Regional production network, Asian trade integration, and optimal monetary policy coordination

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Abstract

Through the lens of Bayesian-estimated two-region New Keynesian model with vertical and processing trade, this paper provides an unified framework to shed lights on the magnitude of production sharing in East and Southeast Asia, the measure of vertical specialization between China, East, and Southeast Asia, a propagation mechanism demonstrating how these economies are interdependent, and the welfare-maximizing monetary policy rule.

JEL classification: C11, E52, E61, F15, F41, F42

[VERY PRELIMINARY DRAFT]

[FIRST VERSION: APR 6, 2012]

1. Introduction

One of the defining characteristics of today's international trade is the heavy flow of parts and components across countries. Underlying the fast-growing world trade since trade barrier reduction in 1980s, which brings about the integration of majority developing countries into world economy, is the reorganization of production structure. Productions are vertically sliced and fragmented across countries with different factor endowments, and as a result, multiple back-and-forth trades in intermediate goods are generated before a final product is assembled (Feenstra 1998). And this vertical intra-industry trade under the umbrella of international production network has accounted for an increasing share of total trade (Hummels et al. 2001; Yi 2003).

While the formation of production network is equally observed in the rest of the world (see, for instance, Koopsman et al. 2010), the depth and complexity of vertical production network and trade in East Asia is unrivalled. In a study of 79 countries, over 121 categories of goods within the period of 1967-2005, Amador and Cabral (2009) show that out of top ten vertically most specialized countries, eight are located in East Asia. Of 22 countries in East, Southeast, South, and Central Asia in 2003, Sawyer et al. (2010) document that Southeast Asian countries and the high-income economies in East Asia exhibit the highest level of intra-product trade, followed closely by China (see, also, Athukorala and Yamashita, 2009).

In view of the uniqueness and importance of production sharing in this region, this paper makes an effort to provide a perspective on the magnitude of production fragmentation in East and Southeast Asia, a measure of vertical specialization between China, East, and Southeast Asia, a propagation mechanism demonstrating how these economies are interdependent, and a framework for welfare-maximizing monetary policy rules through the lens of a Bayesian estimated two-region New Keynesian model with vertical and processing trade.

Overall, East and Southeast Asia are tied closely through vertical trade in intermediate inputs. The integration of China into world trading system, however, has restructured the regional production nexus in the sense that East Asia has nearly completely specialized in midstream production while China in downstream production. The corollary is strong complementarity between East Asia and China embodied in the sequential vertical and processing trade. But such complementary relationship is weak between China and Southeast Asia. Despite the fact that Southeast Asia still engages in midstream production and thus vertical trade with China, its importance in total trade has been declining while seeing rising share of processing trade in total exports to China. This simply implies that competitive relationship between China and Southeast Asia has been intensifying since China's WTO accession. Following the tradition of New Keynesian literature as in Woodford (2003), we use a quadratic approximation of the utility-based welfare criterion around the non-distorted global maximum utility to characterize the cooperative allocation for open economies engaging heavily in vertical and processing trade.

The following discussion is organized into four sections. Section 2 lays out a two-region New Keynesian model with three processing stages to explicitly incorporate vertical and processing trade. Section 3 details the Bayesian method and data used in evaluating the trade integration between East Asian economies. Throughout, we shed lights on the measurement of vertical linkage between China, East, and Southeast Asia, the source of fluctuations, and the influence of China on East and Southeast Asia particular in the aftermath of WTO accession. In Section 4, we probe into the welfare-maximizing operational monetary policy rule based on estimated models. Of particular interest is whether optimized policy necessitates response toward foreign disturbances in home policy feedback rule. As a further, whether welfare can be enhanced if there is policy coordination? Section 5 concludes.

2. A macroeconomic model of vertical and processing trade

In this section we lay out a two-region New Keynesian model of vertical and processing trade (NKVPT) according to Wong and Eng (2011). There are three processing stages in the NKVPT model. The upstream firms combine labor services and capital in Cobb-Douglas production technology to produce materials that will be partially exported abroad for subsequent processing in midstream production. Speaking differently, home midstream firms would fabricate the imported intermediate goods in conjunction with local upstream processed materials. A fraction of remanufactured intermediate goods would then be re-exported for final assembly in downstream production. The assembled final goods are to be consumed and invested locally as well as exported to trading partners.

By considering three processing stages, the NKVPT model embraces simultaneously vertical trade and processing trade. While the former is back-and-forth trade in intermediate inputs, the latter involves imports of intermediate inputs for remanufacturing and re-exporting as consumer goods. We believe that such model design is important in order to more satisfactorily gauge the emergence of China as “world factory” that final assembles the intermediate inputs absorbed from intra-East and Southeast Asia for consumer markets in the U.S. and Euro Area on the one hand, and the role of other Asian countries in importing, manufacturing, and exporting intermediate goods on the other hand.

What follows is the brief technical description of the NKVPT model.

2.1 Upstream firms

A unit mass of competitive firms at upstream production has access to Cobb-Douglas production technology of Eq. (1) that uses plant-specific capital $K_{t-1}(j)$, $j \in J$, and differentiated labor $N_t(i)$ of a variety $i \in I$ to produce plant-specific materials $Y_{1t}(j)$ at date *t*.

$$Y_{1t}(j) = e^{A_t}(K_{t-1}(j))^{\alpha}(N_t(i))^{1-\alpha} \tag{1}$$

where A_t is an first-order autoregressive Hicks-neutral total factor productivity (TFP) shock. The upstream firms can only alter its capital over time by varying the rate of investment $I_t(j)$ that comes with a cost $\mathrm{S}(I_t(j)/I_{t-1}(j))$. Capital stock accumulation evolves according to the form in Mandelman et al. (2011).

$$K_t(j) = (1-\delta)K_{t-1}(j) + \mathrm{u}_t^I I_t(j)\left\{1 - \frac{\Psi}{2}\left(\frac{\mathrm{u}_{t-1}^I I_{t-1}(j)}{\mathrm{u}_t^I I_t(j)}\right)\left(\frac{u_t^I I_t(j)}{u_{t-1}^I I_{t-1}(j)} - \Lambda\right)^2\right\} \tag{2}$$

where u_t^I is investment-specific technology (IST) shock, and follows first-order autoregressive process. The parameter Ψ denotes investment adjustment cost, and Λ determines how forward-looking the investment decision is. The upstream firm thus optimally chooses the path of K_t and $N_t\left(= \left[\int_{i\in I} N_t(i)^{1/\mu_t^N} di\right]^{\mu_t^N}\right)$ to minimize the cost of production

$$r_{K,t}K_{t-1}(j) + W_t N_t \tag{3}$$

subject to production function net of investment adjustment cost

$$\Phi_{1t}\left\{e^{A_t}(K_{t-1}(j))^{\alpha}(N_t(i))^{1-\alpha} - \frac{\Psi}{2}\mathrm{u}_{t-1}^I I_{t-1}(j)\left(\frac{u_t^I I_t(j)}{u_{t-1}^I I_{t-1}(j)} - \Lambda\right)^2 = 0\right\}$$

where Φ_{1t} is Lagrangian multiplier which we define as the real marginal cost for upstream firm. $W_t = \left[\int_{i\in I} W_t(i)^{(\varepsilon_{N,t}-1)/\varepsilon_{N,t}} di\right]^{\varepsilon_{N,t}/(\varepsilon_{N,t}-1)}$ refers to the real wage, $r_{K,t}$ is the real return on capital, and $\varepsilon_{N,t}$ denotes the wage elasticity of the demand for labor i. The optimal demand for labor of varieties i, total capital and labor, and investment decision are given by

$$N_t(i) = \left(\frac{W_t(i)}{W_t}\right)^{-\varepsilon_{N,t}} N_t \tag{4}$$

$$K_{t-1}(j) = \left(\frac{1}{r_{K,t}}\right) \alpha \Phi_1 Y_{1t}(j) \tag{5}$$

$$N_t = \left(\frac{1}{W_t}\right)(1-\alpha)\Phi_1 Y_{1t}(j) \tag{6}$$

$$\Phi_{1t}\left(\frac{u_t^I I_t(j)}{u_{t-1}^I I_{t-1}(j)} - \Lambda\right) = \Phi_{1t+1}\left\{\left(\frac{u_{t+1}^I I_{t+1}(j)}{u_t^I I_t(j)} - \Lambda\right)\left(\frac{u_{t+1}^I I_{t+1}(j)}{u_t^I I_t(j)}\right) - \frac{1}{2}\left(\frac{u_{t+1}^I I_{t+1}(j)}{u_t^I I_t(j)} - \Lambda\right)^2\right\} \tag{7}$$

For the sake of simplicity, we assume that the market for upstream goods is tightly competitive. The elasticity of substitution between varieties thus is close to infinity, and as a consequence, price approximates real marginal cost. The pricing decision is further assumed to be symmetry across manufacturing plants.

2.2 Midstream firms

A mass continuum of midstream monopolistically competitive firm *j*, $j \in J$, imports upstream goods $M_{1F,t}^j$ of plant *j* for remanufacture. In combination with local inputs $Y_{1H,t}^j$, the midstream firm *j* uses CES production technology as in Eq. (8) to produce intermediate goods for subsequent processing.

$$Y_{2t}^j = \left[(1-\kappa_2)^{1/\vartheta}\left(Y_{1H,t}^j\right)^{(\vartheta-1)/\vartheta} + \kappa_2{}^{1/\vartheta}\left(M_{1F,t}^j\right)^{(\vartheta-1)/\vartheta}\right]^{\vartheta/(\vartheta-1)} \tag{8}$$

where

$$M_{1F,t}^j = \left(\int_{j\in J} M_{1F,t}^j(j)^{(\varepsilon_{2t}-1)/\varepsilon_{2t}} dj\right)^{\frac{\varepsilon_{2t}}{\varepsilon_{2t}-1}}$$

and

$$Y_{1H,t}^j = \left(\int_{j\in J} Y_{1H,t}^j(j)^{(\varepsilon_{2t}-1)/\varepsilon_{2t}} dj\right)^{\frac{\varepsilon_{2t}}{\varepsilon_{2t}-1}}$$

The demand function for the *j* varieties of $M^j_{1F,t}(j)$ is $\left(P^j_{1F,t}(j)/P^j_{1F,t}\right)^{-\varepsilon_{2t}} M^j_{1F,t}$, and of $Y^j_{1H,t}(j)$ is $\left(P^j_{1H,t}(j)/P^j_{1H,t}\right)^{-\varepsilon_{2t}} Y^j_{1H,t}$. $P^j_{1H,t}$ and $P^j_{1F,t}$, respectively, is the home price of local and imported materials. $\varepsilon_{2t} > 1$ is the time-varying demand elasticity. The parameter κ_2 indicates the share of imported parts and components in midstream production, and the parameter $\vartheta > 0$ denotes the elasticity of substitution between home and imported intermediate inputs. The optimal demand function for home and imported materials can be derived in the following form

$$Y^j_{1H,t} = (1-\kappa_2)\left(\frac{P^j_{1H,t}}{P^j_{1t}}\right)^{-\vartheta} Y^j_{2t} \tag{9}$$

$$M^j_{1F,t} = \kappa_2\left(\frac{P^j_{1F,t}}{P^j_{1t}}\right)^{-\vartheta} Y^j_{2t} \tag{10}$$

where

$$P^j_{1t} = \left[(1-\kappa_2)\left(P^j_{1H,t}\right)^{1-\vartheta} + \kappa_2\left(P^j_{1F,t}\right)^{1-\vartheta}\right]^{1/(1-\vartheta)} \tag{11}$$

P^j_{1t} is the flexible producer price for midstream production.

