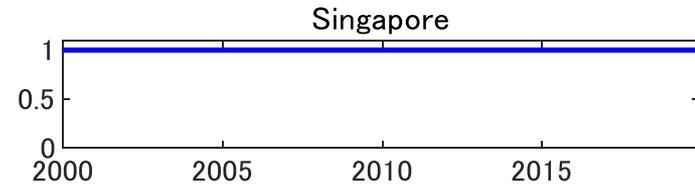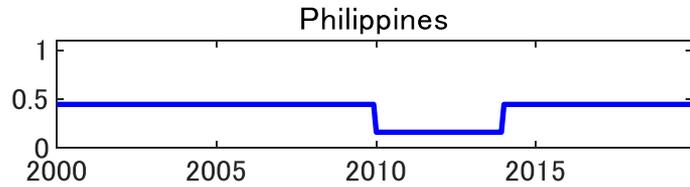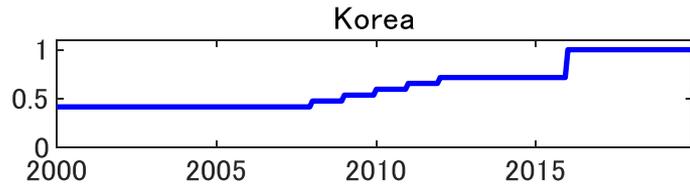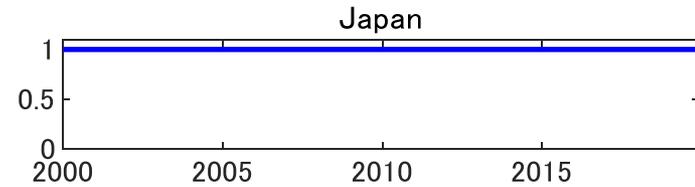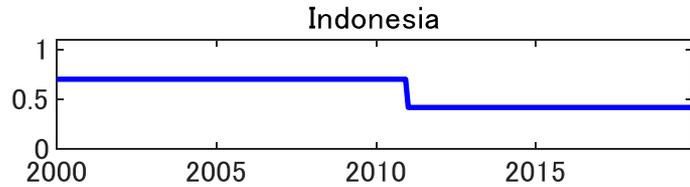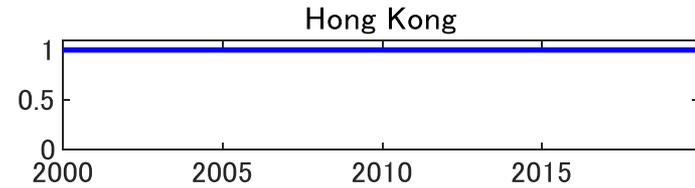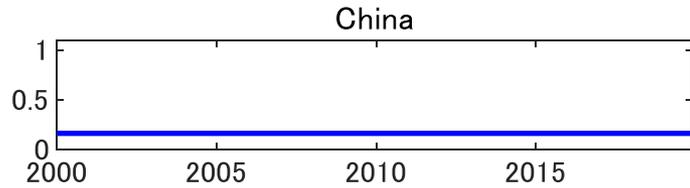
Note: 1: highest, 0: lowest

