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Dynamic Shift to a Basket-Peg or Floating Regime in East Asian Countries in Response to the People's Republic of China's Transition to a New Exchange Rate Regime

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Abstract

This paper analyzes a desirable transition path for East Asian countries given the People's Republic of China's (PRC's) transition to a new exchange rate regime. It attempts to answer two main questions: (i) Would these countries be better off shifting to either a basket peg or a floating regime following the PRC's transition to a basket peg regime? (ii) How and when should these countries shift to the desired regime? The paper captures the influence of the PRC's predetermined shift in its exchange rate regime on East Asian countries' decisions regarding their optimal transition policies based on a dynamic stochastic general equilibrium (DSGE) model of a small open economy. Our calibration exercise using Malaysian and Singapore data from the first quarter (Q1) of 2000 to Q4 2012 reveals that a gradual adjustment to a basket peg is the most desirable policy for both countries. A sudden shift to a basket peg is superior to maintaining a dollar peg in Malaysia, but not in Singapore. Finally, a sudden shift to a floating regime is even worse than maintaining a dollar peg in both countries.

JEL Classification: F33, F41, F42

Contents

1. INTRODUCTION

After the Asian financial crisis of 1997–1998, we have witnessed two asymmetric patterns of shifts in exchange rate regimes in East Asia. On one hand, Indonesia, the Republic of Korea, and Thailand have abandoned their de facto dollar pegs and shifted to a floating or a managed floating regime. A de facto dollar peg was criticized as one of the culprits of the financial crisis. On the other hand, the People's Republic of China (PRC) and Malaysia have maintained their de facto dollar pegs because they have found some merits to their currencies having a stable US dollar rate under conditions of restricted capital mobility. Similarly, although it has maintained a basket peg, Singapore has maintained its high weight on the US dollar rate in its basket of currencies and therefore its strong correlation with the US currency.

However, among countries in the latter group, the PRC deviated from the de facto dollar peg in July 2005 by announcing that the renminbi–US dollar rate would become "adjustable," based on market supply and demand with reference to the exchange rate movements of a basket of currencies. Since then, the renminbi has appreciated against the US dollar and the situation at this time might be best described as a "managed float"—market forces determine the general direction of the renminbi–US dollar rate movement, but the government has slowed its rate of appreciation through market interventions. Following this shift in the PRC exchange rate policy, Malaysia also announced a departure from a dollar peg. [1] In line with the appreciation of the renminbi against the US dollar, both the Malaysian ringgit and the Singapore dollar also appreciated against the US currency.

These movements of the Malaysian ringgit and the Singapore dollar pose two major questions that are not answered explicitly in the literature on exchange rate policy in emerging economies. First, are these countries better off shifting to either a basket peg or a floating regime following the PRC's transition to a basket peg regime? Second, how and when should these countries shift to the desired regime? Would a gradual or sudden adjustment be desirable? Should they shift before, during, or after the PRC's transition given exogenous fluctuations of the renminbi rate? In order to answer these questions, we develop a dynamic stochastic general equilibrium model (DSGE) of a small open economy incorporating the PRC's predetermined shift in exchange rate regime.

Our main contribution is to capture the influence of a foreign country's (the PRC's) predetermined shift in its exchange rate regime on other East Asian countries' choice of optimal transition policy. Obviously, how the PRC shifts to a basket peg with the desired weight has substantial impacts on East Asian economies through fluctuations in the renminbi rate. Yoshino, Kaji, and Asonuma (2014) find that the PRC would opt to adjust its basket weight and capital controls gradually to reach a basket peg with the desired weights being assigned to currencies in the basket. In this regard, we construct five transition policies toward a basket peg or a floating regime together with the option of maintaining the current regime. We compare the calibrated cumulative losses of these policies, which reflect the exogenous influence of the PRC's gradual adjustment to a basket peg. The five policies are based on a gradual adjustment toward a basket peg with a desired weight, two policies with a sudden shift to a basket peg, and two

[1] Bank Negara Malaysia announced in July 2005 that the exchange rate of the ringgit would be allowed to operate in a managed float with immediate effect, with its value being determined by economic fundamentals. Bank Negara Malaysia will monitor the exchange rate against a currency basket to ensure that the exchange rate remains close to its fair value. See Bank Negara Malaysia (2005).

policies with a sudden shift to a floating regime. For policies based on sudden shifts, we consider the difference between shifts implemented before and after the PRC's transition, because the magnitude of the shocks due to sudden shifts depends on the exchange rate regime the PRC is adopting and the degree of the PRC's capital controls.

There are three major implications from simulation exercises using Malaysian and Singapore data from the first quarter (Q1) of 2000 to Q4 2012. First, a gradual adjustment to a basket peg is the most desirable of the available transition policies for both countries. By adjusting the basket weight gradually to the desired level during its transition period, the monetary authorities can effectively minimize negative influences on the output gap and the inflation rate through exchange rate channels. One significant advantage of a basket peg regime is that impacts on the output gap and the inflation rate are canceled out if the Japanese yen rate and the US dollar rate move in opposite directions due to shocks. Second, a sudden shift to a basket peg is superior to maintaining a dollar peg in Malaysia, but not in Singapore. In Malaysia, the benefits under a basket peg with a desired weight surpass the losses associated with a sudden shift. However, for Singapore, a sudden shift results in larger losses, which outweigh the benefits under a basket peg with the desired weight. Finally, in both countries, a sudden shift to a floating regime is even worse than maintaining a dollar peg. The fluctuations of three currencies (renminbi, yen and US dollar) under a floating regime lead to volatile domestic interest rates, dampening growth in these economies, i.e., there will be higher cumulative losses since all exogenous shocks have positive impacts on the output gap (in the same direction).

Our analysis can be applied to any small open country considering a shift from a fixed regime to a basket peg or a floating regime whose exchange rates are significantly influenced by changes in the exchange rate policy of other countries.

The remainder of the paper is organized as follows. Following a literature review, Section 2 presents evidence on exchange rate fluctuations in Malaysia and Singapore. Section 3 provides a dynamic stochastic general equilibrium model of a small open economy. Equilibrium conditions are defined in Section 4. We explain five transition policies with instrument rules in comparison with maintaining the current dollar peg regime in Section 5. Section 6 shows a simulation exercise using Malaysian and Singapore data. Section 7 concludes with a short discussion of the policy implications.

1.1 Literature Review

The paper is related to four streams of the literature. On the desirability of a basket peg regime in East Asia, Ito, Ogawa, and Sasaki (1998) and Ogawa and Ito (2002) analyze the optimality of a basket peg based on a general equilibrium model which does not include capital movements. Yoshino, Kaji, and Suzuki (2004) and Yoshino, Kaji, and Asonuma (2004) also claim that it is better for a country to adopt a basket peg rather than a dollar peg regime based on a general equilibrium model incorporating capital movements across countries.[2] In a similar vein, Shioji (2006a) considers a basket peg regime under two different invoicing schemes: producer currency pricing and vehicle currency pricing. Using empirical analysis, McKibbin and Lee (2004) investigate which

[2] Bird and Rajan (2002) argue that if their currencies had been pegged against a more diversified composite basket of currencies, Southeast Asian countries would have been better able to deal with the "third currency phenomenon,"—problems for emerging market countries that arise from fluctuations in the values of the currencies of their major trading partners against each other—which contributed to the Asian financial crisis.

exchange rates East Asian countries should peg their currencies to using both country-specific (asymmetric), and regional (symmetric) shocks.

The literature dealing with a floating regime in the region includes Adams and Semblat (2004), who emphasize that one currency regime option is a floating regime with inflation targeting. A similar argument is presented by Sussangkarn and Vichyanond (2007), who mention that a managed floating regime combined with inflation targeting suits emerging market environments, such as in Thailand. Kim and Lee (2008) present empirical findings to show that exchange rate flexibility provides greater monetary policy independence.

The literature also considers the exchange rate arrangement in the East Asian region after the PRC's shift in its exchange rate regime. Ito (2008) empirically analyzes how the PRC's exchange rate policy changed before and after the announcement of a modification to its policy in July 2005 and finds that the post-announcement exchange rate regime is close to a crawling-peg against the US dollar and deviates substantially from a basket-peg regime. Shioji (2006b) theoretically analyzes how the PRC's choice of its exchange rate regime interacts with the rest of East Asia's choice under two invoicing regimes. Gochoco-Bautista and Fabella (2006) also stress that a regional monetary arrangement to address intra-regional fluctuations in response to a change in the PRC's monetary and exchange rate arrangement may not be warranted given the differing directions and size of exchange rate adjustments in individual countries due to asymmetric degrees of complementarity between individual countries and the PRC. On the contrary, Volz (2014) argues that there is rather loose and informal exchange rate cooperation in East Asia based on currency baskets, with the PRC per se moving toward a managed exchange rate system guided by a currency basket.[3]

Finally, the current paper contributes to the literature on the dynamic adjustment path of an exchange rate regime. Yoshino, Kaji, and Asonuma (2014) explore the optimal transition path for the PRC's exchange rate regime, i.e., from a de facto dollar peg to a basket peg or a floating regime.

2. EMPIRICAL ANALYSIS ON EXCHANGE RATE DYNAMICS IN THE PRC

We start our discussion with empirical analysis of exchange rate movements in East Asia. Since the Government of the PRC set an initial rate of CNY8.70 to the US dollar in 1994 followed by a slight revaluation to CNY8.28 in 1997, the rate was then kept relatively constant until July 2005. From 21 July 2005 when the PRC government modified its currency policy,[4] the renminbi–dollar rate showed an appreciating trend and the situation at this time might be best described as a "managed float"—market forces determined the general direction of the renminbi–dollar rate movement, but the government has limited its rate of appreciation through market intervention.[5] Following this change in the exchange rate policy in the PRC and the appreciation of the renminbi, the Malaysian ringgit apparently deviated from the constant rate and also showed an

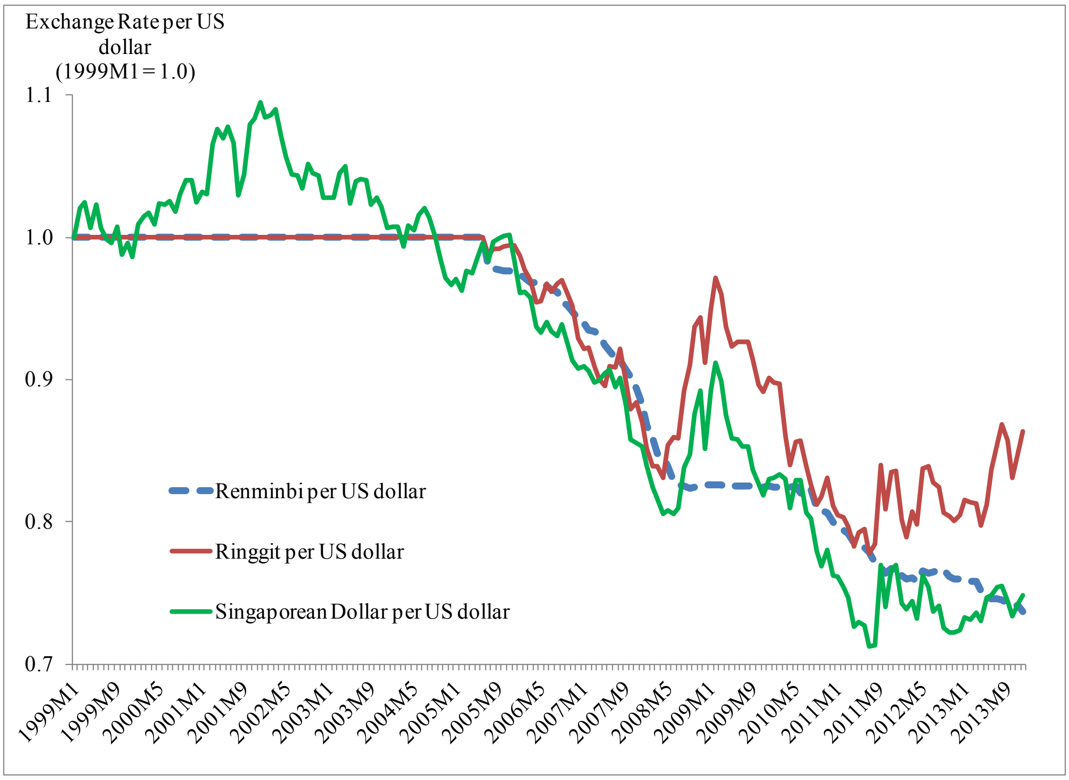
[3] Henning (2012) finds empirically that Malaysia, the Philippines, Singapore, and Thailand have formed a loose but effective "renminbi bloc" with the PRC since the PRC's shift in its exchange rate policy. The Republic of Korea has participated tentatively in this bloc since the Global Financial Crisis.