2.3 Downstream firms

Lastly at downstream production, a continuum of monopolistically competitive final-good producers *j* of measure *J* combines a variety of home $Y^j_{2H,t}$ and imported intermediate goods $M^j_{2F,t}$ using the following CES technology to produce consumer goods.

$$Y^j_{3t} = \left[(1-\kappa_3)^{1/\vartheta}\left(Y^j_{2H,t}\right)^{(\vartheta-1)/\vartheta} + \kappa_3{}^{1/\vartheta}\left(M^j_{2F,t}\right)^{(\vartheta-1)/\vartheta}\right]^{\vartheta/(\vartheta-1)} \tag{12}$$

where

$$Y_{2H,t}^{j} = \left(\int_{j\in J} Y_{2H,t}^{j}(j)^{(\varepsilon_{3t}-1)/\varepsilon_{3t}} dj\right)^{\frac{\varepsilon_{3t}}{\varepsilon_{3t}-1}}$$

$$M_{2F,t}^{j} = \left(\int_{j\in J} M_{2F,t}^{j}(j)^{(\varepsilon_{3t}-1)/\varepsilon_{3t}} dj\right)^{\frac{\varepsilon_{3t}}{\varepsilon_{3t}-1}}$$

The parameter κ_3 denotes the share of imported intermediate inputs in final-good production. Solving for downstream firms' cost minimization problem, as in the case of midstream firms, gives us the demand schedules for the varieties and for home and imported intermediate goods shown in Eqs. (13) – (16), respectively.

$$Y_{2H,t}^{j}(j) = \left(\frac{P_{2H,t}^{j}(j)}{P_{2H,t}^{j}}\right)^{-\varepsilon_{3t}} Y_{2H,t}^{j} \tag{13}$$

$$M_{2F,t}^{j}(j) = \left(\frac{P_{2F,t}^{j}(j)}{P_{2F,t}^{j}}\right)^{-\varepsilon_{3t}} M_{2F,t}^{j} \tag{14}$$

$$Y_{2H,t}^{j} = (1-\kappa_3)\left(\frac{P_{2H,t}^{j}}{P_{2t}^{j}}\right)^{-\vartheta} Y_{3t}^{j} \tag{15}$$

$$M_{2F,t}^{j} = \kappa_3\left(\frac{P_{2F,t}^{j}}{P_{2t}^{j}}\right)^{-\vartheta} Y_{3t}^{j} \tag{16}$$

P_{2t}^{j} is the producer price index for final-good producers:

$$P_{2t}^{j} = \left[(1-\kappa_3)\left(P_{2H,t}^{j}\right)^{1-\vartheta} + \kappa_3\left(P_{2F,t}^{j}\right)^{1-\vartheta}\right]^{1/(1-\vartheta)} \tag{17}$$

2.4 Optimal pricing decision with U.S dollar pricing in export

Pricing decision is assumed to be time dependent. The ability of domestic firms at midstream and downstream production to re-optimize the price is subject to the signal received at probability $1-\theta_{Pn}$, for $n = 2,3$. Firm j that receives the signal chooses $\mathbb{P}_{nH,t}$ to maximize the expected discounted profits $E_t\Pi_t$ for sales in home market and $\mathbb{P}^{D}_{nH,t}$ for export market. For home market, the pricing decision is formulated as

$$E_t\Pi_t^{home} = E_t\sum_{i=0}^{\infty}(\theta_{Pn}\beta)^i\Lambda_{t+i}\left[\frac{\mathbb{P}_{nH,t+i}(j)-MC_{n,t+i}}{P_{n,t+i}}\right]\left[\frac{\mathbb{P}_{nH,t+i}(j)}{P_{nH,t+i}}\right]^{-\varepsilon_{n,t}} Y_{nH,t+i}(j) \quad (18)$$

Contrary to producer-currency pricing decision in the typical New Keynesian model, or local-currency pricing in the New Open-Economy model, we consider U.S. dollar pricing (DP) strategy in exports. This assumption is apparently coherent with the fact that international trade is largely denominated in the U.S dollar (Goldberg and Tille, 2008). The variability of exchange rates between local currency and the U.S. dollar $S_{HD,t}$ will not pass through into foreign price of home export, but rather, it will pass through into local-currency denominated export earnings. Firm's expected export profit in home currency under DP strategy is thus given by

$$E_t\Pi_t^{DP} = E_t\sum_{i=0}^{\infty}(\theta^*_{Pn}\beta)^i\Lambda_{t+i}\left[\frac{S_{HD,t}\mathbb{P}^{D}_{nH,t+i}(j)-MC_{n,t+i}}{P_{n,t+i}}\right]\left[\frac{S_{FD,t}\mathbb{P}^{D}_{nH,t+i}(j)}{P^*_{nH,t+i}}\right]^{-\varepsilon_{n,t}} Y^*_{nH,t+i}(j) \quad (19)$$

In what follows we assume that all firms are symmetric in price setting.

Firms allowed for price re-optimization will reset their log-linearized price $\hat{\mathbb{P}}^{new}_{nH,t}$ to approximate the optimal reset price derived from Eqs. (12) and (13), respectively, for home and export market. The remaining firms that do not receive signal for re-optimization will stick to last-period price, out of which a fraction of them γ_{Pn} will index to last-period inflation. The corresponding inflation dynamics of PPI ($\pi_{2H,t}$), GDP deflator ($\pi_{3H,t}$), intermediate export price ($\pi^*_{2H,t}$) and final export prices ($\pi^*_{3H,t}$) can be derived as

$$\pi_{nH,t} = \left(\frac{\gamma_{Pn}}{1+\theta_{Pn}\beta\gamma_{Pn}}\right)\pi_{nH,t-1} + \left(\frac{\beta}{1+\theta_{Pn}\beta\gamma_{Pn}}\right)E_t\pi_{nH,t+1} + \lambda\left(\widehat{rmc}_{n,t} + \hat{\mu}_{n,t}\right) \quad (20)$$

$$\pi^*_{nH,t} = \left(\frac{\gamma^*_{pn}}{1+\theta^*_{pn}\beta\gamma^*_{pn}}\right)\pi^*_{nH,t-1} + \left(\frac{\beta}{1+\theta^*_{pn}\beta\gamma^*_{pn}}\right)E_t\pi^*_{nH,t+1} + \lambda^*\left(\widehat{rmc}_{n,t} - \hat{s}_{HD,t} + \hat{\mu}^*_{n,t}\right) \quad (21)$$

where

$\lambda = (1-\theta_{Pn})(1-\theta_{Pn}\beta)/\big(\theta_{Pn}(1+\theta_{Pn}\beta\gamma_{Pn})\big)$,

$\lambda^* = \big(1-\theta^*_{pn}\big)\big(1-\theta^*_{pn}\beta\big)/\Big(\theta^*_{pn}\big(1+\theta^*_{pn}\beta\gamma^*_{pn}\big)\Big)$, and $\hat{\mu}_{n,t}$ is an i.i.d price markup shock for $n = 2{,}3$. $\widehat{rmc}_{n,t}$ is the log-deviation of real marginal cost, in which $\widehat{rmc}_{2,t} = \hat{p}_{1,t}$ and $\widehat{rmc}_{3,t} = \hat{p}_{2,t}$.

2.5 Household

Consider a continuum of infinitely-lived households, represented and indexed by *i* ∈ $[0,1]$, who possess the utility function of

$$U = E_t\left\{\sum_{t=0}^{\infty}\beta^t \mathrm{u}_t^C\left[\frac{(C_t^i-H_t)^{1-\sigma}}{1-\sigma} - \mathrm{u}_t^N\frac{(N_t^i)^{1+\chi}}{1+\chi}\right]\right\} \tag{22}$$

where

$$C_t^i = \left[(\gamma)^{1/\varphi}\big(C_{H,t}^i\big)^{(\varphi-1)/\varphi} + (1-\gamma)^{1/\varphi}\big(C_{F,t}^i\big)^{(\varphi-1)/\varphi}\right]^{\varphi/(\varphi-1)} \tag{23}$$

u_t^C and u_t^N, respectively, is i.i.d preference and labor supply shock. $C_{H,t}^i\left\{= \left(\int_{i\in I} C_{H,t}^i(i)^{(\varepsilon_t-1)/\varepsilon_t}dj\right)^{\frac{\varepsilon_t}{\varepsilon_t-1}}\right\}$ and $C_{F,t}^i\left\{= \left(\int_{i\in I} C_{F,t}^i(i)^{(\varepsilon_t-1)/\varepsilon_t}dj\right)^{\frac{\varepsilon_t}{\varepsilon_t-1}}\right\}$ are the composite varieties of home and imported consumer goods. $H_t(= bC_{t-1}^i)$ indicates external habit formation in which b is the parameter that governs the extent of habit persistence. $0 < \beta < 1$ refers to subjective discount factor, σ measures the coefficient of relative risk aversion, and the reciprocal of χ indicates the wage elasticity of labor supply. The parameter $\varphi > 1$ denotes the elasticity of substitution between home and imported consumer goods. The parameter γ measures home bias. Household *i*'s constrained optimization problem can be illustrated as utility maximization of Eq. (22) subject to Eq. (23) and the following flow budget constraint

$$C_t + \left(\frac{S_{HD,t}}{P_t\omega_t}\right)\left(\frac{B_t^*}{R_t^D}\right) + \frac{B_t}{P_tR_t} + K_t = W_t\ N_t\ + \Pi_t + r_{K,t}K_{t-1} + \left(\frac{S_{HD,t}B_{t-1}^*+B_{t-1}}{P_t}\right) \tag{24}$$

where $P_{H,t}$ and $P_{F,t}$, respectively, denotes domestic price of home and imported consumer goods. Household facing exchange-rate risk ω_t in foreign asset market has access only to imperfect international asset market. Note that the foreign bond B_t^* is denominated in U.S. dollar. Thus, the nominal exchange rate between home currency and the U.S. dollar is considered. Solving for the utility maximization problem gives us the optimal demand schedules for varieties and composite varieties as in Eqs. (25) – (28), marginal rate of substitution between works and consumption in Eq. (29), intertemporal substitution of consumption in Eq. (30), and uncovered interest rate parity in Eq. (31).

$$C_{H,t}^i(i) = \left(\frac{P_{H,t}(i)}{P_{H,t}}\right)^{-\varepsilon_t} C_{H,t}^i \tag{25}$$

$$C_{F,t}^i(i) = \left(\frac{P_{F,t}(i)}{P_{F,t}}\right)^{-\varepsilon_t} C_{F,t}^i \tag{26}$$

$$C_{H,t}^i = \gamma \left(\frac{P_{H,t}}{P_t}\right)^{-\varphi} C_t^i \tag{27}$$

$$C_{F,t}^i = \gamma \left(\frac{P_{F,t}}{P_t}\right)^{-\varphi} C_t^i \tag{28}$$

$$\left(N_t^i\right)^{\chi}\left(C_t^i - bC_{t-1}^i\right)^{\sigma} \mathrm{u}_t^N = W_t^{MRS} \tag{29}$$

$$\frac{\left(C_t^i - bC_{t-1}^i\right)^{-\sigma}}{P_t} \mathrm{u}_t^C = \beta(1+r_t)\frac{\left(E_t C_{t+1}^i - bC_t^i\right)^{-\sigma}}{E_t P_{t+1}} E_t \mathrm{u}_{t+1}^C \tag{30}$$

$$S_{HD,t} = E_t S_{HD,t+1}\left(\frac{1+r_t^{us}}{1+r_t}\right)\omega_t \tag{31}$$

P_t is the utility-based consumer price index (CPI).

$$P_t = \left[\gamma P_{H,t}^{1-\varphi} + (1-\gamma) P_{F,t}^{1-\varphi}\right]^{1/(1-\varphi)} \tag{32}$$

Since household is a monopoly supplier of differentiated services, nominal wage is set in Calvo-style, which results in nominal wage inflation dynamics as what follows:

$$\pi_t^W = \left\{\frac{\gamma_W}{1+\theta_w\beta\gamma_W}\right\}\pi_{t-1}^W + \left\{\frac{\beta}{1+\theta_w\beta\gamma_W}\right\}E_t\pi_{t+1}^W + \lambda_w(\widehat{w}_t^{MRS} - \widehat{w}_t + \mathrm{u}_t^W) \quad (33)$$

where $\lambda_w = \frac{(1-\theta_w)(1-\theta_w\beta)}{\theta_w(1+\theta_w\beta\gamma_w)}$. θ_w denotes wage stickiness, and γ_w is wage indexation. u_t^W is i.i.d wage markup shock.