Trade openness, 2000-2020
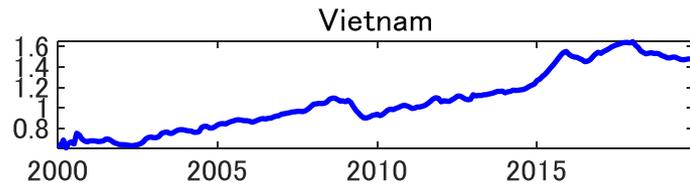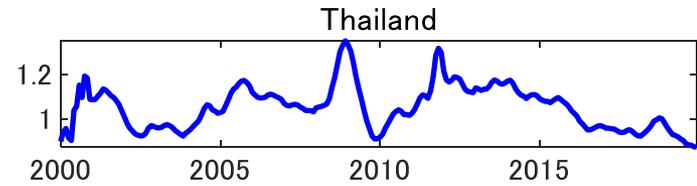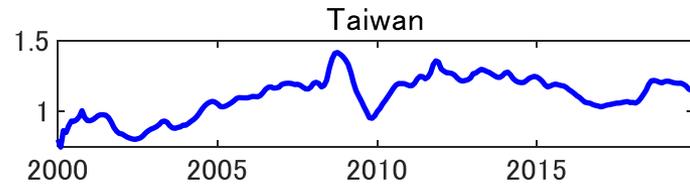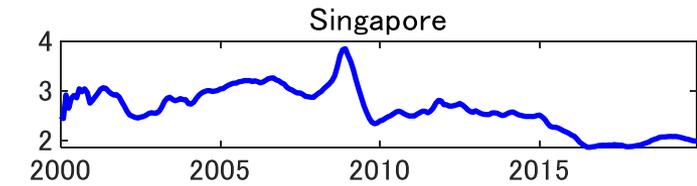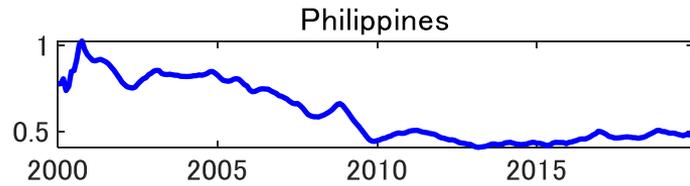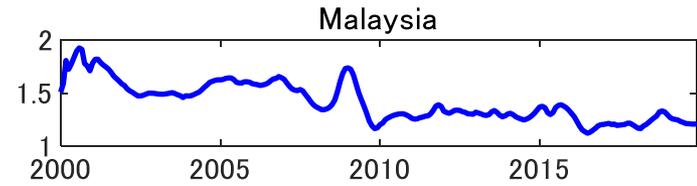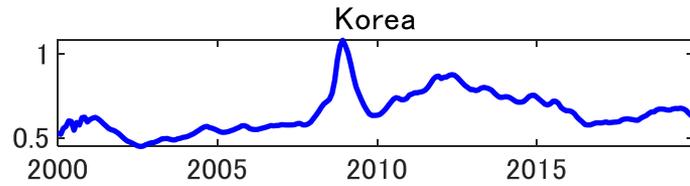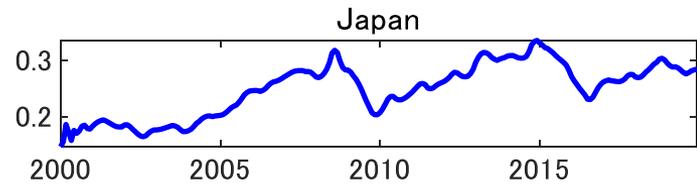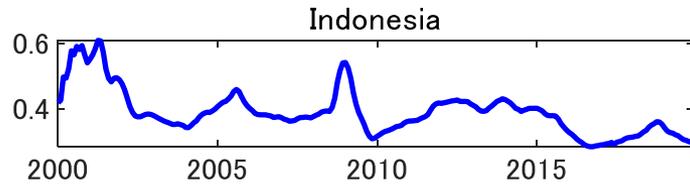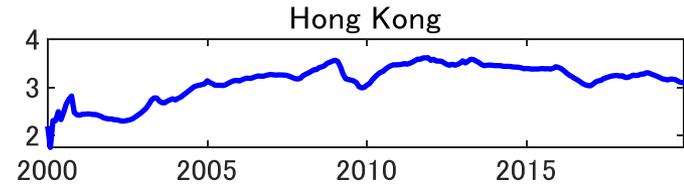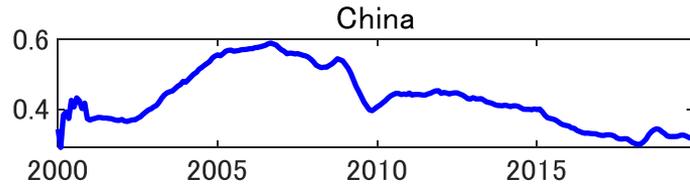
Note: openness = (Exp+Imp)/GDP

Trade openness: East Asia vs. other regions, 2000-2022

Country/Region/Group	Trade in goods and services	Trade in goods
Brunei Darussalam	1.05	0.88
Cambodia	1.25	0.98
China	0.46	0.40
Hong Kong SAR, China	3.60	3.06
Indonesia	0.50	0.42
Japan	0.30	0.24
Korea, Rep.	0.80	0.66
Lao PDR	0.80	0.69
Malaysia	1.63	1.37
Philippines	0.70	0.56
Singapore	3.62	2.71
Taiwan, China	1.27	1.10
Thailand	1.25	1.02
Vietnam	1.42	1.28
United States	0.27	0.21
East Asia & Pacific	0.60	0.50
European Union	0.83	0.62
Latin America & Caribbean	0.45	0.38
Middle East & North Africa	0.78	0.62
North America	0.30	0.24
South Asia	0.42	0.31
Sub-Saharan Africa	0.59	0.48
OECD members	0.52	0.40
High income	0.58	0.45
Middle income	0.52	0.43
Low income	0.50	0.39
World	0.56	0.44

Source: Vu (2025)