[4] It was later announced that the composition of the basket would include the US dollar, yen, euro, and a few other currencies, although the currency composition of the basket has never been revealed.

[5] Xiaoyi (2011) explains three reasons why the PRC's authorities decided to take a gradual approach to reforming the exchange rate mechanism and not allow the exchange rate to float freely.

appreciating trend. The Singapore dollar, which had been fluctuating remarkably, also appreciated, gaining 25% on the US dollar over 2005–2010.

Figure 1. Nominal Exchange Rates Against the US Dollar

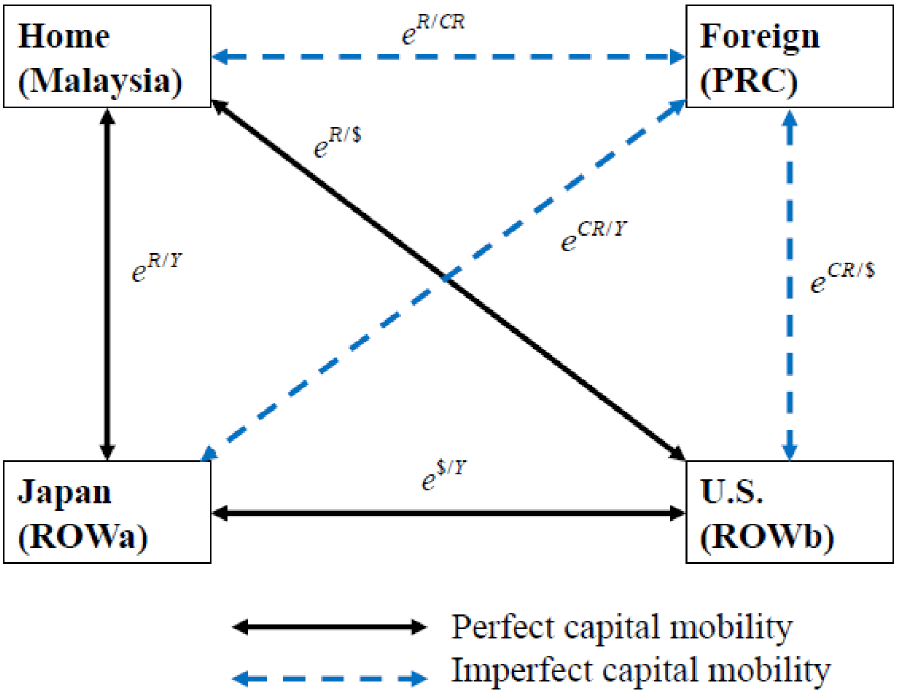


Source: IMF International Financial Statistics.

3. SMALL OPEN-ECONOMY MODEL

In this section, we provide a dynamic stochastic general equilibrium (DSGE) model of a small open economy in which the rest of the world (hereafter ROW) comprises three exogenous countries. Our model is an extended version of that of Clarida, Gali, and Gertler (2002), with two notable differences. First, we analyze transition policies toward a basket-peg regime from a fixed regime. Second, the current paper also considers a case where one of the ROW countries (the PRC) adopts strict and weak capital controls and capital is imperfectly mobile between that country and the others. We assume that there are four countries; Malaysia (Home), the PRC (Foreign), Japan (ROWa) and the US (ROWb). For Home and other countries, there are three sectors: households, firms, and the central bank. We denote Home, the PRC (Foreign), Japan, and the US with the superscripts ^{H}, ^{CH}, ^{JP}, ^{US}. These countries share the same preferences and technologies and produce traded goods, which are imperfect substitutes in utility. While capital is perfectly mobile among Home, Japan, and the US, it is still imperfectly mobile between Foreign (the PRC) and the others. Figure 2 contains a description of our model.

Figure 2: Small Open-Economy Model with Exogenous Countries



Source: Authors' illustration.

3.1 Consumption Goods, Price Index, and Demand

The household consumption basket in Home is defined as follows:

$$C_t = \left[\sum_{i=H,CH,JP,US} \lambda_i^{\frac{1}{\theta}} \left(C_t^{H,i}\right)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}} \tag{1}$$

where λ_i $i = H, CH, JP, US$ denotes the preference for goods produced in i.[6] $C_t^{H,i}$ $i = CH, JP, US$ is the demand of a Home (H) representative household for goods produced in country *i*, and θ is the elasticity of substitution among goods produced in different countries.

[6] We assume $\lambda_H + \lambda_{CH} + \lambda_{JP} + \lambda_{US} = 1$.

By cost minimization of the representative household, we obtain the following demand conditions:

$$C_t^{H,i} = \lambda_i \left(\frac{P_t^{H,i}}{P_t^C}\right)^{-\theta} C_t \quad i = H, CH, JP, US \quad (2)$$

P_t^C is the consumer price index (CPI) in Home and $P_t^{H,i}$ is the price index of goods produced in country i denominated in the Home currency.

$$P_t^C = \left[\sum_{\mathrm{i=CH,JP,US}} \lambda_i \left(P_t^{H,i}\right)^{1-\theta}\right]^{\frac{1}{1-\theta}}$$

(3)

Assume that the law of one price holds for goods produced in each country.

$$P_t^{H,i} = S_t^{R/i} P_t^{i,i} \quad \text{for } i = H, CH, JP, US \quad (4)$$

where $P_t^{i,i}$ is the price of foreign-produced goods denominated in the producer currency (country i) and $S_t^{R/i}$ is the nominal ringgit– i rate. For simplicity, we assume that i goods are sold at price $P_t^{i,i}$ and are denominated in the producer currency.

As was the case in the New Keynesian model, we focus on percentage deviations around the steady state,[7] letting lowercased letters denote percentage deviations around the steady state of the corresponding variables in uppercased letters. Equations (1), (3), and (4) are shown as

$$c_t = \lambda_H c_t^H + \lambda_F c_t^F + \lambda_{JP} c_t^{JP} + \lambda_{US} c_t^{US} \quad (1')$$

$$p_t^{H,i} - p_t^C = e_t^{R/i} \quad \text{for } i = CH, JP, US \quad (3')$$

$$p_t^C = \lambda_H p_t^H + \lambda_F e_t^{R/CR} + \lambda_{JP} e_t^{R/JP} + \lambda_{US} e_t^{R/US} \quad (4')$$

Now we can define consumer price index (CPI) inflation at *t*, such that:

$$\pi_t^C = \lambda_H \pi_t^H + \sum_{i \in \{CH,JP,US\}} \lambda_i \left(e_t^{i/CR} - e_{t-1}^{i/CR}\right)$$

(5)

where this CPI inflation depends on the rate of inflation of domestically produced goods, producer price index (PPI) inflation π_t^H and the change in real exchange rates.

[7] See for example Clarida, Gali, and Gertler (2001, 2002), and Walsh (2003).

3.2 Households and Asset Markets

The Home representative household attempts to maximize the following utility function at time t :

$$U_t = E_t \sum_{s=t}^{\infty} \beta^{s-t} \left[\frac{1}{1-\sigma} (C_s)^{1-\sigma} + \frac{\chi}{1-b} \left(\frac{M_s}{P_s^C} \right)^{1-b} - \frac{1}{1+\eta} (L_s)^{1+\eta} \right]$$

(6)

Inside the bracket, the first term captures the instantaneous utility from consumption, the second term expresses the instantaneous utility from money holdings, where M_s denotes the representative household's money holdings, and the last term defines the disutility from labor effort, where L_s is the labor supply by representative household. The discount rate is denoted by β. The representative household consumes and holds domestic money M_t, nominal bonds denominated in the domestic currency B_t^h, and a nominal bond denominated in US dollars and in yen $B_t^{i,h}$. Only Home residents are assumed to hold the Home currency. The household budget constraints in real terms are therefore:

$$C_t = \frac{W_t}{P_t^C} L_t - \frac{B_t^h - (1 + i_{t-1})}{P_t^C} - \frac{M_t - M_{t-1}}{P_t^C} - \sum_{i \in \{CH,JP,US\}} \frac{S_t^{R/i} \left[B_t^{i,h} - (1 + i_{t-1}^i) \Psi_t^i B_{t-1}^{i,h} \right]}{P_t^C} + \frac{\Pi_t}{P_t^C}$$

(7)

where i_t and i_t^i for $i \in \{CH, JP, US\}$ are the nominal yields on the bonds in terms of Home currency and in terms of the renminbi, yen, or US dollar or yen; Ψ_t^i denotes costs of holding foreign bonds where $\Psi_t^{JP} = \Psi_t^{US} = 0$ as capital is perfectly mobile between Home and Japan (US) and $\Psi_t^{JP} = \overline{\Psi}_t$ as capital is imperfectly mobile between Home and the PRC. Π_t is a nominal dividend from firms.

The representative household maximizes (6) subject to (7). Euler, money demand, and labor-leisure optimality equations are derived from first-order conditions with respect to holdings of domestic bonds and money, and labor.

$$\frac{(C_t)^{-\sigma}}{P_t^C} = \beta E_t \left[(1 + i_t) \frac{(C_{t+1})^{-\sigma}}{P_{t+1}^C} \right]$$

(8)

$$\frac{\chi \left(\frac{M_t}{P_t^C} \right)^{1-b}}{(C_t)^{-\sigma}} = \frac{i_t}{1 + i_t}$$

(9)

$$\frac{W_t}{P_t^C} = \frac{(L_t)^{\eta}}{(C_t)^{-\sigma}}$$

(10)

With the first-order conditions of foreign bonds and equation (8), we fullfil the uncovered interest party conditions between domestic and foreign bonds. For bonds denominated in yen and US dollars, we have the following equation:

$$E_t\left[\frac{(C_{t+1})^{-\sigma}P_t^C}{P_{t+1}^C}(1+i_t)\right]=\beta E_t\left[\frac{(C_{t+1})^{-\sigma}P_t^C}{P_{t+1}^C}\left(1+i_t^i\right)\frac{S_{t+1}^{R/i}}{S_t^{R/i}}\right]\quad \text{for } i=JP,US$$

(11)

For bonds denominated in renminbi, we have the uncovered interest parity condition, which shows imperfect capital mobility between Home and bonds denominated in renminbi shown as;

$$E_t\left[\frac{(C_{t+1})^{-\sigma}P_t^C}{P_{t+1}^C}(1+i_t)\right]=\beta E_t\left[\frac{(C_{t+1})^{-\sigma}P_t^C}{P_{t+1}^C}(1+i_t^{CH})\overline{\Psi}_{t+1}\frac{S_{t+1}^{R/CH}}{S_t^{R/CH}}\right]$$

(11a)

Log-linearized versions of equations (8)–(11) and (11a) are:

$$c_t=E_tc_{t+1}-\frac{1}{\sigma}(i_t-E_t\pi_{t+1}^C)\quad (8')$$

$$m_t-p_t^C=\left(\frac{1}{b}\right)(\sigma c_t-i_t)\quad (9')$$

$$\eta l_t+\sigma c_t=w_t-p_t^C\quad (10')$$

$$i_t-E_t\pi_{t+1}^C=i_t^i-E_t\pi_{t+1}^i+E_te_{t+1}^{R/i}-e_t^{R/i}\quad (11')$$

$$i_t-E_t\pi_{t+1}^C=i_t^{CH}-E_t\pi_{t+1}^{CH}+E_te_{t+1}^{R/CH}-e_t^{R/CH}+E_t\overline{\psi}_{t+1}\quad (11a')$$

3.3 Firms

3.3.1 Firms Serving the Domestic Market

There is a continuum number of firms serving the domestic market indexed $[0,n_H]$. The producer price index is a composite of price defined as follows.[8]

$$P_t^H=\left[\left(\frac{1}{n_H}\right)\int_0^{n_H}(p_t^H(z))^{1-\xi}dz\right]^{\frac{1}{1-\xi}}$$

(12)

8 Similarly, the goods produced in Home can be determined as follows: $C_t^H=\left[\left(\frac{1}{n_H}\right)^{\frac{1}{\xi}}\int_0^{n_H}(C_t^H(z))^{\frac{\xi-1}{\xi}}dz\right]^{\frac{\xi}{\xi-1}}$, where ξ is the degree of substitutability among the goods produced in Home. So demand for good ***z*** can be expressed as above.