2.6 Trade balance, aggregate demand, and monetary policy

We define trade balance as the balance between aggregate f.o.b exports and aggregate c.i.f imports.

$$\mathbb{T}_t = Y_{1H,t}^* + \int_{j\in J} Y_{2H,t}^*(j)dj + \int_{j\in J} Y_{3H,t}^*(j)dj - M_{1F,t} - \int_{j\in J} M_{2F,t}(j)\,dj - \int_{i\in I} C_{F,t}(i)\,di \quad (34)$$

The value added of the economy (GDP) can be defined as

$$\mathbb{Y}_t = C_t + I_t + \mathbb{T}_t \quad (35)$$

The model is closed by considering a general form of monetary policy reaction as below:

$$r_t = \rho_R r_{t-1} + (1-\rho_R)\left(r_t^n + V_\pi \pi_{CPI,t} + V_{\mathbb{Y}}\widehat{\mathbb{Y}}_t + V_{\Delta S}\Delta s_{HD,t}\right) + \mathrm{u}_t^R \quad (36)$$

where $r_t^n\left(= \mathrm{u}_t^C + \sigma(u_t^I + \hat{a}_t)\right)$ is the natural rate of interest, ρ_R measures the interest rate persistence, $V_\pi, V_{\mathbb{Y}}$, and $V_{\Delta S}$, respectively, indicates central bank's responsiveness toward variability in CPI inflation, aggregate demand variability, and rate of change in nominal exchange rates between home currency and U.S. dollar. u_t^R refers to i.i.d white noise to the conduct of monetary policy.

3. Evaluating the trade integration between East and Southeast Asia

3.1 A Bayesian estimation

We take the model to the data using Bayesian method. As the literature on Bayesian estimation and evaluation has been growing tremendously, its estimation procedure is briefly sketched here. The procedure is principally built around the likelihood function of the data derived from the model in conjunction with the prior belief on the probability distribution of the parameters. Bayesian estimation is thus about finding a set of parameters that maximizes the posteriors (see, for instance, Fernandez-Villaverde, 2010; Schorfheide, 2011).

According to Bayes's theorem, the posterior distribution of model parameters $\mathcal{P}(\mathbb{X}|\Upsilon,\mathcal{M})$ is formed by combining the likelihood function $\mathcal{P}(\Upsilon|\mathbb{X},\mathcal{M})$ and prior density $\mathcal{P}(\mathbb{X},\mathcal{M})$ in following manner:

$$\mathcal{P}(\mathbb{X}|\Upsilon,\mathcal{M}) = \frac{\mathcal{P}(\Upsilon|\mathbb{X},\mathcal{M})\mathcal{P}(\mathbb{X},\mathcal{M})}{\mathcal{P}(\Upsilon,\mathcal{M})} \tag{37}$$

where $\mathcal{P}(\Upsilon,\mathcal{M})$ is the marginal density of the data, given a specific model:

$$\mathcal{P}(\Upsilon,\mathcal{M}) = \int_{\mathbb{X}} \mathcal{P}(\Upsilon|\mathbb{X},\mathcal{M})\mathcal{P}(\mathbb{X},\mathcal{M})\, d\mathbb{X} \tag{38}$$

Suppose that the marginal density of the data is a constant or equals certain parameter, the posterior kernel can be derived from the numerator of the posterior density

$$\mathcal{K}(\mathbb{X}|\Upsilon,\mathcal{M}) \equiv \mathcal{P}(\mathbb{X}|\Upsilon,\mathcal{M}) \propto \mathcal{P}(\Upsilon|\mathbb{X},\mathcal{M})\mathcal{P}(\mathbb{X},\mathcal{M}) \tag{39}$$

where $\propto$ denotes proportionality. Posterior kernel is simulated to generate draws using Markov Chain Monte Carlo (MCMC) method. The resultant findings provide the point estimates, standard deviations and probability density region.

3.2 Data and priors

In this paper we are going to study nine East and Southeast Asian economies, including Japan, the Republic of Korea, Hong Kong, Taiwan, Singapore, Malaysia, Thailand, Indonesia, and the Philippines, in addition to China. The regional vertical production and trade link is systematically formed as the consequence of the massive outflow of vertical foreign direct investment from Japan in the aftermath of Plaza Accord and subsequently other first-tier Newly Industrializing Economies to Southeast Asia, and to China. In view of this, we focus on the year 1987 onward and categorize the nine Asian economies, besides China (CN), into developing Southeast Asian economies (SEA4), which consists of Indonesia, Malaysia, Philippines, and Thailand, and advanced East Asian economies (EA5) for the rest. There are three two-region models to be estimated: SEA4-EA5 model, CN-EA5 model, and CN-SEA4 model. The name that appears first is treated as home region, while the following as foreign region.

We use 19 macroeconomic observable series in estimating the NKVPT model, which include real GDP, real consumption, real investment, labor force, nominal interest rate, nominal exchange rates between home currency and the U.S. dollar, PPI inflation, GDP deflator inflation, and CPI inflation for SEA4, EA5, and China in two-region setting, and the U.S. federal funds rate. All the quantity variables are deflated by respective deflators, and all data, except for the rates of inflation and interest, are logged and de-trended using Hodrik-Prescott Filter with a smoothing parameter of $\lambda = 1600$. We then construct the trade-weighted cyclical observable series for SEA4 and EA5 using time-varying fraction of national total trade over aggregate regional trade. We lastly decompose the constructed series into two subsamples: one from 1987Q1 to 2000Q4 and another from 2001Q1 to 2008Q4. This is to shed lights on the impact of China's WTO accession and the subsequent emergence of China as the center of final assembly in the regional production network on East and Southeast Asian economies.

We assume symmetric priors for estimation. Nonetheless, we allow for different posteriors for price indexation and stickiness, share of imported materials, home bias in consumption, monetary policy reaction functions, and standard deviation of structural shocks. We use Dynare 4.2.5 algorithms for model estimation, and adjust the number of Markov chains to ensure that estimates for mean and standard deviation across the Markov chains are satisfactorily consistent.

Because of the lack of previous studies on the Bayesian estimation on the Asian economies, we are bound to the principle of allowing equal probability for all potential parameter values within the theoretically coherent range when the true value is uncertain. As such, priors for the share of imported material at both midstream and downstream production, price stickiness, and the standard deviation of shocks are assumed to be in uniform distribution with a range of [0,1]. The priors for efficient shock persistence are in beta distribution, while the parameters in monetary policy reaction function, which theoretically must have positive values, are in gamma distribution with prior means following the standard assumption. The priors and probability distribution functions are detailed in Table 1.

----- [INSERT TABLE 1 HERE] -----

3.3 Measuring the vertical linkage

Tables 2 to 4 report the estimates of mode, mean and probability interval for selective interesting parameters in SEA4-EA5 model, CN-EA5 model, and CN-SEA4 model, respectively. All structural shocks and parameters are nicely identified as evidenced by the proximity between posterior mode and mean which falls within the

90% probability interval[1]. Figure 1 compares the autocorrelations shown in the data with the one generated from the two-region models, respectively shown in (a) throughout (c). Evidently, the model is fit in terms of replicating the dynamics shown in the data.

Due to space constraint, we only pay attention to the share of imported materials in productions. Table 2 shows that SEA4 and EA5 have been tightly bonded since 1987 in the sense that the productions in both regions rely heavily on the intermediate inputs imported from each other. For instance, over the first subsample periods, the mean share of materials imported from EA5 for midstream production in SEA4 is 64.9%. The share of materials in EA5 production imported from SEA4 is even higher. Unsurprisingly, such a strong trade in intermediate inputs can also be seen in the interaction between CN and EA5, and SEA4.

--- [INSERT TABLES 2 to 4 HERE] ---

To probe into the degree of vertical and sequential trade linkage among these regions, we construct an index of vertical specialization in the spirit of Hummels et al. (2001)[2]. In particular, the degree of vertical specialization of total export for country i over production h is measured by

$$VS_i = \frac{\sum_h \kappa_h Export_h}{\sum_h Export_h} \tag{40}$$

which can be decomposed into vertical trade and processing trade

[1] Detailed illustration on the identification of each parameter and shock are available upon request.
[2] As defined in Hummels et al. (2001), vertical specialization occurs when (a) a good is produced in two or more sequential stages; (b) two or more countries provide value-added during the production of the goods; (c) at least one country must use imported inputs in its stage of the production process, and some of the resulting output must be exported. Koopman et al. (2010) further classify the value chains into four different categories: (a) final goods export; (b) intermediate exports that are transformed into final goods and absorbed by the direct importer; (c) intermediate inputs that are used to produce other intermediates and sent to a third country for further processing; and (d) intermediate inputs that are transformed into final goods and exported to a third country for consumption. In this respect, the NKVPT model, which features two-region setting with three sequential production stages, has an advantage of measuring the vertical specialization embodied in Hummels et al. (2001), which is conceptually equivalent to the first two categories in Koopman et al. (2010), while capturing the back-and-forth trade in intermediates as in the category (c) in Koopman et al. (2010). However, the limitation of a two-region setting is obvious: it cannot measure the vertical and processing trade involving third country.

$$VS_i = \underbrace{\kappa_2 \left(\frac{Export_2}{\sum_2^3 Export_h} \right)}_{vertical\ trade} + \underbrace{\kappa_3 \left(\frac{Export_3}{\sum_2^3 Export_h} \right)}_{processing\ trade}$$

Vertical trade refers to back-and-forth trade in intermediate inputs, that is, importing intermediate inputs for remanufacturing and reexporting as intermediate input for subsequent fabrication. Processing trade belongs to the type of trade which imports intermediate inputs from other countries to provide final goods. Such decomposition is useful in understanding the nature of trade in East Asian economies given its more roundabout production network. Koopman et al. (2010) show that for much of East Asia, including Hong Kong, Korea, Taiwan, Malaysia, and Philippines, use imported intermediate inputs to provide both intermediate inputs and final goods concurrently in the world production chain. Meanwhile, Japan lies upstream in the production chain by providing intermediate inputs, and China lies downstream in the production chain by using imported intermediate inputs to provide final goods to the world (see, also, Athukorala and Menon 2010).