Firms maximize the expected profits subject to three constraints. The first is a production function summarizing available technology. The technology for a monopolistically competitive firm z in country j is:

$$Y_t^H(z) = F_t(L_t^H(z))^{\alpha}(H_t^H(z))^{1-\alpha} \quad (13)$$

where $Y_t^H(z)$ is the output of the firm z in period t, F_t is a country-specific productivity shifter, and $L_t^H(z)$ and $H_t^H(z)$ express labor employed and imported raw materials used by firm z, respectively. The second constraint on the firm is the demand curve each firm faces. This is given by:

$$C_t^H(z) = \left(\frac{P_t^H(z)}{P_t^H}\right)^{-\xi}\left(\frac{P_t^H}{P_t^C}\right)^{-\theta} C_t.$$

The third constraint is that for each period some firms are not able to adjust their prices. The specific model of price stickiness we use is based on Calvo (1983). Each period, the firms that adjust their prices are randomly selected, and a fraction, $1-\omega$, of all firms adjusts, while the remaining fraction ω does not adjust. The parameter ω is a measure of the degree of nominal rigidity; a larger ω implies that fewer firms adjust each period and the expected time interval between price changes is longer. Those firms that adjust their prices at time *t* do so to maximize the expected discounted value of current and future profits. Profits at some future date *t* + *s* are affected by the choice of price at time *t* only if the firm has not received another opportunity to update its price between *t* and *t* + *s*. The probability of this is ω^s.

Before analyzing the firms' pricing decision, we consider a cost minimization problem which involves minimizing the cost of labor and imported raw materials subject to (14). This problem can be written in real terms (divided by the producer price index) as:

$$\min_{L_t^H(z),H_t^H(z)} \left(\frac{W_t}{P_t^H}\right)L_t^H(z) + \left(\frac{Q_t}{P_t^H}\right)H_t^H(z) + \phi_t^H[Y_t^H(z) - F_t(L_t^H(z))^{\alpha}(H_t^H(z))^{1-\alpha}]$$

where ϕ_t^H denotes the real marginal costs of firms serving the domestic market. The first order condition implies:

$$\phi_t^H = \frac{\left(\frac{W_t}{P_t^H}\right)^{\alpha}\left(\frac{Q_t}{P_t^H}\right)^{1-\alpha}}{F_t(\alpha)^{\alpha}(1-\alpha)^{1-\alpha}}$$

The log-linearized version can be expressed as:

$$mc_t^h = \alpha w_t + (1-\alpha)q_t - p_t^H - f_t \quad (14)$$

The firm's pricing decision problem then involves picking $p_t^H(z)$ to maximize:

$$E_t \sum_{s=0}^{\infty} \omega^s d_{s,t+s} \left[\left(\frac{p_{t+s}^H(z)}{P_{t+s}^H} \right) C_{t+s}^H(z) - \phi_{t+s} C_{t+s}^H(z) \right]$$

where the discount factor $d_{s,t+s}$ is given by $\beta^s \left(\frac{C_{t+s}}{C_t} \right)^{-\sigma}$ and demand function

$C_{t+s}^H(z) = \left(\frac{P_{t+s}^H(z)}{P_{t+s}^H} \right)^{-\xi} \left(\frac{P_{t+s}^H}{P_{t+s}^C} \right)^{-\theta} C_{t+s}.$

This can be rewritten as:

$$E_t \sum_{s=0}^{\infty} \omega^{s \beta^s \left(\frac{C_{t+s}}{C_t} \right)^{-\sigma}} \left[\left(\frac{p_{t+s}^H(z)}{P_{t+s}^H} \right)^{1-\xi} - \phi_{t+s} \left(\frac{p_{t+s}^H(z)}{P_{t+s}^H} \right)^{-\xi} \right] \left(\frac{P_{t+s}^H}{P_{t+s}^C} \right)^{-\theta} C_{t+s}$$

We assume p_t^{H*} to be the optimal price chosen by all firms adjusting at time t.[9] The first order condition for the optimal price of p_t^{H*} is

$$\frac{p_t^{H*}}{P_t^H} = \left(\frac{\xi}{\xi - 1} \right) \frac{E_t \sum_{s=0}^{\infty} \omega^s \beta^s C_{t+s}^{1-\sigma} \phi_{t+s} \left(\frac{P_{t+s}^H}{P_t^H} \right)^{\xi} \left(\frac{P_{t+s}^H}{P_{t+s}^C} \right)^{-\theta}}{E_t \sum_{s=0}^{\infty} \omega^s \beta^s C_{t+s}^{1-\sigma} \left(\frac{P_{t+s}^H}{P_t^H} \right)^{\xi-1} \left(\frac{P_{t+s}^H}{P_{t+s}^C} \right)^{-\theta}}$$

(15)

We consider the case in which all firms are able to adjust their price every period ($\omega = 0$). When $\omega = 0$, equation (15) reduces to:

$$\frac{p_t^{H*}}{P_t^H} = \left(\frac{\xi}{\xi - 1} \right) \phi_t = \bar{\xi}_M \phi_t$$

(16)

In this case, all firms charge the same price: $p_t^{H*} = P_t^H$ and $\phi_t = \frac{1}{\bar{\xi}_M}$. Using a definition of marginal cost, this implies that:

$$\left(\frac{W_t}{P_t^H} \right)^{\alpha} \left(\frac{Q_t}{P_t^H} \right)^{1-\alpha} = \frac{F_t (\alpha)^{\alpha} (1-\alpha)^{1-\alpha}}{\mu_M}$$

When prices are sticky ($\omega > 0$), output deviates from the flexible-price equilibrium level. Because the firms will not adjust their prices every period, they must take into account

[9] While individual firms produce differentiated products, they all have the same production function technology and face a demand function with constant and identical demand elasticity. In other words, they are essentially identical, except that they may have set their current prices at different dates in the past. However, all firms adjusting in period t face the same problem, so all adjusting firms will set the same price.

expected future marginal cost as well as current marginal cost whenever they have an opportunity to adjust their prices. The aggregate price index is an average of the prices charged by the fraction $1-\varpi$ of firms setting their prices in period *t* and the average price of the remaining fraction ϖ of firms setting their prices in earlier periods. However, because the adjusting firms were selected randomly among all firms, the average price of non-adjusters is the average of prices of firms that prevailed in period $t-1$. Thus, from the definition of PPI, the average price in period *t* satisfies:

$$(P_t^H)^{1-\theta} = (1-\varpi)(p_t^{*H})^{1-\theta} + \varpi(P_{t-1}^H)^{1-\theta} \quad (17)$$

Equations (15) and (17) can be approximated around a zero-average inflation steady-state equilibrium to obtain an expression for an aggregate inflation of the economy;

$$\pi_t^H = \beta E_t \pi_{t+1}^H + \kappa \widehat{mc}_t^H \quad (18)$$

where $\kappa = \frac{(1-\varpi)(1-\beta\varpi)}{\varpi}$ and $\widehat{mc}_t^H$ is the real marginal cost defined with the producer price index, expressed by a percentage deviation around its steady-state value. Combining equation (5) with (18):

$$\pi_t^C = \beta E_t \pi_{t+1}^C + \lambda_H \kappa \widehat{mc}_t^H - \sum_{i\in\{CH,JP,US\}} \lambda_i \left\{\beta\left(E_t e_{t+1}^{R/i} - e_t^{R/i}\right) + \left(e_t^{R/i} - e_{t-1}^{R/i}\right)\right\}$$

(18')

3.3.2 Exporting Firms

Similarly, there is a continuum of exporting firms indexed $[0, n_{EX}]$. Export price $p_t^{i,H}$ is a composite of prices set by individual firms defined as follows;

$$P_t^{i,H} = \left[\left(\frac{1}{n_{EX}}\right)\int_0^{n_{EX}} \left(p_t^{i,H}(z)\right)^{1-\xi} dz\right]^{\frac{1}{1-\xi}} \quad \text{for } i \in \{CH, JP, US\}$$

(12')

Each exporting firm maximizes expected profits subject to two constraints. The first one is a production function summarizing available technology shown as:

$$Y_t^{EX} = F_t (L_t^{EX})^{\alpha'} (H_t^{EX})^{1-\alpha'} \quad (13')$$

The other constraint on the firm is the demand curve each firm faces. This is given by $C_t^{i,H}(z) = \left(\frac{P_t^{i,H}(z)}{P_t^{i,H}}\right)^{-\xi}\left(\frac{P_t^{i,H}}{P_t^{i}}\right)^{-\theta} Y_t^i$ for $i \in \{CH, JP, US\}$. We consider the firm's cost minimization problem which involves minimizing the cost of labor and imported raw materials subject to (13'), which is quite similar to firms serving only the domestic market. The first order condition of this problem implies

$$\phi_t^{i,H} = \frac{\left(\frac{W_t}{P_t^{i,H}}\right)^{\alpha'}\left(\frac{Q_t}{P_t^{i,H}}\right)^{1-\alpha'}}{F_t(\alpha')^{\alpha'}(1-\alpha')^{1-\alpha'}} \quad \text{for } i \in \{CH, JP, US\}$$

where $\phi_t^{i,H}$ is equal to the exporting firm's real marginal cost.

Unlike firms serving the domestic market, we assume that the exporting firms serve the markets in the PRC, Japan, and the US using local currency pricing (LCP). These firms face exchange rate fluctuations affecting their profits and therefore adjust their prices frequently, i.e., every period. The firms' pricing problem then involves $p_t^{i,H}(z)$ to maximize profits each period:

$$S_t^{B/i}\left(\frac{p_t^{i,H}(z)}{P_t^{i,H}}\right)^{-\xi} C_t^{i,H}(z) - \phi_t^{i,H}\, C_t^{i,H}(z) \quad \text{for } i \in \{CH, JP, US\}$$

As price is flexible, we assume that $p_t^{i,H} = P_t^{i,H}$ and $\phi_t^{i,H} = \frac{S_t^{B/i}}{\bar{\xi}_M}$ for $i \in \{CH, JP, US\}$.

Using the definition of marginal cost, this implies that:

$$\left(\frac{W_t}{P_t^H}\right)^{\alpha'}\left(\frac{Q_t}{P_t^H}\right)^{1-\alpha'} = \frac{F_t(\alpha')^{\alpha'}(1-\alpha')^{1-\alpha'} S_t^{B/i}}{\bar{\xi}_M}$$

The log-linearized version can be expressed as:

$$p_t^{i,H} - p_t^{i*} = \alpha' w_t + (1-\alpha')q_t - p_t^C - e_t^{R/i} \quad \text{for } i \in \{CH, JP, US\} \quad (19)$$

3.5 Foreign and Rest of the World Countries

In order to keep our analysis simple, we assume that Foreign countries are large relative to the Home country. It follows that it is now unnecessary to distinguish between CPI inflation and PPI inflation in the Foreign countries. Moreover, it also implies that their output level is the same as their consumption level.

Home exporting firms serve Foreign markets with local currency pricing (LCP). Let $C_t^{i,H}$ be consumption in country i of Home-produced goods. Assuming that Foreign households have the same preferences as those of the Home residents (so the demand elasticity is the same), we have:

$$C_t^{i,H} = \left(\frac{P_t^{EX,i}}{P_t^{i*}}\right)^{-\theta} Y_t^i \qquad \text{for } i \in \{CH, JP, US\} \quad (20)$$

where $Y_t^i = C_t^{i*}$ for $i \in \{CH, JP, US\}$.

The log-linearized version of equation (20) is:

$$c_t^{i,H} = -\theta\left(p_t^{EX,i} - p_t^{i*}\right) + y_t^i \qquad \text{for } i \in \{CH, JP, US\} \quad (20')$$

Euler equations for households in Foreign countries imply:

$$y_t^i = E_t y_{t+1}^i - \frac{1}{\sigma}\left(i_t^i - E_t \pi_{t+1}^i\right) \qquad \text{for } i \in \{CH, JP, US\} \quad (21)$$

The interest party condition for the PRC in a nominal and log-linearized version is shown as:

$$E_t\left[\frac{(C_{t+1}^*)^{-\sigma} P_t^{*C}}{P_{t+1}^{*C}}(1 + i_t^*)\right] = \beta E_t\left[\frac{(C_{t+1}^*)^{-\sigma} P_t^{*C}}{P_{t+1}^{*C}}\left(1 + i_t^i\right)\Psi_{t+1}^* \frac{S_{t+1}^{CR/i}}{S_t^{CR/i}}\right] \qquad \text{for } i = JP, US$$

$$i_t^{CH} - E_t \pi_{t+1}^{CH} - r_t^{CH,o} = r_t^i + E_t e_{t+1}^{CR/i} - e_t^{CR/i} + E_t \bar{\psi}_{t+1} \quad \text{for } i = JP, US \quad (22)$$

$E_t \bar{\psi}_{t+1}$ denotes the expected risk premium.[10]

Under a dollar-peg and a basket-peg regime, the basket for the PRC central bank is a weighted average of the real yen rate and the real dollar rate. Home's central bank intervenes in the foreign exchange market to maintain a basket equation expressed in log-linearized form such that:[11]

$$(1 - v_t^*) e_t^{CR/JY} + v_t^* e_t^{CR/\$} = 0 \quad (23)$$

[10] Since we assume capital mobility across two ROW countries, i.e., US bonds and Japanese bonds are perfect substitutable, the same amount of risk premium ($E_t \bar{\psi}_{t+1}$) will appear in the interest parity equation respect to yen-denominated asset return.

[11] While Yoshino, Kaji, and Asonuma (2004, 2009a) and Yoshino, Kaji, and Suzuki (2004) consider a basket comprising nominal exchange rates, we consider a basket of real exchange rates as in Yoshino, Kaji, and Asonuma (2012).

Using the exchange rate triangle:

$$e_t^{CR/JY} = -\upsilon_t^* e_t^{JP/\$}, \quad e_t^{CR/\$} = (1-\upsilon_t^*) e_t^{JP/\$} \quad (23')$$

Furthermore, under a dollar peg regime, the basket weight is fixed at 1:

$$\upsilon_t^* = 1 \quad \Leftrightarrow \quad e_t^{CR/\$} = 0 \quad (23a)$$

3.6 Central Bank

Finally, we consider two cases for the Home central bank; (i) adopting the basket-peg regime and (ii) adopting the dollar-peg regime. The balance sheet of the central bank is defined as follows. It lists domestic bonds (B_t^c), yen bonds ($B_t^{JP,c}$) and US dollar bonds ($B_t^{US\$,c}$) as assets, whereas the money supply is a liability.

$$B_t^c + S_t^{R/JP} B_t^{JP,c} + S_t^{R/\$} B_t^{US\$,c} = M_t$$

3.6.1 Basket-Peg Regime

Under the basket-peg regime[12] the basket for the Home central bank is a weighted average of the real yen rate and the real US dollar rate. The Home central bank intervenes in the foreign exchange market to maintain a basket equation expressed in log-linearized form such that:

$$(1-\upsilon_t) e_t^{R/JY} + \upsilon_t e_t^{R/\$} = 0 \quad (24)$$

Using the exchange rate triangle:

$$e_t^{R/JY} = -\upsilon_t e_t^{JP/\$}, \quad e_t^{CR/\$} = (1-\upsilon_t) e_t^{JP/\$} \quad (24')$$

3.6.2 Dollar-Peg Regime

A dollar-peg regime is regarded as an extreme case of a basket-peg regime such that the basket weight of the US dollar rate is equal to 1 and that of the yen rate is equal to 0. Therefore, the Home central bank intervenes in the foreign exchange rate market to maintain the following special basket equation expressed in log-linearlized form:

$$\upsilon_t = 1 \quad \Leftrightarrow \quad e_t^{R/\$} = 0 \quad (24a)$$

implying that Home's central bank stabilizes only the US dollar rate.

[12] The optimality of basket-peg regimes in East Asian countries has been discussed in Ito, Ogawa and Sasaki (1998),Ogawa, and Ito (2002), Yoshino, Kaji, and Asonuma (2004, 2005, 2012) and Yoshino, Kaji, and Suzuki (2004).

3.6.3 Floating Regime

Under a floating regime, the Home central bank implements the interest rate rule, under which the central bank commits its interest rate to the output gap, inflation rate, and effective exchange rate, and allows the exchange rate to fluctuate.

$$i_t - E_t\pi_{t+1}^C - r_t^o = \gamma_\pi \pi_t + \gamma_x x_t + (1-\gamma_\pi - \gamma_x)\hat{e}_t^{REER} \quad (25)$$

where $\hat{e}_t^{REER} = \phi_{CH}\hat{e}_t^{R/CH} + \phi_{JP}\hat{e}_t^{R/JP} + \phi_{US}\hat{e}_t^{R/US}$ is the real effective exchange rate (REER).[13]

4. EQUILIBRIUM

4.1 Equilibrium Conditions

The equilibrium condition for domestic bonds can be written as:

$$B_t^h + B_t^c = B_t$$

where B_t is the total supply of domestic bonds.

Production equals consumption at equilibrium.[14] For domestically produced output, this requires that:

$$y_t = \omega_H c_t^{H,H} + \omega_{CH} c_t^{CH,H} + \omega_{JP} c_t^{JP,H} + \omega_{US} c_t^{US,H} \quad (26)$$

where ω_i shows the share of consumption of domestic goods in country *i* at the steady state.[15] From Euler equations (8') and (21) and goods demand equations (2) and (20'), we obtain an open-economy "IS" equation:

$$\begin{aligned} y_t = {} & E_t y_{t+1} - \frac{\omega_H}{\sigma}\left(i_t - E_t\pi_{t+1}^C\right) - \theta(1-\omega_H)\left\{\alpha'(w_t - E_t w_{t+1}) + \left(1-\alpha'\right)(q_t - E_t q_{t+1})\right\} \\ & + \sum_{i\in\{CH,JP,US\}} \left\{\left(\theta\omega_i + \frac{\lambda_i}{\lambda_H}\right)\left(e_t^{R/i} - E_t e_{t+1}^{R/i}\right) - \frac{\omega_i}{\sigma} r_t^i\right\} \\ & + \theta\left(\frac{\omega_H}{\lambda_H} - 1\right) E_t\pi_{t+1}^C \end{aligned} \quad (27)$$

[13] Ho (2012) proposes a new approach of compiling effective exchange rate indices based on GDP weights.

[14] Simultaneously, the equilibrium conditions for labor and intermediate goods hold: $L_t = \int_o^{n_H} L_t^H(z)dz + \int_o^{n_{EX}} L_t^{EX}(z)dz$ and $H_t = \int_o^{n_H} H_t^H(z)dz + \int_o^{n_{EX}} H_t^{EX}(z)dz$.

[15] We assume $\sum_{i\in\{H,CH,JP,US\}} \omega_i = 1$.

The equilibrium condition for the labor market is derived from household labor supply (10'), firm optimization conditions, and marginal cost equations for two types of firms (14) and (19):

$$y_t = E_t y_{t+1} - \left\{1 - (1-\omega_H)\alpha' + \frac{1}{\eta}\right\}(E_t w_{t+1} - w_t) + \left\{1 - \omega_H - \frac{\omega_H}{\lambda_H} + \frac{1}{\eta}\right\} E_t \pi^C_{t+1}$$
$$+ \frac{1}{\eta}\left(i_t - E_t \pi^C_{t+1}\right) + (1-\omega_H)\left(1-\alpha'\right)(E_t q_{t+1} - q_t)$$
$$+ \sum_{i \in \{CH,JP,US\}} \left\{\left(\omega_i + \frac{\omega_H \lambda_i}{\lambda_H}\right)\left(E_t e^{R/i}_{t+1} - e^{R/i}_t\right)\right\} \tag{28}$$

The equilibrium condition for the money market is also derived from household money demand (9') using equation (25).

$$m_t = \frac{\sigma}{b\omega_H} y_t + \frac{\sigma(1-\omega_H)}{b\omega_H}\left\{\alpha' w_t + \left(1-\alpha'\right) q_t\right\} - \frac{\sigma}{b}\left[\frac{1-2\omega_H}{\omega_H} + \theta\left(\frac{\lambda_H - 1}{\lambda_H}\right)\right] p^C_t$$
$$- \sum_{i \in \{CH,JP,US\}} \left\{\left(\lambda_i + \frac{\omega_i}{\omega_H}\right)\theta e^{R/i}_t\right\} - \left(\frac{1}{b}\right) i_t \tag{29}$$

4.2 Deviations from the Flexible-Price Equilibrium

When prices are sticky, output and real exchange rates can differ from their flexible-price equilibrium values.[16] We denote output gap x_t as $x_t \equiv y_t - y^o_t$. We obtain the following equilibrium conditions:

$$x_t = E_t x_{t+1} - \frac{\omega_H}{\sigma}\left(i_t - E_t \pi^C_{t+1} - r^o_t\right) + \theta\left(\frac{\omega_H}{\lambda_H} - 1\right) E_t \pi^C_{t+1}$$
$$- \theta(1-\omega_H)\left\{\alpha'(\widehat{w}_t - E_t \widehat{w}_{t+1}) + \left(1-\alpha'\right)(\hat{q}_t - E_t \hat{q}_{t+1})\right\}$$
$$+ \sum_{i \in \{CH,JP,US\}} \left\{\left(\theta\omega_i + \frac{\lambda_i}{\lambda_H}\right)\left(\hat{e}^{R/i}_t - E_t \hat{e}^{R/i}_{t+1}\right) - \frac{\omega_i}{\sigma}\hat{r}^i_t\right\} \tag{30}$$

[16] Values at the flexible-price equilibrium are shown in Appendix 1.

$$\pi_t^C = \frac{\beta}{1+\kappa} E_t \pi_{t+1}^C + \frac{\lambda_H \kappa}{1+\kappa} \{\alpha \widehat{w}_t + (1-\alpha') \widehat{q}_t\} - \sum_{i \in \{CH,JP,US\}} \frac{\lambda_i}{1+\kappa} \left\{ \begin{array}{c} \beta \left(E_t \hat{e}_{t+1}^{\frac{R}{i}} - \hat{e}_t^{\frac{R}{i}} \right) \\ +(1+\kappa)\left(\hat{e}_t^{R/i} - \hat{e}_{t-1}^{R/i} \right) \end{array} \right\} \quad (31)$$

$$x_t = E_t x_{t+1} - \left\{1 - (1-\omega_H)\alpha' + \frac{1}{\eta}\right\} (E_t \widehat{w}_{t+1} - \widehat{w}_t) + \left\{1 - \omega_H - \frac{\omega_H}{\lambda_H} + \frac{1}{\eta}\right\} E_t \pi_{t+1}^C + \frac{1}{\eta}\left(i_t - E_t \pi_{t+1}^C - r_t^o\right) + (1-\omega_H)(1-\alpha')(E_t \widehat{q}_{t+1} - \widehat{q}_t) + \sum_{i \in \{CH,JP,US\}} \left\{ \left(\omega_i + \frac{\omega_H \lambda_i}{\lambda_H}\right) \left(E_t \hat{e}_{t+1}^{R/i} - \hat{e}_t^{R/i}\right) \right\} \quad (32)$$

$$m_t - m_t^o = \frac{\sigma}{b\omega_H} x_t + \frac{\sigma(1-\omega_H)}{b\omega_H} \{\alpha' \widehat{w}_t + (1-\alpha') \widehat{q}_t\} - \frac{\sigma}{b} \left[\frac{1-2\omega_H}{\omega_H} + \theta \left(\frac{\lambda_H - 1}{\lambda_H} \right) \right] \pi_t^C - \sum_{i \in \{CH,JP,US\}} \left\{ \left(\lambda_i + \frac{\omega_i}{\omega_H}\right) \theta \hat{e}_t^{R/i} \right\} - \left(\frac{1}{b}\right)(i_t - i_t^o) \quad (33)$$

$$i_t - E_t \pi_{t+1}^C - r_t^o = \hat{r}_t^i + E_t \hat{e}_{t+1}^{R/i} - \hat{e}_t^{R/i} \quad \text{for } i = JP, US \quad (11'')$$

$$i_t - E_t \pi_{t+1}^C - r_t^o = \hat{r}_t^{CH} + E_t \hat{e}_{t+1}^{R/CH} - \hat{e}_t^{R/CH} + E_t \widehat{\psi}_{t+1} \quad (11a'')$$

Equations (28) and (29) are open-economy Investment-Saving (IS) and Aggregate Supply (AS) equations. Equations (30) and (31) show labor market and money market equilibrium conditions, respectively. Equations (11'') and (11a'') are real interest parity conditions. Seven endogenous variables, x_t, π_t^C, $(i_t - i_t^o)$, $\widehat{w}_t$, $\hat{e}_t^{R/CH}$, $\hat{e}_t^{R/JP}$, $\hat{e}_t^{R/US}$ are solved with the seven equations mentioned above (note that we have two equations for interest parity condition 11'').