Table 5 reports the computation of vertical specialization of total export over three different estimated models. Based on the estimated share of imported intermediate inputs in production, and the share of intermediates and final goods in total exports inferred from Kim et al. (2011)[3], Table 5 shows that the share of vertical specialization in total exports ranges from 0.293 to 0.644 over the period of 1987 to 2008. In the trade between SEA4 and EA5 over the period 1987 to 2000, for instance, 26.7% of SEA4 total exports to EA5, along with 34.6% of EA5 total exports to SEA4, are categorized as vertical trade. Of total Chinese exports to EA5 during the period 1987 to 2000, vertical and processing trade combined account for 43%. Overall, the findings are consistent with those estimates of Ando (2006), Koopman et

[3] The share of upstream and midstream outputs combined in total exports is inferred to be 0.822 for EA5 and SEA4, respectively, and 0.566 for China. The latter is in line with the estimates of Koopman et al. (2010) shown in Table 1a, while the former presumes a value slightly higher than their estimates.

al. (2010), and Dean et al. (2011) in that East Asia as a region is densely intertwined through vertical and processing trade as the corollary of vertical fragmentation of sequential production chains across regions.

--- [INSERT TABLE 5 HERE] ---

3.4 Source of fluctuations

An interesting question appears when witnessing such tied vertical and sequential linkage: to what extent then the foreign shocks influence home macroeconomic fluctuations? We address this question by looking into the ability of each structural shock in accounting for the macroeconomic volatility over the short, medium, and long run. Table 6 reports the results of variance decomposition for three selective macroeconomic variables, namely, GDP, CPI inflation, and short-term nominal interest rate. Detailed findings are available upon request.

--- [INSERT TABLE 6 HERE] ---

Several worth-discussing points emerge.

Firstly, foreign influences on home macroeconomic fluctuation are substantial, though in different ways across regions, over the short, medium, and long run. For instance, shocks to EA5 intermediate export price mark-up and trade cost combined can account for an approximate 37% of SEA4 GDP volatility contemporaneously, 33% after four quarters, and 34% over the long run. Secondly, in the presence of vertical specialization, foreign trade cost is too important to be ignored for GDP volatility, particularly over the short and medium run. In the estimated SEA4-EA5 model, foreign trade cost shock per se can account for 28.8% and 15.8% of the contemporaneous GDP fluctuation in SEA4 and EA5, respectively. The fraction is even higher in the estimated CN-EA5 model, of which 65% and 25% of CN and EA5 GDP volatility, respectively, can be attributed to disturbance on foreign trade cost. This observation is certainly in line with the consensus that back-and-forth trade can propagate even a small shock to trade cost (Yi, 2003). Thirdly, in contrast to Kim and Lee (2008) which found a dominant role of technology and labor supply shocks in explaining the cross-country output fluctuation, the influence of total factor productivity (TFP) is largely confined as domestic source of fluctuation, and is relatively unimportant when compared to investment-specific technology (IST) shock and preference shock. It is the shock to export price – both intermediates and final goods – markup and trade cost that matters for international macroeconomic fluctuations.

But at CPI inflation front, fourthly, home TFP shock together with preference shock is critically important. For instance, in the estimated SEA4-EA5 model, home TFP shock can explain approximately 42% and 72% of contemporaneous and long-run CPI inflation fluctuation in SEA4. The role of EA5's own TFP shock on her CPI inflation volatility is equally substantial. And such a role of home TFP shock can be observed in other two estimated models, too. With respect to the foreign source of shock, interestingly, the U.S interest rate shock has been the most common influential foreign disturbance across the estimated models. We conjecture that dollar pricing in trade has laid the ground for the non-trivial role of U.S interest rate in that changes in the U.S Federal Funds rate are transmitted through nominal exchange rates into firms' pricing decision, and are propagated by multiple sequential production chains.

Lastly, we find that policy interest rate in each estimated model largely responds to domestic shocks. Shock to the U.S interest rate has been the only common source of foreign shock across models. In the estimated CN-EA5 model particularly, the transmission of changes in the U.S Federal Funds rate into interest rates in China and East Asia economies is large not only contemporaneously but also in the long run (Edwards, 2010).

3.5 Deciphering the influence of China

To regional economies, of which production and trade have been vertically the most integrated in the world, the emergence of China has posed both opportunity and threat. On the one hand, rapid expansion of China's processing exports implies greater demand for parts and components from its Asian neighbors. Ianchovichina and Walmsley (2005), for instance, calibrate and simulate on a multicountry and multisector model, and show that China's WTO accession has crowded in Japan and the newly industrialized economies in East Asia that supply materials to China. Eichengreen et al. (2007) also find that China's growth is beneficial to advanced East Asian economies exporting capital-intensive goods but not to developing Southeast Asian countries exporting labor-intensive goods (see also Park and Shin, 2010; Haltmaier et al., 2007; and Roland-Holst and Weiss, 2004. Greenaway et al. 2008 argue the reverse).

Table 5 shows the influence of China especially in the aftermath of accession to World Trade Organization in late 2001. Most dramatic change is the trade interaction between China and the advanced East Asian economies. Prior to Chinese WTO's accession, both regions vertically specialize in midstream production with higher vertical trade as a share of total exports (0.241 for China and 0.228 for EA5). However, accession to World Trade Organization has tremendously overhauled regional production network by repositioning China as the destination for final assembly of parts and components shipped from the advanced East Asian neighbors to produce and export final goods[4]. Processing trade accounts for larger share of Chinese total exports to East Asia (0.377), while witnessing a rising share of vertical trade in EA5 total exports to China (0.400).

[4] See, for instance, Athukorala and Menon (2010), Athukorala and Yamashita (2009), and Hayakawa (2007).

Although the developing Southeast Asia remains specializing in midstream production, the share of vertical trade in SEA4 total exports to China has been falling drastically from 0.401 in pre China's WTO accession to 0.251 in post China's WTO accession, alongside the strengthening share of processing trade in China throughout the periods. One interesting fact to note is the developing Southeast Asia is indeed vertically bonded more closely to the advanced East Asia rather than China in the aftermath of China's WTO accession.

Of question is in what way China would have affected the East and Southeast Asia? Figure 3 depicts the dynamic responses of East and Southeast Asia, in (a) and (b), respectively, toward one percent increase in China's final goods export price markup. The responses are obviously different. For China and East Asia which complement each other in that East Asia engages in vertical trade (with nearly zero processing trade) vis-à-vis the processing China, the dynamic responses of both regions seems synchronized, despite the fact that the shock is asymmetric.

--- [INSERT FIGURE 3] ---

The intuition is straightforward. Thanks to the higher final goods export price inflation, East Asian consumption is redirected from import toward home-produced final goods. Simply, the demand for Chinese processing export will fall. The resultant contraction in China's downstream production in turn transmits into East Asia through declining demand for intermediates imported from East Asia. The repercussion effect is channeled through multiple sequential production chains. Gross domestic product in both regions fall in consequence of the trade complementary embodied in the vertical-processing trade structure.

However, tale is different for the case of China and Southeast Asia. There exists not only trade complementarity between China and Southeast Asia. With rising share of processing trade in total exports, Southeast Asia also competes head-to-head with China in final goods market. And this does matter. Positive shock to China's final goods export price markup on the one hand makes expensive China's exports unfavorable, and on the other hand induces Chinese supply of final goods toward more profitable export market, which, in turn, fuels higher price of final goods in China's home market. As a result, the Chinese expenditure is switched toward imported final goods from Southeast Asia. Adverse response of China's GDP is thus accompanied with favorable response of Southeast Asian GDP.

4. Can Asia gain from monetary policy coordination?

We turn to an important normative question: can Asia gain from monetary policy coordination given the growing presence of vertical and processing trade? Speaking differently, would the lack of international monetary policy coordination result in substantive welfare lose? The influential Obstfeld and Rogoff (2002) argue that under plausible assumption the lack of cooperation in rule setting is of second order. Clarida et al. (2001, 2002) argue that the policy problem for central bank of a small open economy is isomorphic to the one it would face under closed economy. Openness does not distinct optimal monetary policy of an open economy from that of closed economy. Benigno and Benigno (2008) further show that the allocation under optimal cooperative solution can be implemented through inflation-targeting regime in such a way that each monetary authority minimizes a quadratic loss function that targets only domestic GDP inflation and the output gap.

A worth-mentioning yet unsurprising feature of this literature is that production is modelled either as a process with single stage or two vertically and sequentially not connected stages [5]. In this paper, we propose a welfare criterion which

[5] There are few exceptions which deserve more discussion. See, for instance, Shi and Xu (2007), and Berger (2006). Petrella and Stantoro (2011) and Strum (2009) consider the importance of geographically defragmented input-output interaction in optimal monetary policy.

characterizes the cooperative allocation for an open economy engaging in vertical and processing trade. Following the tradition of New Keynesian literature as in Woodford (2003), we derive a quadratic approximation of the utility-based welfare criterion around the non-distorted global maximum utility by taking into account all the resource constraints. We obtain the following loss function

$$\mathbb{W} = E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{U_t - U^{max}}{U_c c} \right)$$

of which

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{U_t - U^{max}}{U_c c} \right)$$

$$= -\frac{1}{2} \left\{ \left(\frac{\gamma \varepsilon}{\lambda_h \Delta} \right) \pi_{h,t}^2 + \left(\frac{\mathcal{L}_{2h}^*}{\lambda_{2h}^*} \right) \pi_{2h,t}^{*2} + \left(\frac{\mathcal{L}_{3h}^*}{\lambda_{3h}^*} \right) \pi_{3h,t}^{*2} - \left(\frac{\mathcal{L}_f}{\lambda_f} \right) \pi_{f,t}^2 + \left(\frac{\mathcal{L}_w}{\lambda_w} \right) \pi_{w,t}^2 \right\}$$

$$- \left(\tfrac{\sigma-1}{2} \right) \left\{ \left(\tfrac{\Gamma \gamma}{\Delta} \right)^2 \hat{q}_t^2 + \left(\tfrac{\bar{c}}{\bar{\mathbb{Y}}} \right)^{-2} \Delta^{-2} \widehat{\mathbb{Y}}_t^2 + \left(\tfrac{\Theta}{\Delta} \right)^2 \hat{\tau}_t^2 \right\} - \left(\tfrac{\bar{c}}{\bar{\mathbb{Y}}} \right)^{-1} \left(\tfrac{1+\chi}{1-\alpha} \right) \tilde{y}_{1t}^2 + + \left(\Omega \tfrac{\bar{\iota}}{\bar{c}} \right)^2 \hat{\iota}_t^2 - \mathcal{F}_t +$$

$$t.i.p + O(\|\zeta\|^3) \qquad (41)$$

where q is real exchange rate, $\tilde{y}_{1t} = \hat{y}_{1t} - \hat{a}_t - \alpha \hat{k}_{t-1}$, and

$$\mathcal{F}_t = \left(\tfrac{\sigma-1}{2} \right) \Delta^{-2} \left\{ \Theta^{*2} \hat{\tau}_t^{*2} + \left(\tfrac{\bar{c}^*}{\bar{c}} \varrho^* \right)^2 \hat{c}_t^{*2} + \left[\Omega^* \left(\tfrac{\bar{\iota}^*}{\bar{c}^*} \right) \left(\tfrac{\bar{c}^*}{\bar{c}} \right) \right]^2 \hat{\iota}_t^{*2} \right\} \qquad (42)$$

$$\mathcal{L}_{2h}^* = \frac{\varepsilon_2^*}{\Delta} \left\{ \frac{1-\gamma}{1+\bar{\tau}+\bar{\tau}^*} + \left(\frac{\bar{c}^*}{\bar{c}} \right) \left(\frac{\gamma \kappa_3^*}{1+\bar{\tau}^*} \right) + \left(\frac{\bar{\iota}^*}{\bar{c}^*} \right) \left(\frac{\bar{c}^*}{\bar{c}} \right) \right\}$$