5. TRANSITION POLICIES AND BASKET WEIGHT RULES

5.1 Transition Policies Toward a Stable Basket-Peg Regime

We define five transition policies together with maintaining the current regime. As in Yoshino, Kaji, and Asonuma (2014), we assume that the PRC (Foreign) undergoes the following process throughout the current analysis: it starts from a dollar-peg regime with capital controls, and undergoes a transition to adjust its basket weight and capital controls, and finally adopts a basket-peg regime with a desired weight.[17] We consider the following five transition policies for Home such that it starts from a dollar-peg regime under perfect capital mobility and shifts to a basket-peg or a floating regime. Figure 3 displays six policy options for Home.

(i) Maintaining a dollar peg under perfect capital mobility (basket weight to the US dollar is always equal to 1);

(ii) Gradual shifting from a dollar peg to a basket peg with fixed weights (gradual adjustment of basket weight);

(iii) Sudden shift from a dollar peg to a basket peg with fixed weights (sudden adjustment of basket weights) before the Foreign country's transition period;

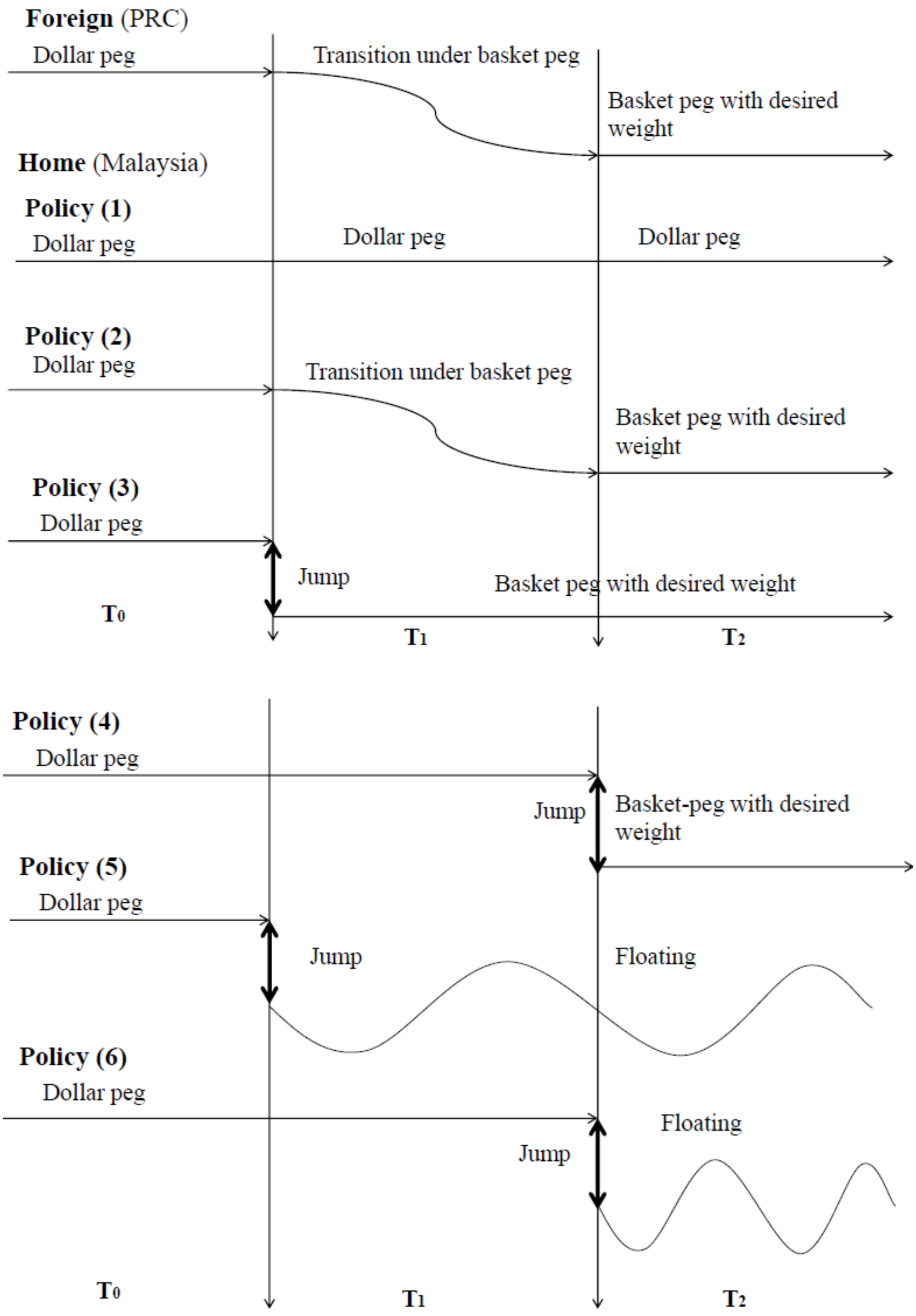
(iv) Sudden shift from a dollar peg to a basket peg with fixed weights (sudden adjustment of basket weight) after the Foreign country's transition period;

(v) Sudden shift from a dollar peg to a floating regime before the Foreign country's transition period; and

(vi) Sudden shift from a dollar peg to a floating regime after the Foreign country's transition period.

[17] Yoshino, Kaji and Asonuma (2014) find that the PRC is better off shifting gradually to a stable basket peg through a transition process of adjusting basket-weight and capital controls rather than shifting suddenly to a floating or a basket-peg regime.

Figure 3: Transition Policies



PRC = People's Republic of China.

Source: Authors' illustration.

The first policy is maintaining the current regime under perfect capital mobility, i.e. the basket weight to the US dollar rate is always equal to 1. The second is similar, but there is a transition period to adjust the basket weight before gradually reaching a basket peg with the desired weight. The third policy is that Home shifts suddenly from a dollar-peg regime to a basket-peg regime with the desired weight before the PRC's transition. This implies that the economy jumps to a basket peg with the desired weight before the PRC starts to adjust its basket weight. Under the fourth policy, the Home country shifts suddenly from a dollar peg to a basket peg after the PRC's transition. Once the PRC completes the adjustment process, the economy moves to the desired regime. The fifth policy is that the Home country shifts suddenly to a floating regime before the PRC transition, while under the sixth policy, the Home country postpones shifting to a basket peg until the PRC completes the adjustment process.

We assume that an initial time period for a dollar peg is T_0. Furthermore, a transition period in which the PRC adjusts its basket weight and capital control is set as T_1 and a time interval after the PRC implements a basket peg with a desired weights is set as T_2. The discount rate is assumed to be β. Through the analysis, the cumulative loss for the Home country is defined as follows:

$$L_1 = E_t \sum_{i=0}^{T_0+T_1+T_2} \beta^i \left[\varpi_1\left(\pi_{t+i}^C\right)^2 + \varpi_2(x_{t+i})^2 + (1-\varpi_1-\varpi_2)(\hat{e}_t^{REER})^2\right] \tag{34}$$

where ω_1 and ω_2 show weights on policy targets, respectively. This indicates that the Home monetary authority attempts to minimize the CPI inflation rate, output gap, and real effective exchange rate (REER). There are benefits and costs associated with the five transition policies as explained in Table 1. These benefits and costs are clearly included in the cumulative losses defined above.

5.2 Instrument Rules

5.2.1 Foreign Basket Weight Rule

As explained in Yoshino, Kaji, and Asonuma (2014), the PRC opts to take gradual adjustment of basket weights and reaches its desired basket-peg regime with long-term weights υ^{*F} shown as:

$$\upsilon_{t+i}^F = \left\{\begin{array}{c} 1 \quad if \quad i \le T_0 \\ 1 - \dfrac{(1-\upsilon^{*F})}{T_1}(i - T_0) \quad if \quad T_0 \le i \le T_0 + T_1 \\ \upsilon^{*F} \quad if \quad T_0 + T_1 \le i \le T_0 + T_1 + T_2 \end{array}\right\} \tag{35}$$

Table 1: Benefits and Costs of Transition Policies

Policy	Benefits	Costs
(i) Maintaining a dollar peg	a. No volatility of $e_t^{R/US}$.	a. No monetary policy autonomy.
(ii) Gradual adjustment to a basket peg	a. Small volatility of i b. Small volatility of $e_t^{R/US}$, $e_t^{R/JP}$ c. Small variations of $e_t^{R/US,e}$, $e_t^{R/JP,e}$	a. Time to desirable regime b. Adjustment costs
(iii) Sudden shift to a basket peg before the PRC's transition	a. Reaching desirable regime at once b. Longer period of desirable regime c. No adjustment costs. Small variations of $e_t^{R/US,e}$, $e_t^{R/JP,e}$	a. High volatility of i b. High volatility of $e_t^{R/US}$, $e_t^{R/JP}$ c. Large indirect effect from the PRC (still under the dollar peg)
(iv) Sudden shift to a basket peg after PRC's transition	a. Reaching desirable regime at once b. No adjustment costs c. Small variations of $e_t^{R/US,e}$, $e_t^{R/JP,e}$ d. Small indirect effect from the PRC	a. High volatility of i b. High volatility of $e_t^{R/US}$, $e_t^{R/JP}$ c. Shorter period of desirable regime
(v) Sudden shift to a floating regime before PRC's transition	a. Reaching desirable regime at once b. Longer period of desirable regime c. No adjustment costs	a. High volatility of i b. High volatility of $e_t^{R/US}$, $e_t^{R/JP}$ c. Large variations of $e_t^{R/US,e}$, $e_t^{R/JP,e}$
(vi) Sudden shift to a floating regime after PRC's transition	a. Reaching desirable regime at once b. Longer period of desirable regime c. Small indirect effect from the PRC	a. High volatility of i b. High volatility of $e_t^{R/US}$, $e_t^{R/JP}$ c. Shorter period of desirable regime

PRC = People's Republic of China.

Source: Authors' compilation.

5.2.2 Home Basket Weight Rule and Interest Rate Rule

Next, we define weight rules under three transitional policies to a basket-peg regime and policy for maintaining the current regime. Similarly, the interest rate rule under two transition policies to a floating regime is also specified. One feature is common across the transition policies to a basket peg: once Home reaches the desirable basket peg, a basket weight to the dollar rate is fixed at υ_i^{*H} for $i = 2,3,4$.

For maintaining a dollar peg (policy 1), Home's basket weight rule is shown as

$$\upsilon_{1,t+i}^{H} = \{1 \quad if \quad i \leq T_0 \leq T_0 + T_1 + T_2\} \quad (36)$$

For a gradual shift from a dollar peg to a basket peg (policy 2), the Home basket weight rule is summarized as:

$$\upsilon_{2,t+i}^{H} = \left\{ \begin{array}{c} 1 \quad if \quad i \leq T_0 \\ 1 - \dfrac{(1-\upsilon^{*H})}{T_1}(i - T_0) \quad if \quad T_0 \leq i \leq T_0 + T_1 \\ \upsilon_2^{*H} \quad if \quad T_0 + T_1 \leq i \leq T_0 + T_1 + T_2 \end{array} \right\}$$

(37)

For a sudden shift from a dollar peg to a basket peg with the desired weight (sudden adjustment of basket weight) before the PRC's transition, the following is the basket weight rule:

$$\upsilon_{3,t+i}^{H} = \begin{Bmatrix} 1 \quad if \quad i \le T_0 \\ \upsilon_3^{*H} \quad if \quad T_0 \le i \le T_0 + T_1 + T_2 \end{Bmatrix}$$

(38)

Similarly for policy (4), Home authorities shift from a dollar peg to a basket peg after the PRC's transition:

$$\upsilon_{4,t+i}^{H} = \begin{Bmatrix} 1 \quad if \quad i \le T_0 + T_1 \\ \upsilon_3^{*H} \quad if \quad T_0 + T_1 \le i \le T_0 + T_1 + T_2 \end{Bmatrix}$$

(39)

Unlike the case above, under transition policy (5), the Home authorities implement the following interest rate rule before the PRC's transition shown as:

$$\begin{Bmatrix} \upsilon_{5,t+i}^{H} = 1 \quad if \quad i \le T_0 \\ i_t - E_t\pi_{t+1}^{C} - r_t^{o} = \gamma_\pi \pi_t + \gamma_x x_t + (1-\gamma_\pi - \gamma_x)\hat{e}_t^{REER} \quad if \quad T_0 \le i \le T_0 + T_1 + T_2 \end{Bmatrix}$$

(40)

In a similar vein, under transition policy (6), Home authorities implement the interest rate rule after the PRC's transition shown as:

$$\begin{Bmatrix} \upsilon_{6,t+i}^{H} = 1 \quad if \quad i \le T_0 + T_1 \\ i_t - E_t\pi_{t+1}^{C} - r_t^{o} = \gamma_\pi \pi_t + \gamma_x x_t + (1-\gamma_\pi - \gamma_x)\hat{e}_t^{REER} \quad if \quad T_0 + T_1 \le i \le T_0 + T_1 + T_2 \end{Bmatrix}$$

(41)

We then define the desired basket weight under policies (2), (3), and (4). Under policy (2), Home monetary authorities minimize the cumulative loss by target weight υ_2^{*H} respectively, given the Foreign weight rule (35) and Home weight rule (37). The target weight is shown as

$$\upsilon_2^{*H} = arg \max_{\upsilon_2^{*H}} L_t \qquad \text{s.t. } (35), (37)$$

Under policy (3), Home monetary authorities minimize the cumulative loss by target weight υ_3^{*H} respectively, given the Foreign weight rule (35) and Home weight rule (38). The target weight is shown as:

$$\upsilon_3^{*H} = arg \max_{\upsilon_3^{*H}} L_t \qquad s.t. \ (35), (38)$$

Under policy (4), Home monetary authorities minimize the cumulative loss by target weight υ_4^{*H}respectively, given the Foreign weight rule (35) and Home weight rule (39). The target weight is shown as:

$$\upsilon_4^{*H} = arg \max_{\upsilon_4^{*H}} L_t \quad s.t.\ (35),(39)$$

Under policy (5), Home monetary authorities minimize the cumulative loss by coefficients on output gap and inflation rate π_t and x_t respectively, given Foreign weight rule (35) and instrument rules:

$$\begin{Bmatrix} \gamma_\pi^* \\ \gamma_x^* \end{Bmatrix} = arg \max_{\gamma_\pi,\gamma_x} L_t \quad s.t.\ (35),(40)$$

Finally, under policy (6), the Home monetary authorities minimize the cumulative loss by coefficients on output gap and inflation rate π_t and x_t respectively, given Foreign weight rule (35) and instrument rules.

$$\begin{Bmatrix} \gamma_\pi^{**} \\ \gamma_x^{**} \end{Bmatrix} = arg \max_{\gamma_\pi,\gamma_x} L_t \quad s.t.\ (35),(41)$$

6. QUANTITATIVE ANALYSIS

In this section, we provide quantitative analysis based on calibration exercises using Malaysian and Singapore data. We use quarterly data from the IMF (2014a, 2014b), International Financial Statistics (IFS), and also annual data from the IMF Direction of Trade Statistics (DOT).[18] Our sample period is Q1 2000– Q4 2012, so we have enough periods after the PRC announced its departure from the dollar peg in Q3 2005. We use actual data of both (i) real shocks such as the oil price, and (ii) monetary shocks, such as the risk premium for the PRC, the real interest rate in the PRC, the real interest rate in Japan, and the real interest rate in the US over the sample period. Our quantitative exercises compute the cumulative losses affected by both real and monetary shocks under the six policies specifed in the previous section.

Through these calibration exercises, we find that a gradual adjustment to a basket peg is the most desirable of the transition policies for both countries. Moreover, a sudden shift to a basket peg is superior to maintaining a dollar peg in Malaysia, but not in Singapore. Finally, a sudden shift to a floating regime is even worse than maintaining a dollar peg in both countries.

The rest of the section proceeds as follows. First, we specify parameters in the model and compute deviations of variables from the flexible-price equilibrium. Second, we apply a unit root test. Third, we estimate policy instruments and specify exogenous shock processes. Finally, we compute cumulative losses under the six policies using specified parameters and shocks.

6.1 Selected Parameters and Variables

We start our calibration by setting some parameters in our model. As in a standard international real business cycle model (Arellano 2008) we set the intertemporal

[18] We can provide the data set upon request. Details of the data set are explained in Appendix 2.

elasticity of substitution σ to 2. As in Gali and Monacelli (2005), we use $\beta = 0.99$, which implies a risk-free annual return of about 4% in the steady state. Similarly, following Gali and Monacelli (2005), we define $\eta = 3$, which implies a labor supply elasticity of 1/3 and $\mu = 6$ consistent with the markup (μ_M) of 1.2 in the steady state. b is targeted at 2/3, which corresponds to the elasticity of real money holdings with respect to an interest rate of 3/2 in Yoshino, Kaji, and Asonuma (2012). We set elasticity of goods across countries $\theta = 2$ as in Shioji (2006b). Parameter ϖ is defined to be 0.75, consistent with an average period of 1 year between price adjustments as in Gali and Monacelli (2005). Thus, $\kappa = 0.086$. We calculate parameters for final goods consumption share and export share of domestically produced goods using the annual export and import shares of Malaysia and Singapore over 2005–2012 from the IMF DOT, together with annual consumption data over 2005–2012 from the IMF IFS. For the input share of domestic final goods production, we assign $\alpha = 0.25$, $\alpha' = 0.07$ for Malaysia $\alpha = 0.25$, $\alpha' = 0.08$ for Singapore. These reflect the input shares of labor and intermediate goods in the final goods sector in 2005 from the Institute of Developing Economies Asian International Input-Output Table 2005.[19]

Table 2: Country-Specifc Parameters

(A) Final goods consumption share, export share of Home produced goods and input share of final goods production

(1) Malaysia

Parameter	Value	Parameter	Value	Parameter	Value	Parameter	Value
λ_H	0.65	λ_{CH}	0.13	λ_{JP}	0.12	λ_{US}	0.12
ω_H	0.62	ω_{CH}	0.62	ω_{JP}	0.12	ω_{US}	0.15
		ϕ_{CH}	0.34	ϕ_{JP}	0.32	ϕ_{US}	0.34
α	0.25	α'	0.07				

(2) Singapore

Parameter	Value	Parameter	Value	Parameter	Value	Parameter	Value
λ_H	0.47	λ_{CH}	0.19	λ_{JP}	0.14	λ_{US}	0.20
ω_H	0.52	ω_{CH}	0.21	ω_{JP}	0.15	ω_{US}	0.16
		ϕ_{CH}	0.40	ϕ_{JP}	0.24	ϕ_{US}	0.36
α	0.25	α'	0.08				

Sources: IDE (2005), IMF DOT, IFS and authors' calculations.

(B) Weights on policy targets

Parameter	(1) Malaysia	(2) Singapore
ϖ_1	0.40	0.40
ϖ_2	0.40	0.40

Source: Authors' calculations.

Next, by removing the non-trend components, we define Hodrik-Prescot (H-P) filtered trend values as the flexible-price equilibrium values of variables. For the expected value, we use next-period H-P filtered trend values since cyclical components are assumed to be the independent and identically distributed processes.

[19] The sectoral classification into tradable and non-tradable goods follows a traditional approach adopted in the real business cycle literature. The tradable goods sector comprises "manufacturing" and the primary sectors, whereas the non-tradable goods sector is composed of the remaining sectors.

6.2 Unit Root Tests

We apply the Dicky-Fuller Least Squares (DF-GLS) unit root test and results are summarized in Table 3. For Malaysia, all variables except x_t are stationary at the level. Similarly, for Singapore, all variables except $m_t - m_t^o$ are stationary at the level. For common shocks, most variables are stationary at the level, while $\hat{r}_t^{JP}$ is stationary at the first difference. For variables that are stationary at the first difference, we use the first difference for analysis in subsequent subsections.

Table 3: Dicky-Fuller Generalized Least Squares (DF-GLS) Tests

(1) Malaysia

Variables	Degree	Trend	Lag	DF-GLS Stat. /1	Results
π_t	level	No	5	-3.823***	I(0) /2
x_t	level	No	5	-2.213***	
	1st diff.	No	4	-3.829***	I(1) /3
$m_t - m_t^o$	level	No	4	-5.299***	I(0) /2
$i_t - i_t^o$	level	No	1	-4.124***	I(0) /2
$e_t^{MYR/CHY} - e_t^{MYR/CHY,o}$	level	No	8	-3.580***	I(0) /2
$e_t^{MYR/JPY} - e_t^{MYR/JPY,o}$	level	No	10	-2.704***	I(0) /2
$e_t^{MYR/US\$} - e_t^{MYR/US\$,o}$	level	No	3	-3.334***	I(0) /2
$e_t^{REER} - e_t^{REER,o}$	level	No	3	-3.919***	I(0) /2

(2) Singapore

Variables	Degree	Trend	Lag	DF-GLS Stat. /1	Results
π_t	level	No	5	-3.833***	I(0) /2
x_t	level	No	3	-3.419***	I(0) /2
$m_t - m_t^o$	level	No	4	-1.460	
	1st diff.	No	5	-3.643***	I(1) /3
$i_t - i_t^o$	level	No	1	-4.830***	I(0) /2
$e_t^{SGD/CHY} - e_t^{SGD/CHY,o}$	level	No	8	-3.321***	I(0) /2
$e_t^{SGD/JPY} - e_t^{SGD/JPY,o}$	level	No	1	-3.291***	I(0) /2
$e_t^{SGD/US\$} - e_t^{SGD/US\$,o}$	level	No	1	-3.346***	I(0) /2
$e_t^{REER} - e_t^{REER,o}$	level	No	3	-3.116***	I(0) /2

(3) Common

Variables	Degree	Trend	Lag	DF-GLS Stat. [a]	Results
$\hat{q}_t$	Level	No	1	-4.371***	I(0) [b]
$E_t\hat{\psi}_{t+1}$	Level	No	3	-5.132***	I(0) [b]
$\hat{r}_t^{CH}$	Level	No	7	-5.390***	I(0) [b]
$\hat{r}_t^{JP}$	Level	No	4	-2.260	
	1st diff.	No	3	-6.451***	I(1) [c]
$\hat{r}_t^{US}$	Level	No	5	-3.502***	I(0) [b]

Notes: [a] ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. [b] I(0) shows that the variable follows a stationary process at the level. [c] I(1) shows that the variable follows a unit root of degree 1.

Source: Authors' calculations.

6.3 Estimation of Policy Instruments and Shock Processes

On the basis of the result of the unit root test, we estimate the policy instrument rules under a floating regime for Malaysia and Singapore and common shock processes. We use a generalized method of moments (GMM) estimation and apply an auto-regressive integrated moving average (ARIMA) model to five shocks: (i) oil price, (ii) risk premium for the PRC, (iii) real interest rate in the PRC, (iv) real interest rate in Japan, and (v) real interest rate in the US. The regression results are reported in Table 4. Finally, Table 5 summarizes the parameter values.