$$\mathcal{L}_{3h}^* = \frac{\varepsilon_3^*}{\Delta} \left(\frac{\bar{c}^*}{\bar{c}} \right) \left(\frac{1-\gamma}{1+\bar{\tau}^*} \right)$$

$$\mathcal{L}_f = \frac{\varepsilon_2 \kappa_3}{\Delta} \left\{ \gamma + \left(\frac{\bar{c}^*}{\bar{c}} \right) \left(\frac{1-\gamma}{1+\bar{\tau}^*} \right) + \frac{\bar{\iota}}{\bar{c}} \right\}$$

$$\mathcal{L}_w = \left(\frac{\bar{c}}{\bar{\mathbb{Y}}} \right)^{-1} \left\{ 1 - \alpha + \frac{1+\chi}{2} \right\} \varepsilon_w$$

$$\Gamma = f(\gamma, \varphi, \vartheta, \kappa_2^*, \kappa_3^*, \kappa_2, \kappa_3, \bar{\tau}, \bar{\tau}^*)$$

$$\Theta = f(\gamma, \kappa_2^*, \kappa_3^*, \kappa_2, \kappa_3, \bar{\tau}, \bar{\tau}^*)$$

$$\Theta^* = f(\gamma, \kappa_2^*, \kappa_3^*, \kappa_2, \kappa_3, \bar{\tau}, \bar{\tau}^*)$$

$$\Omega = \frac{\kappa_2^* \kappa_3}{1 + \bar{\tau} + \bar{\tau}^*} - \kappa_2(-1\kappa_3) - \kappa_3$$

$$\Omega^* = \frac{\kappa_2^*(1 - \kappa_3^*) + \kappa_3^*(1 - \kappa_2)}{1 + \bar{\tau}^*}$$

$$\varrho^* = \frac{\gamma\{\kappa_2^*(1 - \kappa_3^*) + \kappa_3^* - \kappa_2\kappa_3^*\} + (1 - \gamma)\{1 - \kappa_2(1 - \kappa_3) - \kappa_3\}}{1 + \bar{\tau}^*} + \frac{(1 - \gamma)\kappa_2^*\kappa_3}{1 + \bar{\tau} + 2\bar{\tau}^*}\Delta$$

$$= \gamma(1 - \kappa_2(1 - \kappa_3) - \kappa_3) + \frac{(1 - \gamma)\{\kappa_2^*(1 - \kappa_3^*) + \kappa_3^* - \kappa_2\kappa_3^*\} + \gamma\kappa_2\kappa_3^*}{1 + \bar{\tau} + \bar{\tau}^*}$$

What is the welfare-maximizing monetary policy rule? We consider three games:

(i) Each central bank stabilizes only domestic variables, *given* foreign monetary policy action.

(ii) Each central bank stabilizes both domestic and foreign variables, *given* foreign monetary policy action.

(iii) A coordinated regime, in which there is a supranational monetary authority maximize the GDP-weighted joint welfare function, $\mathbb{W}^G = \mu\mathbb{W} + (1 - \mu)\mathbb{W}^*$.

[TO BE ADDED]

5. Conclusion

[TO BE ADDED]

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Table 1. The priors for parameters and shocks

	Prior distribution		
	Probability distribution function	Mean	Standard deviation
Parameters			
Risk aversion coefficient σ	Uniform	1	0.577
Reciprocal of wage elasticity of labor supply χ_N	Gamma	2	1.000
Habit persistence b	Beta	0.7	0.100
Forward looking-ness of investment decision Λ	Uniform	0.5	0.289
Els btw. home and imported intermediate goods ϑ	Normal	1.5	0.500
Home bias in consumption γ	Beta	0.7	0.100
Share of imported materials at intermediate production κ_2	Uniform	0.5	0.289
Share of imported intermediate goods at final production κ_3	Uniform	0.5	0.289
Employment indexation γ_w	Uniform	0.5	0.289
Producer price indexation γ_{p2}	Uniform	0.5	0.289
Final goods price indexation γ_{p3}	Uniform	0.5	0.289
Intermediate export price indexation γ_{p2}^*	Uniform	0.5	0.289
Final goods export price indexation γ_{p3}^*	Uniform	0.5	0.289
Employment stickiness θ_e	Uniform	0.75	0.144
Producer price stickiness θ_{p2}	Uniform	0.75	0.144
Final goods price stickiness θ_{p3}	Uniform	0.75	0.144
Intermediate export price stickiness θ_{p2}^*	Uniform	0.75	0.144
Final export price stickiness θ_{p3}^*	Uniform	0.75	0.144
Policy inertia ρ_R	Beta	0.7	0.100
Policy response to inflation V_π	Gamma	1.5	1.000
Policy response to GDP fluctuation $V_{\mathbb{Y}}$	Gamma	0.125	0.050
Policy response to exchange rate variability $V_{\Delta S}$	Gamma	0.5	0.100
TFP shock persistence ρ_a	Beta	0.8	0.100
IST shock persistence ρ_I	Beta	0.7	0.100
Shocks			
Total factor productivity σ_a	Uniform	0.5	0.289
Investment-specific technology σ_I	Uniform	0.5	0.289
Labor supply σ_n	Uniform	0.5	0.289
Preference σ_c	Uniform	0.5	0.289
Producer price markup $\sigma_{\pi_{2h}}$	Uniform	0.5	0.289
Final goods price markup $\sigma_{\pi_{3h}}$	Uniform	0.5	0.289
Intermediate export price markup $\sigma_{\pi_{2h}^*}$	Uniform	0.5	0.289
Final export price markup $\sigma_{\pi_{3h}^*}$	Uniform	0.5	0.289
Transportation cost σ_τ	Uniform	0.5	0.289
Monetary policy σ_r	Uniform	0.5	0.289
UIPC σ_s	Uniform	0.5	0.289
U.S monetary policy σ_{ffr}	Uniform	0.5	0.289

Table 2. Selected posterior distributions for SEA4-EA5 model

	1987Q1-2000Q4								2001Q1-2008Q4							
	Southeast Asia				East Asia				Southeast Asia				East Asia			
	Mode	5%	Mean	95%	Mode	5%	Mean	95%	Mode	5%	Mean	95%	Mode	5%	Mean	95%
Parameters																
σ	0.392	0.291	0.352	0.416	0.392	0.291	0.352	0.416	0.503	0.370	0.481	0.585	0.503	0.370	0.481	0.585
γ	0.758	0.725	0.773	0.821	0.941	0.925	0.941	0.957	0.659	0.614	0.667	0.746	0.889	0.861	0.889	0.920
ϑ	1.548	1.483	1.551	1.611	1.548	1.483	1.551	1.611	1.577	1.521	1.592	1.663	1.577	1.521	1.592	1.663
Λ	1.000	0.976	0.946	1.000	1.000	0.976	0.946	1.000	0.963	0.926	0.965	1.000	0.963	0.926	0.965	1.000
κ_2	0.620	0.527	**0.649**	0.745	0.854	0.729	**0.843**	0.995	1.000	0.814	**0.921**	1.000	0.577	0.511	**0.622**	0.743
κ_3	0.173	0.087	**0.148**	0.217	0.786	0.687	**0.811**	0.943	0.510	0.328	**0.511**	0.667	0.768	0.621	**0.735**	0.858
θ_{p2}	0.620	0.592	0.619	0.646	0.871	0.843	0.867	0.890	0.602	0.572	0.621	0.685	0.691	0.634	0.680	0.722
θ_{p3}	0.776	0.750	0.777	0.805	0.943	0.936	0.944	0.952	0.851	0.808	0.841	0.873	0.910	0.892	0.914	0.933
θ^*_{p2}	0.955	0.932	0.946	0.960	0.587	0.520	0.590	0.662	0.703	0.640	0.737	0.860	0.734	0.650	0.715	0.780
θ^*_{p3}	0.639	0.604	0.637	0.678	0.699	0.671	0.699	0.727	0.652	0.605	0.644	0.683	0.770	0.740	0.772	0.802
ρ_a	0.809	0.760	0.820	0.882	0.947	0.936	0.944	0.952	0.890	0.855	0.897	0.937	0.902	0.840	0.886	0.944
ρ_I	0.799	0.739	0.771	0.801	0.640	0.559	0.630	0.698	0.705	0.628	0.662	0.698	0.597	0.556	0.597	0.645
Shocks																
σ_a	0.047	0.034	0.055	0.074	0.030	0.025	0.036	0.047	0.038	0.030	0.043	0.056	0.024	0.019	0.030	0.041
σ_I	0.023	0.021	0.028	0.034	0.027	0.019	0.029	0.038	0.017	0.016	0.022	0.027	0.030	0.023	0.031	0.040
σ_C	0.059	0.049	0.061	0.073	0.033	0.027	0.033	0.039	0.036	0.029	0.038	0.047	0.017	0.029	0.038	0.047
$\sigma_{\pi_{2h}}$	0.157	0.125	0.167	0.214	0.659	0.447	0.643	0.873	0.123	0.081	0.142	0.220	0.104	0.060	0.099	0.136
$\sigma_{\pi_{3h}}$	0.192	0.142	0.219	0.318	0.866	0.762	0.887	1.000	0.296	0.000	0.192	0.393	0.427	0.342	0.479	0.618
$\sigma_{\pi^*_{2h}}$	1.000	0.805	0.894	1.000	0.633	0.610	0.687	0.773	0.279	0.223	0.348	0.480	0.664	0.429	0.595	0.752
$\sigma_{\pi^*_{3h}}$	0.440	0.374	0.472	0.571	0.657	0.573	0.709	0.839	0.261	0.198	0.271	0.339	0.364	0.321	0.429	0.537
σ_r	0.014	0.011	0.014	0.018	0.004	0.004	0.005	0.006	0.011	0.008	0.011	0.015	0.003	0.003	0.003	0.004

Notes: The posterior distribution is obtained using the Metropolis-Hastings sampling algorithm based on 4 parallel chains of 50,000 draws, of which the first half was discarded as burn-in. The average acceptance rate is 0.238 for estimation of subsample 1987Q1-2000Q4, and 0.272 for 2001Q1-2008Q4. We impose identical posteriors for σ, ϑ, and Λ across regions.