Table 4: Regression Results

(1) Malaysia

Instruments	π_t	x_t	$e_t^{REER} - e_t^{REER,o}$
$i_t - i_t^o$	0.0025 (0.023)	0.023* (0.012)	-
$i_t - i_t^o$	0.0026 (0.025)	0.025** (0.012)	-0.036 (0.011)

(2) Singapore

Instruments	π_t	x_t	$e_t^{REER} - e_t^{REER,o}$
$i_t - i_t^o$	-0.029 (0.027)	0.035** (0.010)	-
$i_t - i_t^o$	-0.026 (0.038)	0.033** (0.017)	-0.0007 (0.026)

(3) Common shocks

Instruments	AR(1) term
$\hat{q}_t$	0.52*** (0.14)
$E_t\hat{\psi}_{t+1}$	0.64*** (0.14)
$\hat{r}_t^{CH}$	0.84*** (0.10)
$\hat{r}_t^{JP}$	0.71*** (0.14)
$\hat{r}_t^{US}$	0.69*** (0.14)

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. An auto-regressive integrated moving average (ARIMA) estimation is applied.

Source: Authors' calculations.

Table 5: Parameters Used in Calibration

Parameters	Values	Parameters	Values
β	0.99	σ	2
η	3	b	0.67
μ	6	θ	2
ω	0.75	κ	0.086
ρ_q	0.52	ρ_ψ	0.64
$\rho_{r^{CH}}$	0.84	$\rho_{r^{JP}}$	0.71
$\rho_{r^{US}}$	0.69		

Source: Authors' calculations.

6.4 The PRC's Transition Path

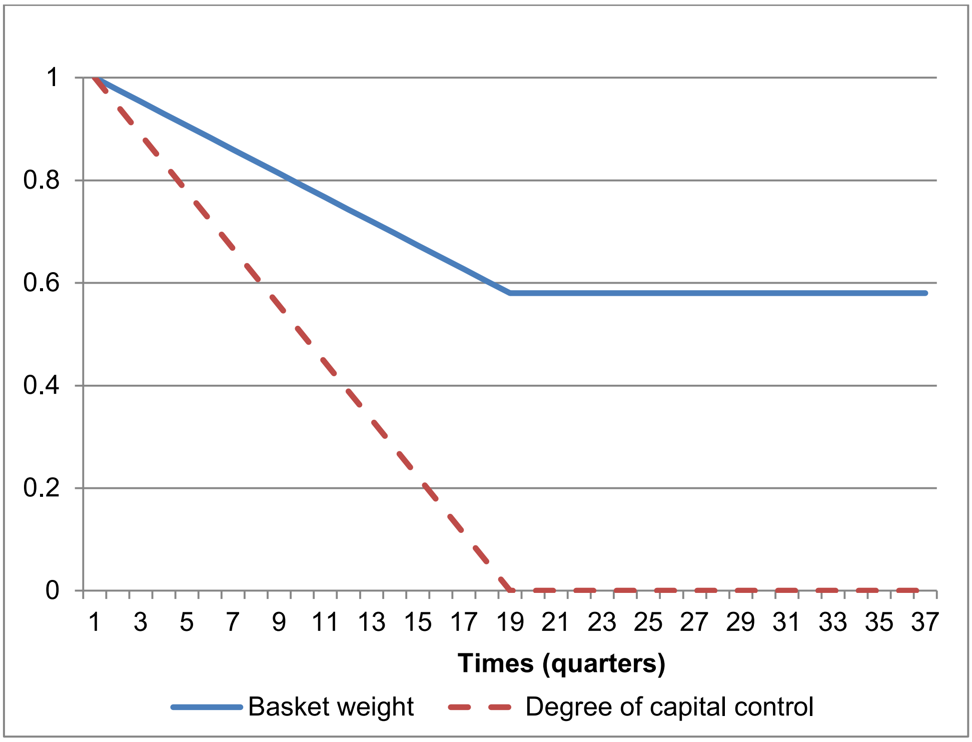
With regard to the most desirable transition path for the PRC's exchange rate regime, Yoshino, Kaji, and Asonuma (2014) find that the PRC is better off following a gradual adjustment to a basket-peg regime. During this transition, the PRC should opt to gradually adjust its weight from 1 (pegging to US dollar) to its desired weight, i.e., 0.58, and remove its capital controls. In this regard, the desired weight is set to $\upsilon^{*F} = 0.58$ and the degree of capital control is set to 0 after the transition. For the risk premium on

PRC bonds, we assume the following form to reflect the impact of relaxing capital controls:

$$E_t\hat{\psi}_{t+1} = \lambda_t E_t\tilde{\psi}_{t+1} \tag{42}$$

where λ_t captures the degree of capital controls and $E_t\tilde{\psi}_{t+1}$ is the actual risk premium on PRC bonds. When λ_t is equal to 1, it is close to the situation of capital controls where the actual risk premium exits. On the contrary, when λ_t is equal to 0, there is no risk premium, i.e., the PRC bonds are perfectly substitutable.

Figure 4: Basket Weight and Capital Controls in the PRC



Source: Yoshino, Kaji, and Asonuma (2014).

6.5 Cumulative Losses

Figure A3.1 in Appendix 3 shows the impacts of shocks on the output gap under three regimes. The impulse responses under a dollar peg resemble those under a basket peg: while a 1% increase in the PRC risk premium and the PRC real interest rate positively dampen the output gap, a 1% increase in the US real interest rate shock negatively affects the output gap. On the contrary, under a floating regime, all shocks positively affect the output gap in a symmetric manner. As long as the country is exposed to shocks in the same direction, it is difficult for the country to avoid its output gap being severely dampened.

Finally, we analyze the relative superiority of the transition policies in terms of cumulative losses. We calculate cumulative losses for each transition policy for Malaysia and Singapore using actual shocks for 37 quarters (Q4 2000–Q4 2009) corresponding to $T_1 = 18$, and $T_2 = 18$. These cumulative losses are computed based on equation (34) comprised of the inflation rate, output gap, and real effective exchange rate.

The following implications emerge from Table 6. First, a gradual adjustment to a basket peg is the most desirable option for both countries. By adjusting its basket weight gradually to the desired level during the transition period, the monetary authorities can effectively minimize the negative influence on the output gap and inflation rate though the exchange rate channel. One advantage of a basket peg regime is that impacts on the output gap and inflation rate are canceled out if the yen rate and the US dollar rate move in opposite directions due to shocks. This is obvious in the size of the real interest rate shocks in Japan and the US which are smaller under a basket peg than under a dollar peg in Figure A2.1.

Second, a sudden shift to a basket peg is superior to maintaining the dollar peg in Malaysia, but not in Singapore. Benefits under a basket peg with the desired weight after shifts surpass the losses associated with a sudden shift in the case of Malaysia. In addition, both policy 3 and policy 4 result in the same cumulative losses: while losses due to a sudden shift while the PRC is maintaining a dollar peg with capital control are completely offset by the benefits of smaller losses under a basket peg with the desired weight for longer horizons. However, this is not the case in Singapore: losses associated with a sudden shift are greater than the benefits under a basket peg with the desired weight. It is worth noting that cumulative losses for maintaining the dollar peg do not differ remarkably from those of the best solution (a gradual adjustment to a basket peg or the second-best (a sudden shift to a basket-peg). This is because there is no influence arising from removing capital controls in Malaysia and Singapore as capital has been perfectly mobile between Malaysia (Singapore) and the rest of the world except the PRC since the initial period (T_0).

Finally, in both countries, a sudden shift to a floating regime is worse than maintaining the dollar peg. Under a floating regime, all exogenous shocks have positive impacts on the output gap (in the same direction) as shown in Figure A2.1. This results in higher cumulative losses through volatile interest rates due to fluctuations of the three exchange rates (renminbi, yen, and US dollar).

Table 6: Comparison of Transition Policies

(1) Malaysia

	Policy 1	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
Stable Regime	Dollar peg	Basket peg	Basket peg	Basket peg	Floating	Floating
Adjustment	-	Gradual	Sudden	Sudden	Sudden	Sudden
Desired Basket Weight	1.00	0.40	0.54	0.45	-	-
Cumulative Losses (%) [/a]	17.51	17.35	17.46	17.46	24.31	25.93

(2) Singapore

	Policy 1	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
Stable Regime	Dollar peg	Basket peg	Basket peg	Basket peg	Floating	Floating
Adjustment	-	Gradual	Sudden	Sudden	Sudden	Sudden
Desired Basket Weight	1.00	0.67	0.90	0.85	-	-
Cumulative Losses (%) [a]	45.60	45.56	45.64	45.61	60.51	64.18

[a] Percentage deviation from trend.

Source: Authors' calculations.

7. CONCLUSION

This paper considered the optimal transition policy for East Asian countries given the PRC's announcement of a shift in its exchange rate regime. Throughout the paper, we attempted to answer two major questions that have not been answered explicitly in the literature of exchange rate policy in emerging economies. (i) Are these countries better off shifting to either a basket peg or a floating regime following the PRC's transition toward a basket peg regime? (ii) Depending on the answer to that question, how and when should these countries shift to the desired regime? Is a gradual or sudden adjustment desirable? Should the countries shift before, during, or after the PRC's transition, given exogenous fluctuations in the renminbi rate? In order to answer these questions, we developed a dynamic stochastic general equilibrium (DSGE) model of a small open economy incorporating the PRC's pre-determined shift in its exchange rate regime.

Our main innovation is to capture the influence of the Foreign country's (the PRC's) predetermined shift to a new exchange rate regime on the East Asian countries' choice of optimal transition policy. In the paper, we assumed that the PRC gradually adjusted its basket weight and capital controls to reach a basket peg with its desired regime consistent with the findings in Yoshino, Kaji, and Asonuma (2014). We constructed five transition policies toward a basket peg or a floating regime, which we examined together with maintaining the current regime, and compared the calibrated cumulative losses of these policies, which reflect the exogenous influence of the PRC's shift to a basket peg. The five policies comprise: a gradual adjustment toward a basket peg with the desired weight, two policies with sudden shifts to a basket peg, and two policies with sudden shifts to a floating regime. For policies with sudden shifts, we considered shifts implemented both before and after the PRC's transition because the magnitude of the shocks due to sudden shifts depend on the exchange rate regime the PRC is adopting and the degree of the PRC's capital controls.

Based on a simulation exercise using Malaysian and Singapore data from Q1 2000 to Q4 2012, we found that at first a gradual adjustment to a basket peg is the most desirable transition policy for both countries. By adjusting the basket weight gradually to the desired level during the transition period, the monetary authorities can effectively minimize the negative influence on the output gap and the inflation rate through exchange rate channels. One prominent advantage of a basket-peg regime is that impacts on the output gap and the inflation rate are canceled out if the Japanese yen rate and the US dollar rate move in opposite directions due to shocks. Second, a sudden shift to a basket peg is superior to maintaining a dollar peg in Malaysia, but not in Singapore. The benefits under a basket peg with the desired weight after its shift surpass losses associated with a sudden shift in the case of Malaysia. However, for Singapore, a sudden shift results in larger losses, outweighing benefits under a basket peg with the desired weight. Finally, in both countries, a sudden shift to a floating regime is even worse than maintaining a dollar peg. Fluctuations in the three exchange rates (renminbi, yen, and US dollar) under a floating regime lead to volatile interest rates dampening these economies, i.e. higher cumulative losses since all exogenous shocks have positive impacts on the output gap (in the same direction).