Table 3. Selected posterior distributions for CN-EA5 model

	1987Q1-2000Q4								2001Q1-2008Q4							
	China				East Asia				China				East Asia			
	Mode	5%	Mean	95%	Mode	5%	Mean	95%	Mode	5%	Mean	95%	Mode	5%	Mean	95%
Parameters																
σ	0.350	0.297	0.352	0.414	0.350	0.297	0.352	0.414	0.349	0.285	0.344	0.404	0.349	0.285	0.344	0.404
γ	0.763	0.720	0.751	0.778	0.888	0.851	0.880	0.904	0.457	0.410	0.444	0.478	0.706	0.671	0.702	0.728
ϑ	1.409	1.384	1.428	1.470	1.409	1.384	1.428	1.470	1.557	1.484	1.528	1.576	1.557	1.484	1.528	1.576
Λ	1.000	0.968	0.986	1.000	1.000	0.968	0.986	1.000	0.997	0.953	0.977	1.000	0.997	0.953	0.977	1.000
κ_2	0.841	0.749	**0.851**	0.968	0.523	0.455	**0.555**	0.712	0.490	0.405	**0.519**	0.623	1.000	0.941	**0.973**	1.000
κ_3	0.439	0.370	**0.436**	0.503	0.762	0.715	**0.805**	0.901	0.841	0.775	**0.869**	0.969	0.391	0.346	**0.406**	0.461
θ_{p2}	0.591	0.578	0.610	0.642	0.845	0.829	0.848	0.865	0.670	0.632	0.663	0.691	0.663	0.630	0.670	0.710
θ_{p3}	0.899	0.892	0.903	0.913	0.932	0.926	0.935	0.944	0.940	0.936	0.950	0.964	0.917	0.907	0.922	0.933
θ_{p2}^*	0.938	0.930	0.942	0.954	0.769	0.691	0.738	0.780	0.740	0.711	0.780	0.850	0.925	0.920	0.940	0.962
θ_{p3}^*	0.726	0.707	0.732	0.753	0.555	0.532	0.558	0.588	0.648	0.619	0.653	0.700	0.729	0.719	0.739	0.758
ρ_a	0.940	0.934	0.939	0.945	0.940	0.934	0.942	0.950	0.940	0.930	0.938	0.946	0.713	0.681	0.725	0.771
ρ_I	0.644	0.667	0.702	0.734	0.681	0.642	0.676	0.713	0.752	0.730	0.768	0.812	0.659	0.644	0.664	0.682
Shocks																
σ_a	0.102	0.078	0.102	0.124	0.032	0.024	0.035	0.044	0.039	0.030	0.041	0.054	0.048	0.030	0.049	0.067
σ_I	0.037	0.022	0.029	0.035	0.022	0.019	0.024	0.029	0.004	0.002	0.003	0.004	0.026	0.020	0.026	0.032
σ_C	0.077	0.067	0.080	0.092	0.037	0.033	0.039	0.046	0.025	0.019	0.025	0.031	0.021	0.014	0.023	0.031
$\sigma_{\pi_{2h}}$	0.129	0.116	0.154	0.197	0.419	0.303	0.411	0.506	0.050	0.029	0.052	0.073	0.106	0.068	0.123	0.175
$\sigma_{\pi_{3h}}$	0.864	0.857	0.932	1.000	0.559	0.496	0.632	0.739	0.353	0.358	0.517	0.677	0.609	0.527	0.669	0.780
$\sigma_{\pi_{2h}^*}$	0.635	0.637	0.712	0.785	1.000	0.904	0.957	1.000	0.580	0.448	0.570	0.706	0.209	0.160	0.241	0.312
$\sigma_{\pi_{3h}^*}$	0.670	0.540	0.631	0.721	0.202	0.157	0.202	0.243	0.181	0.131	0.209	0.288	0.118	0.100	0.166	0.228
σ_r	0.013	0.010	0.013	0.015	0.005	0.004	0.005	0.006	0.005	0.004	0.006	0.007	0.004	0.003	0.005	0.006

Notes: The posterior distribution is obtained using the Metropolis-Hastings sampling algorithm based on 4 parallel chains of 50,000 draws, of which the first half was discarded as burn-in. The average acceptance rate is 0.237 for estimation of subsample 1987Q1-2000Q4, and 0.346 for 2001Q1-2008Q4. We impose identical posteriors for σ, ϑ, and Λ across regions.

Table 4. Selected posterior distributions for CN-SEA4 model

	1987Q1-2000Q4								2001Q1-2008Q4							
	China				Southeast Asia				China				Southeast Asia			
	Mode	5%	Mean	95%	Mode	5%	Mean	95%	Mode	5%	Mean	95%	Mode	5%	Mean	95%
Parameters																
σ	0.578	0.465	0.544	0.621	0.578	0.465	0.544	0.621	0.916	0.812	1.020	1.209	0.916	0.812	1.020	1.209
γ	0.734	0.657	0.697	0.737	0.677	0.626	0.664	0.712	0.844	0.808	0.862	0.902	0.603	0.579	0.618	0.663
ϑ	1.417	1.355	1.424	1.484	1.417	1.355	1.424	1.484	1.592	1.519	1.559	1.603	1.592	1.519	1.559	1.603
Λ	0.860	0.821	0.884	0.949	0.860	0.821	0.884	0.949	0.927	0.861	0.920	0.991	0.927	0.861	0.920	0.991
κ_2	0.828	0.816	**0.898**	1.000	1.000	0.947	**0.975**	1.000	0.512	0.377	**0.518**	0.709	0.732	0.424	**0.610**	0.771
κ_3	0.896	0.818	**0.899**	1.000	0.685	0.625	**0.684**	0.744	1.000	0.901	**0.949**	1.000	0.637	0.597	**0.752**	0.919
θ_{p2}	0.605	0.568	0.589	0.611	0.739	0.707	0.732	0.754	0.656	0.623	0.657	0.694	0.567	0.513	0.563	0.611
θ_{p3}	0.909	0.890	0.902	0.915	0.864	0.848	0.864	0.881	0.935	0.927	0.941	0.954	0.856	0.835	0.855	0.874
θ_{p2}^*	0.947	0.932	0.950	0.967	0.909	0.889	0.913	0.938	0.745	0.664	0.744	0.813	0.648	0.523	0.643	0.732
θ_{p3}^*	0.663	0.643	0.671	0.701	0.594	0.571	0.598	0.625	0.715	0.677	0.707	0.739	0.555	0.500	0.522	0.546
ρ_a	0.945	0.933	0.944	0.955	0.949	0.930	0.944	0.959	0.852	0.838	0.887	0.936	0.894	0.839	0.884	0.931
ρ_I	0.707	0.680	0.725	0.765	0.687	0.664	0.710	0.755	0.599	0.556	0.612	0.680	0.678	0.561	0.616	0.676
Shocks																
σ_a	0.055	0.044	0.058	0.070	0.054	0.039	0.057	0.075	0.025	0.014	0.022	0.030	0.041	0.030	0.046	0.061
σ_I	0.028	0.019	0.027	0.034	0.042	0.027	0.038	0.049	0.008	0.005	0.008	0.012	0.019	0.017	0.026	0.034
σ_C	0.071	0.061	0.074	0.088	0.066	0.057	0.071	0.083	0.029	0.022	0.030	0.037	0.060	0.022	0.030	0.037
$\sigma_{\pi_{2h}}$	0.126	0.091	0.119	0.147	0.635	0.476	0.576	0.682	0.062	0.042	0.065	0.086	0.089	0.056	0.098	0.138
$\sigma_{\pi_{3h}}$	0.736	0.637	0.742	0.853	0.932	0.728	0.853	0.993	0.972	0.727	0.855	0.994	0.996	0.901	0.956	1.000
$\sigma_{\pi_{2h}^*}$	0.790	0.733	0.871	1.000	0.727	0.654	0.769	0.897	0.389	0.114	0.224	0.331	0.490	0.415	0.573	0.742
$\sigma_{\pi_{3h}^*}$	0.399	0.332	0.413	0.487	0.248	0.191	0.250	0.305	0.311	0.253	0.326	0.407	0.059	0.029	0.056	0.082
σ_r	0.008	0.006	0.008	0.010	0.033	0.024	0.032	0.039	0.004	0.002	0.004	0.006	0.012	0.009	0.013	0.017

Notes: The posterior distribution is obtained using the Metropolis-Hastings sampling algorithm based on 4 parallel chains of 50,000 draws, of which the first half was discarded as burn-in. The average acceptance rate is 0.346 for estimation of subsample 1987Q1-2000Q4, and 0.251 for 2001Q1-2008Q4. We impose identical posteriors for σ, ϑ, and Λ across regions.

Table 5. Measuring vertical specialization of total export

	Pre China's WTO accession							Post China's WTO accession						
	Share of imported intermediate inputs		Export share		Vertical specialization			Share of imported intermediate inputs		Export share		Vertical specialization		
Model	Mid-stream	Down-stream	Mid-stream	Down-stream	Vertical trade	Processing trade	Index	Mid-stream	Down-stream	Mid-stream	Down-stream	Vertical trade	Processing trade	Index
SEA4-EA5														
SEA	0.649	0.148	0.411	0.178	**0.267**	0.026	0.293	0.921	0.511	0.411	0.178	**0.379**	0.091	0.469
EA	0.843	0.811	0.411	0.178	**0.346**	0.144	0.491	0.622	0.735	0.411	0.178	**0.256**	0.131	0.386
CN-EA5														
China	0.851	0.436	0.283	0.434	**0.241**	0.189	0.430	0.519	0.869	0.283	0.434	0.147	**0.377**	0.524
EA	0.555	0.805	0.411	0.178	**0.228**	0.143	0.371	0.973	0.406	0.411	0.178	**0.400**	0.072	0.472
CN-SEA4														
China	0.898	0.899	0.283	0.434	0.254	**0.390**	0.644	0.518	0.949	0.283	0.434	0.147	**0.412**	0.558
SEA	0.975	0.684	0.411	0.178	**0.401**	0.122	0.522	0.610	0.752	0.411	0.178	**0.251**	0.134	0.385

Notes: The formula for computing the vertical specialization of total export for country i is given by
$VS_i = \underbrace{\kappa_2\left(\frac{Export_2}{\sum_2^3 Export_h}\right)}_{vertical\ trade} + \underbrace{\kappa_3\left(\frac{Export_3}{\sum_2^3 Export_h}\right)}_{processing\ trade}$. The share of midstream and downstream output in total export is inferred from Kim et al. (2011).
SEA4 consists of Indonesia, Malaysia, Thailand, and the Philippines, and EA5 consists of Japan, the Republic of Korea, Hong Kong, Taiwan, and Singapore.
All are weighted by time-varying total trade share.

Table 6. Variance decomposition, 2001Q1-2008Q4: foreign influences are important in different ways

(a) GDP

	SEA4					**EA5**			
	Home			Foreign		**Home**			**Foreign**
t	u_c	$u_{\pi^*_{2h}}$	$u_{\pi^*_{3h}}$	$u_{\pi_{2f}}$	u_{τ^*}	$\boldsymbol{u_{a^*}}$	$\boldsymbol{u_{I^*}}$	$\boldsymbol{u_{C^*}}$	$\boldsymbol{u_{\tau}}$
0	19.37	6.33	12.5	8.57	28.77	**3.02**	**36.2**	**31.8**	**15.8**
2	18.17	8.9	15.0	13.7	18.93	**5.4**	**41.2**	**30.3**	**10.7**
4	14.31	11.67	15.66	20.7	12.74	**9.5**	**41.3**	**26.8**	**8.27**
8	11.24	13.69	14.34	25.45	9.86	**12.9**	**37.6**	**24.0**	**7.34**
16	10.47	14.38	13.56	25.37	9.2	**12.6**	**36.1**	**22.6**	**6.82**
∞	10.37	14.33	13.44	25.13	9.11	**12.4**	**35.9**	**22.3**	**6.73**

	CN					**EA5**					
	Home			Foreign		**Home**			**Foreign**		
t	u_a	$u_{\pi^*_{2h}}$	$u_{\pi^*_{3h}}$	u_{τ^*}	$u_{\pi^*_{3f}}$	$\boldsymbol{u_{I^*}}$	$\boldsymbol{u_{C^*}}$	$\boldsymbol{u_{\pi_{2f}}}$	$\boldsymbol{u_a}$	$\boldsymbol{u_{\pi^*_{3h}}}$	$\boldsymbol{u_{\tau}}$
0	0.02	1.4	5.85	65.07	6.51	**28.2**	**33.5**	**0.21**	**0.01**	**0.12**	**25.3**
2	0.05	3.89	9.12	51.38	10.24	**32.3**	**33.8**	**0.46**	**0.02**	**0.27**	**18.1**
4	0.12	9.4	13.55	37.12	13.15	**32.6**	**30.9**	**1.25**	**0.06**	**1.9**	**14.6**
8	0.24	13.76	19.55	25.78	11.95	**28.6**	**26.8**	**3.31**	**0.2**	**9.18**	**12.6**
16	1.32	12.38	21.04	21.16	9.78	**25.7**	**24.1**	**6.4**	**1.53**	**11.92**	**11.3**
∞	18.12	4.81	6.3	7.86	2.85	**16.6**	**15.5**	**23.5**	**14.3**	**7.85**	**7.21**

	CN				**SEA4**			
	Home	Foreign			**Home**			**Foreign**
t	$u_{\pi^*_{2h}}$	u_{a^*}	$u_{\pi_{2f}}$	$u_{\pi^*_{3f}}$	$\boldsymbol{u_{a^*}}$	$\boldsymbol{u_{C^*}}$	$\boldsymbol{u_{\pi_{2f}}}$	$\boldsymbol{u_{\tau}}$
0	2.29	0.47	28.44	34.33	**1.91**	**13.1**	**63**	**14.6**
2	4.61	0.38	36.43	31.13	**2.86**	**11.4**	**69**	**8.86**
4	9.8	0.29	43.77	24.32	**5.28**	**9.27**	**71.1**	**6.05**
8	17.3	2.36	43.02	16.73	**10**	**7.87**	**68.1**	**4.93**
16	20.44	8.26	36.22	12.06	**14.54**	**7.22**	**63.5**	**4.5**
∞	20.22	11.95	33.42	10.77	**15.73**	**7.07**	**62.2**	**4.41**

(b) CPI Inflation

	SEA4				**EA5**			
	Home		Foreign		**Home**		**Foreign**	
t	u_a	u_c	$u_{\pi_{3f}}$	u_{ffr}	$\boldsymbol{u_{a^*}}$	$\boldsymbol{u_{I^*}}$	$\boldsymbol{u_{\pi_{3h}^*}}$	$\boldsymbol{u_{ffr}}$
0	41.63	21.25	9.37	10.3	**32.01**	**10.54**	**16.21**	**22.09**
2	51.29	16.28	8.04	8.7	**40.55**	**8.84**	**15.59**	**14.72**
4	61.17	12.26	6.01	7.46	**51.08**	**7.24**	**11.11**	**9.7**
8	68.33	9.56	4.71	6.55	**60.1**	**5.93**	**7.86**	**7.07**
16	71.54	8.39	4.14	6.02	**64.95**	**5.37**	**6.87**	**6.09**
∞	72.14	8.19	4.04	5.89	**65.82**	**5.25**	**6.67**	**9.91**

	CN				**EA5**		
	Home			Foreign	**Home**	**Foreign**	
t	u_a	u_c	u_r	u_{ffr}	$\boldsymbol{u_{a^*}}$	$\boldsymbol{u_{\pi_{3h}^*}}$	$\boldsymbol{u_{ffr}}$
0	34.41	12.62	9.96	26.32	**10.62**	**26.13**	**28.21**
2	38.28	11.44	9.03	23.88	**10.61**	**33.26**	**21.25**
4	45.39	9.77	7.71	20.39	**15.19**	**31.31**	**18.01**
8	54.22	7.8	6.16	16.37	**22.47**	**26.55**	**16.5**
16	61.12	6.39	5.05	13.6	**24.02**	**26.4**	**15.86**
∞	63.83	5.79	4.58	12.33	**23.93**	**26.39**	**15.83**

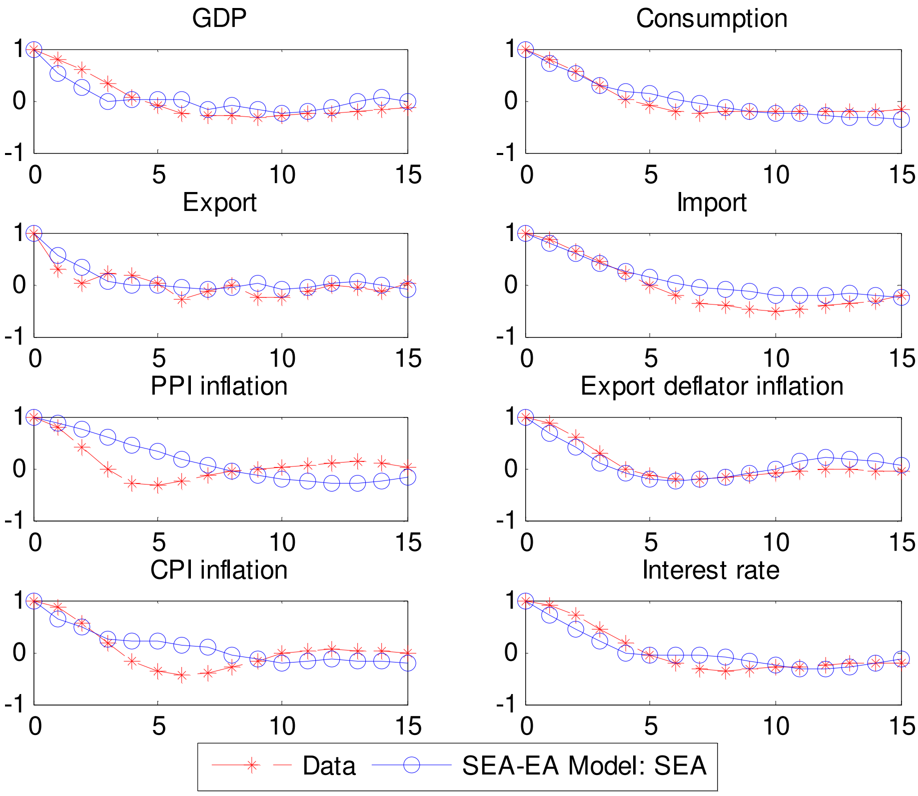
	CN				**SEA4**		
	Home		Foreign		**Home**		
t	u_a	u_s	$u_{\pi_{2f}}$	u_{ffr}	$\boldsymbol{u_{a^*}}$	$\boldsymbol{u_{I^*}}$	$\boldsymbol{u_{C^*}}$
0	30.55	27.07	0.05	17.7	**46.21**	**8.91**	**14.33**
2	39.16	24.85	5.18	10.01	**56.29**	**7.77**	**10.22**
4	54.46	11.74	11.42	5.59	**67.79**	**6.42**	**7.32**
8	62.49	5.55	13.91	3.37	**75.12**	**5.11**	**5.54**
16	64.64	3.93	12.76	2.53	**78.04**	**4.51**	**4.87**
∞	64.31	3.7	12.22	2.39	**78.48**	**4.42**	**4.47**

(c) Nominal interest rate

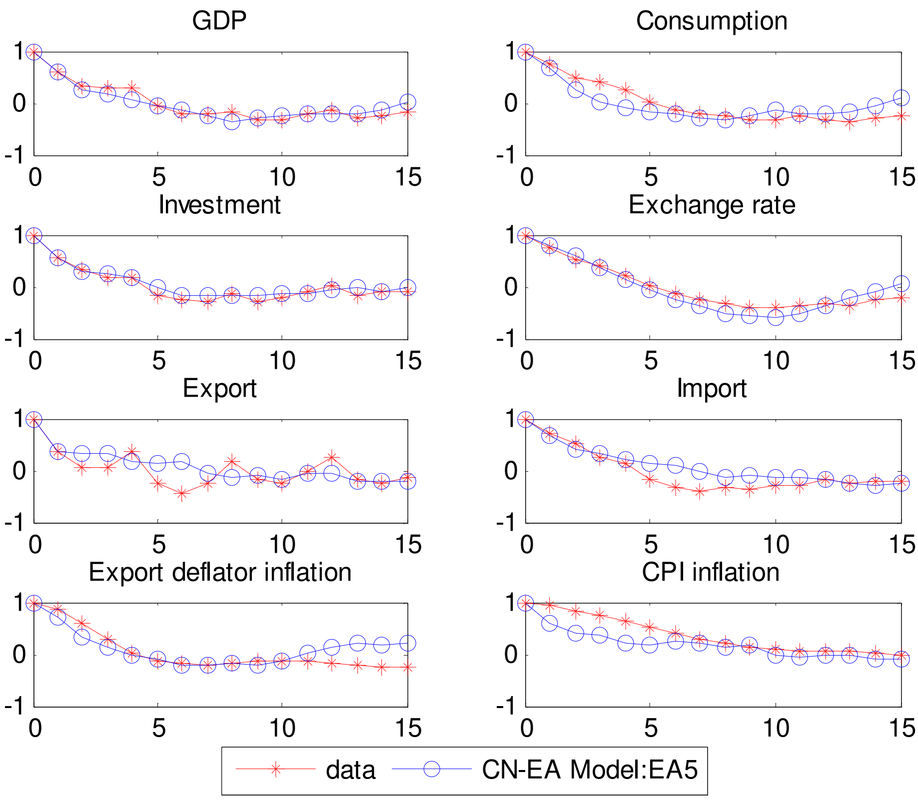
	SEA					**EA**			
	Home				Foreign	**Home**			**Foreign**
t	u_a	u_c	$u_{\pi^*_{2h}}$	$u_{\pi^*_{3h}}$	u_{ffr}	$\boldsymbol{u_{I^*}}$	$\boldsymbol{u_{C^*}}$	$\boldsymbol{u_{r^*}}$	$\boldsymbol{u_{ffr}}$
0	10.23	10.77	9.74	8.01	46.41	**0.13**	**5.55**	**21.13**	**59.02**
2	8.64	13.15	9.72	6.22	47.13	**2.27**	**7.13**	**22.48**	**56.17**
4	6.56	15.36	8.09	4	44.62	**9.76**	**8.79**	**21.48**	**46.43**
8	6.52	14.98	7.63	7.18	38.91	**17.29**	**8.98**	**16.78**	**32.13**
16	7.93	14.03	9.85	14.38	36.17	**17.93**	**8.07**	**13.25**	**24.71**
∞	8.48	13.87	10.01	15.67	35.75	**17.47**	**7.83**	**12.8**	**23.9**

	CN				**EA**				
	Home		Foreign		**Home**			**Foreign**	
t	u_a	$u_{\pi^*_{2h}}$	$u_{\pi_{2f}}$	u_{ffr}	$\boldsymbol{u_{a^*}}$	$\boldsymbol{u_{C^*}}$	$\boldsymbol{u_{r^*}}$	$\boldsymbol{u_{\pi^*_{3h}}}$	$\boldsymbol{u_{ffr}}$
0	16.6	14.12	13.43	42.9	**7.23**	**24.41**	**31.23**	**9.86**	**15.13**
2	15.74	15.77	16.01	39.98	**14.07**	**20.68**	**24.71**	**17.9**	**10.87**
4	14.53	16.74	20.09	35.36	**19.61**	**15.87**	**17.39**	**24.24**	**8.19**
8	13.51	15.42	23.63	31.55	**18.5**	**12.66**	**13.28**	**22.51**	**11.19**
16	12.19	17.43	22	28.39	**17.2**	**10.74**	**11.35**	**22.1**	**15.15**
∞	12.89	17.77	22.06	25.72	**17.04**	**10.55**	**11.15**	**22**	**15.01**