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APPENDIX 1: FLEXIBLE-PRICE EQUILIBRIUM

The conditions at the flexible-price equilibrium are as follows. The values of the flexible-price equilibrium can be derived from this system of conditions where the consumer price index inflation rate is zero, i.e., $\pi_t^{C,o} = E_t\pi_{t+1}^{C,o} = 0$.

$$y_t^o = E_t y_{t+1}^o - \frac{\omega_H}{\sigma}\left(i_t^o - E_t\pi_{t+1}^{C,o}\right) - \theta(1-\omega_H)\left\{\alpha'(w_t^o - E_t w_{t+1}^o) + \left(1-\alpha'\right)(q_t^o - E_t q_{t+1}^o)\right\}$$
$$+\theta\left(\frac{\omega_H}{\lambda_H} - 1\right)E_t\pi_{t+1}^{C,o}$$
$$+\sum_{i\in\{CH,JP,US\}}\left\{\left(\theta\omega_i + \frac{\lambda_i}{\lambda_H}\right)\left(e_t^{R/i,o} - E_t e_{t+1}^{R/i,o}\right) - \frac{\omega_i}{\sigma} r_t^{i,o}\right\}$$

(A1)

$$\pi_t^{C,o} = \frac{\beta}{1+\kappa}E_t\pi_{t+1}^{C,o} + \frac{\lambda_H\kappa}{1+\kappa}\left\{\alpha w_t^o + \left(1-\alpha'\right)q_t^o\right\}$$
$$-\sum_{i\in\{CH,JP,US\}}\frac{\lambda_i}{1+\kappa}\left\{\begin{matrix}\beta\left(E_t e_{t+1}^{R/i,o} - e_t^{R/i,o}\right)\\ +(1+\kappa)\left(e_t^{R/i,o} - e_{t-1}^{R/i,o}\right)\end{matrix}\right\}$$

(A2)

$$y_t^o = E_t y_{t+1}^o - \left\{1-(1-\omega_H)\alpha' + \frac{1}{\eta}\right\}(E_t w_{t+1}^o - w_t^o) + \left\{1-\omega_H - \frac{\omega_H}{\lambda_H} + \frac{1}{\eta}\right\}E_t\pi_{t+1}^{C,o}$$
$$+\frac{1}{\eta}\left(i_t^o - E_t\pi_{t+1}^{C,o}\right) + (1-\omega_H)\left(1-\alpha'\right)(E_t q_{t+1}^o - q_t^o)$$
$$+\sum_{i\in\{CH,JP,US\}}\left\{\left(\omega_i + \frac{\omega_H\lambda_i}{\lambda_H}\right)\left(E_t e_{t+1}^{R/i,o} - e_t^{R/i,o}\right)\right\}$$

(A3)

$$m_t^o = \frac{\sigma}{b\omega_H}y_t^o + \frac{\sigma(1-\omega_H)}{b\omega_H}\left\{\alpha' w_t^o + \left(1-\alpha'\right)q_t^o\right\} - \frac{\sigma}{b}\left[\frac{1-2\omega_H}{\omega_H} + \theta\left(\frac{\lambda_H - 1}{\lambda_H}\right)\right]\pi_t^{C,o}$$
$$-\sum_{i\in\{CH,JP,US\}}\left\{\left(\lambda_i + \frac{\omega_i}{\omega_H}\right)\theta e_t^{R/i,o}\right\} - \left(\frac{1}{b}\right)i_t^o$$

(A4)

$$i_t^o - E_t \pi_{t+1}^{C.o} = r_t^{i,o} + (E_t e_{t+1}^{R/i,o} - e_t^{R/i.o})$$

(A5)

$$i_t^o - E_t \pi_{t+1}^{C.o} = r_t^{CH,o} + (E_t e_{t+1}^{R/CH,o} - e_t^{R/CH.o}) + E_t \bar{\psi}_{t+1}^o$$

(A6)

APPENDIX 2: DETAILS OF DATA

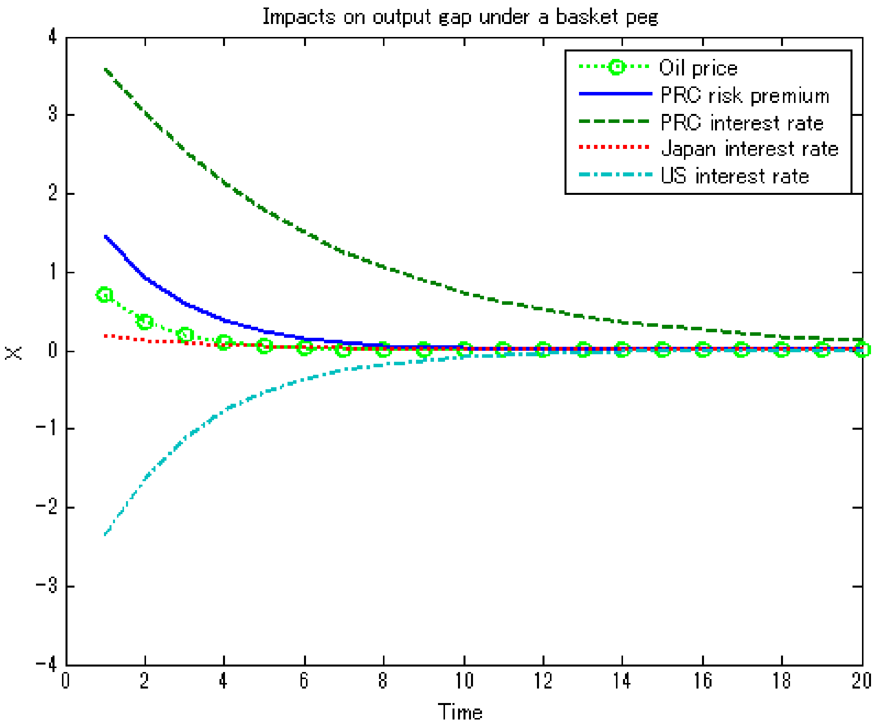
Table A2.1: Sources of Data

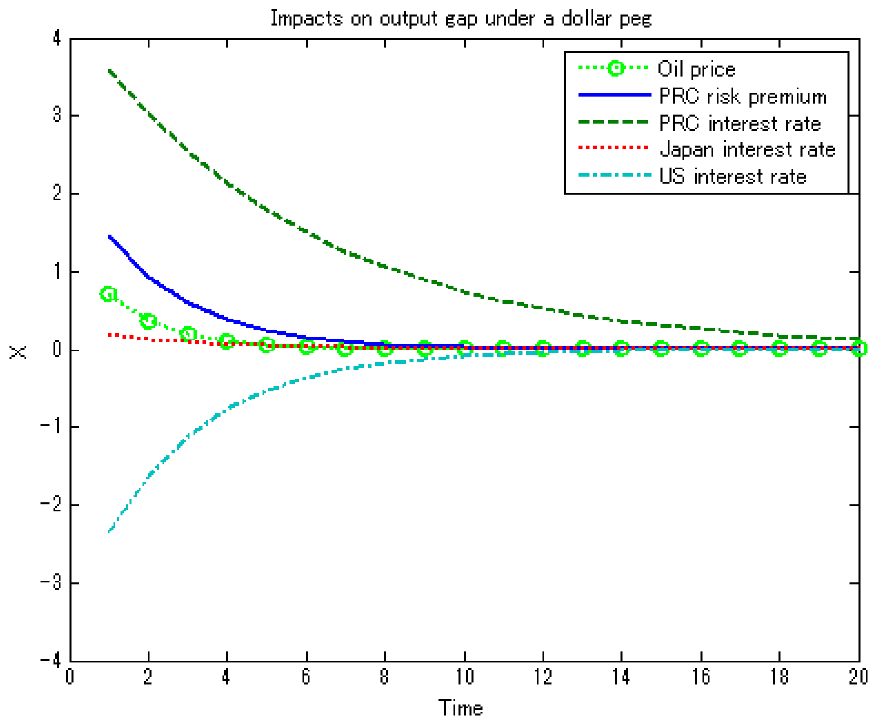
Variable	Definition	Country	Source	Range
Y_t	Gross domestic debt	Malaysia and Singapore	IMF IFS	Q1 2000–Q4 2012
$S_t^{R/CR}$	Nominal Renminbi Exchange Rate	Malaysia and Singapore	IMF IFS	Q1 2000–Q4 2012
$S_t^{R/Yen}$	Nominal Yen Exchange Rate	Malaysia and Singapore	IMF IFS	Q1 2000–Q4 2012
$S_t^{R/US\$}$	Nominal US Dollar Exchange Rate	Malaysia and Singapore	IMF IFS	Q1 2000–Q4 2012
$S_t^{\$/yen}$	Nominal Dollar-Yen Exchange Rate	Malaysia and Singapore	Authors' calculations	Q1 2000–Q4 2012
P_t^{CH}	Consumer price index in the PRC	PRC	IMF IFS	Q1 2000–Q4 2012
P_t^{J}	Consumer price index in Japan	Japan	IMF IFS	Q1 2000–Q4 2012
P_t^{US}	Consumer price index in the United States	United States	IMF IFS	Q1 2000–Q4 2012
M_t	Nominal money supply (M1)	Malaysia and Singapore	IMF IFS	Q1 2000–Q4 2012
i_t	Nominal government bond yields	Malaysia and Singapore	IMF IFS	Q1 2000–Q4 2012
i_t^{CH}	Nominal government bond yields	PRC	IMF IFS	Q1 2000–Q4 2012
i_t^{JP}	Nominal government bond yields	Japan	IMF IFS	Q1 2000–Q4 2012
i_t^{US}	Nominal government bond yields	United States	IMF IFS	Q1 2000–Q4 2012
π_t	Annual change in domestic CPI	Malaysia and Singapore	IMF IFS	Q1 2000–Q4 2012
EX_t^i	Annual exports to the PRC, Japan, and the US	Malaysia and Singapore	IMF DOT	2005–2012
IM_t^i	Annual imports from PRC, Japan, and the US	Malaysia and Singapore	IMF DOT	2005–2012
C_t	Annual domestic consumption	Malaysia and Singapore	IMF IFS	2005–2012
$E_t\Psi_{t+1}^{CH}$	Risk premium in PRC	PRC	Authors' calculations	Q1 2000–Q4 2012
Q_t	Crude oil price		IMF WEO	Q1 2000–Q4 2012

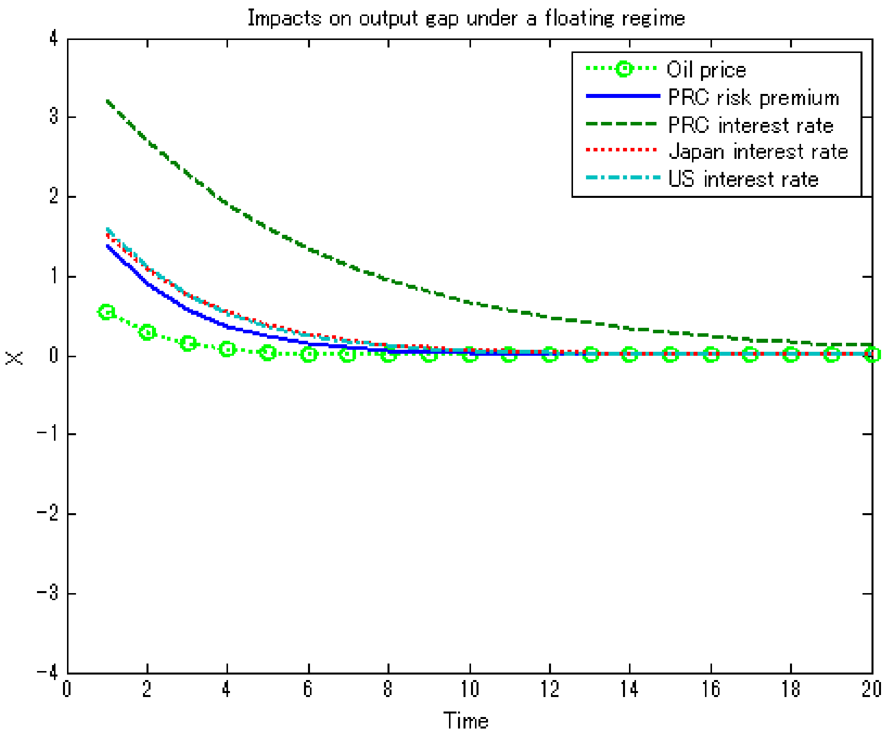
PRC = People's Republic of China.

APPENDIX 3: IMPULSE RESPONSES IN CALIBRATION EXERCISE

Figure A3.1: Impulse Responses under a Basket Peg, Dollar Peg, and a Floating Regime






Impacts on output gap under a floating regime
Oil price
PRC risk premium
PRC interest rate
Japan interest rate
US interest rate
x
Time
4
3
2
1
0
-1
-2
-3
-4
0
2
4
6
8
10
12
14
16
18
20