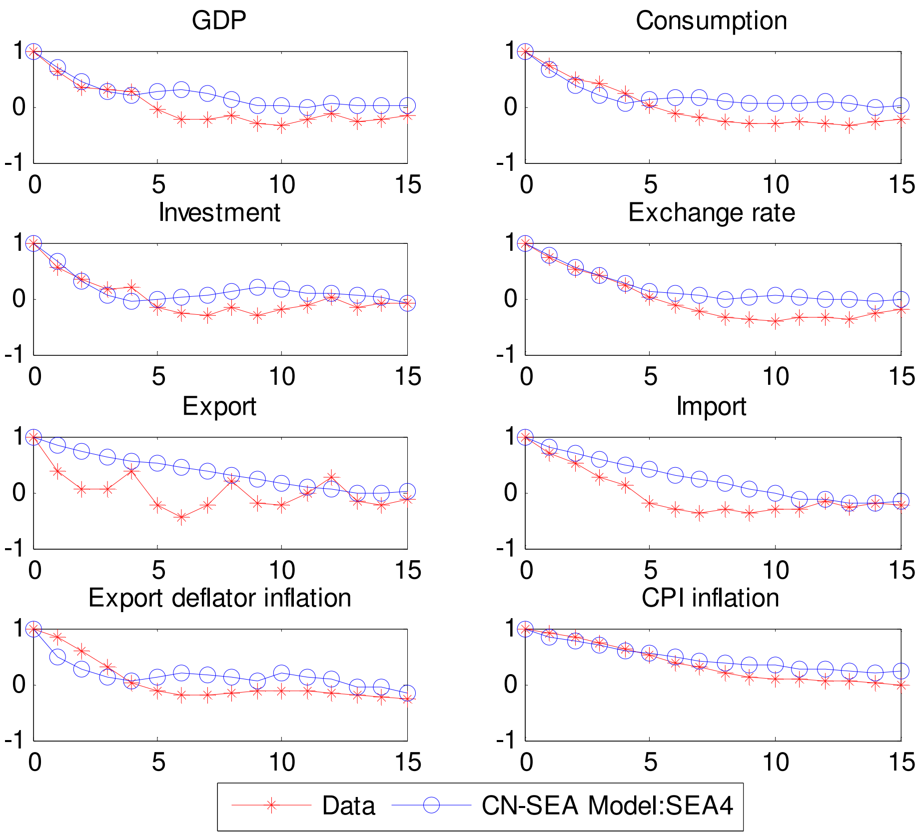
	CN					**SEA**			
	Home				Foreign	**Home**			**Foreign**
t	u_a	u_c	u_r	u_s	u_{ffr}	$\boldsymbol{u_{C^*}}$	$\boldsymbol{u_{s^*}}$	$\boldsymbol{u_{\pi_{2f}}}$	$\boldsymbol{u_{ffr}}$
0	2.20	17.97	14.98	38.41	19.32	**8.37**	**37.15**	**22.79**	**17.14**
2	9.25	20.74	16.63	25.11	19.66	**10.3**	**26.36**	**29.11**	**19.48**
4	20.82	19.56	15.04	15.89	17.34	**11.68**	**20.39**	**30.95**	**20.66**
8	25.83	16.67	12.53	11.83	16.91	**12.15**	**17.98**	**28.61**	**20.57**
16	23.51	14.78	11.08	10.44	17.2	**10.91**	**15.53**	**33.62**	**17.9**
∞	23.22	14.37	10.78	10.15	16.82	**10.41**	**14.67**	**35.06**	**16.92**


GDP
Consumption
Export
Import
PPI inflation
Export deflator inflation
CPI inflation
Interest rate
Data
SEA-EA Model: SEA

(a)

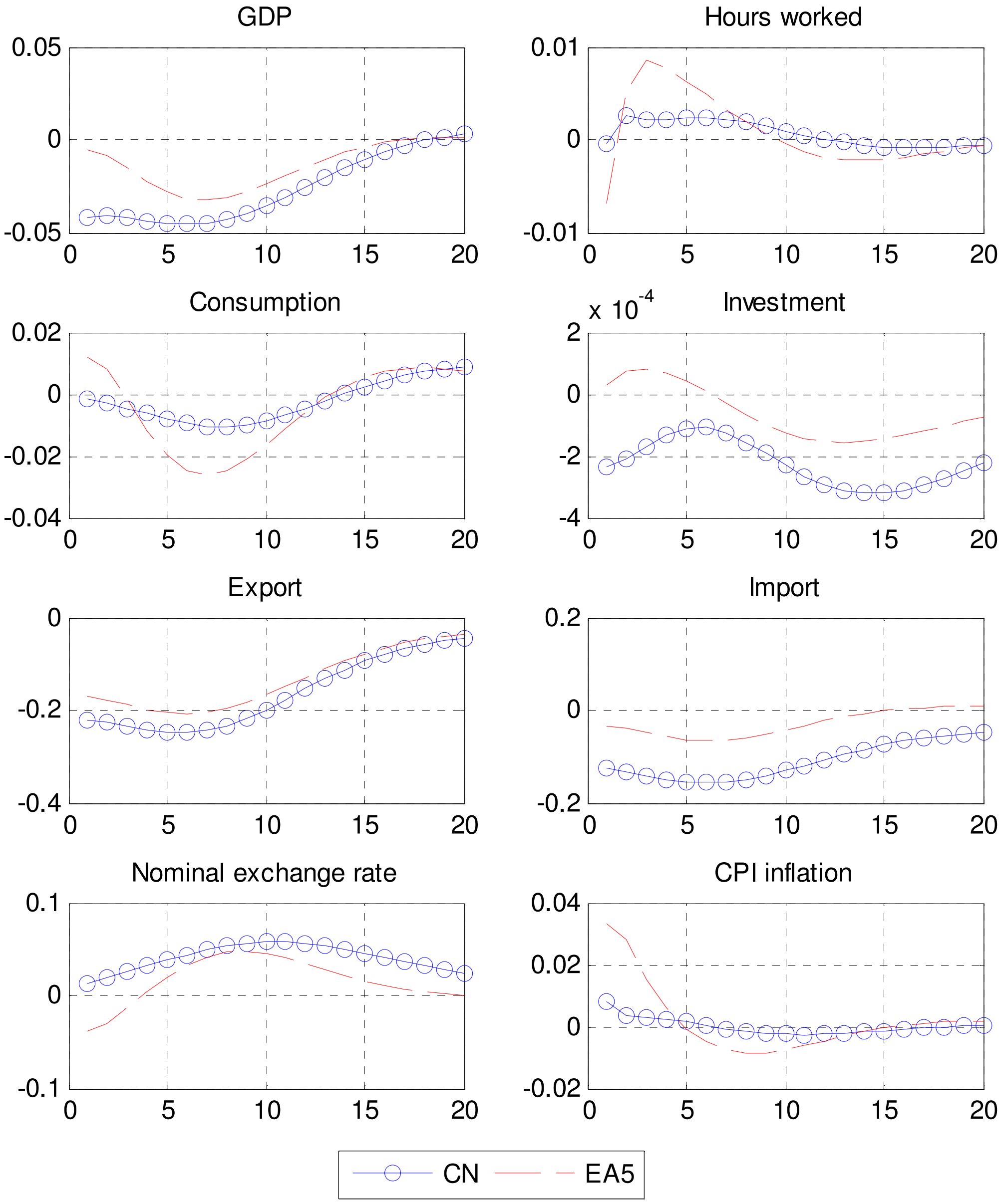

GDP
Consumption
Investment
Exchange rate
Export
Import
Export deflator inflation
CPI inflation
data
CN-EA Model:EA5

(b)

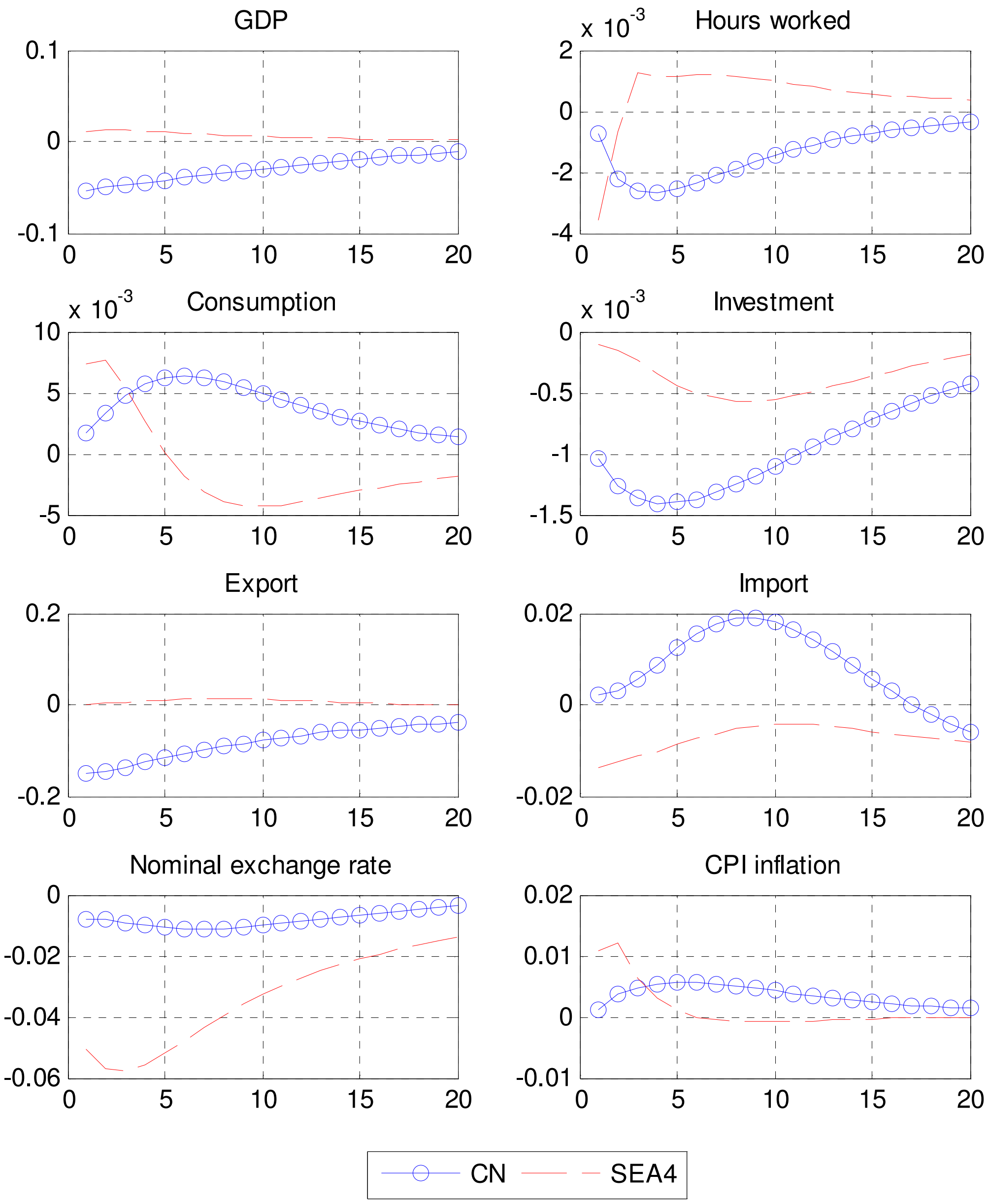


(c)

Fig. 1. Model fit in replicating the actual autocorrelation after China's WTO accession



(a) CN-EA5 model



(b) CN-SEA4 model

Fig. 3. Dynamic response to 1% China's final export price markup shock, 2001Q1-2008Q4