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Keywords: Intertemporal approach; Current account; Collateral constraints; East Asian financial crisis; Kiyotaki-Moore model.

JEL Classification Numbers: F32, F41.

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1 Introduction

The intertemporal current account (ICA) approach has been the dominant theoretical framework for investigating the determinants of the current account dynamics over the last three decades. This paper introduces collateral constraints into the ICA approach and empirically investigates how the current account in the East Asian countries was affected by domestic financial frictions before and after the East Asian financial crisis in 1997-1998.

Early influential papers such as Sachs (1981), Obstfeld (1982), and Johnson (1986) led to the wide use of the ICA approach to study short-run current account dynamics. According to the ICA approach, current account imbalances are an outcome of optimal intertemporal saving and investment decisions (Obstfeld and Rogoff, 1995). Most empirical studies in this literature use Campbell and Shiller's (1987) methodology to derive a directly estimable closed-form solution for the current account dynamics. Typical empirical studies along this line include Sheffrin and Woo (1990), Milbourne and Otto (1992), Otto (1992), and Ghosh (1995). Generally speaking, the empirical fits for these simple ICA models are relatively poor, and subsequent authors have improved the models in various directions. Some endogenize investment dynamics, separating them from output dynamics, and others incorporate time-varying interest rates. In these studies, many researchers focus on the effects that global and country-specific shocks and/or permanent and temporary shocks have on the current account. As demonstrated by Glick and Rogoff (1995) and Razin (1995), a global shock does not impact the current account because agents in a small open economy are uninsured against a global shock and their consumption cannot be optimally smoothed. However, a country-specific shock does affect the current account because agents mitigate the effects of the shock by adjusting their optimal consumption and saving behavior through the international financial markets. By deriving a closed-form current account solution, Kano (2008) examines the response of the current account to three different shocks, global, country-specific permanent, and country-specific transitory shocks, and discovers that consumption-tilting factors are crucial in explaining the current account movements in Canada and the United Kingdom.[1]

Moreover, applying Campbell and Mankiw's (1989) methodology, Shibata and Shintani (1998) and Bussière et al. (2010) introduce agents who cannot access international financial markets into the ICA model. Considering country-specific shocks to net output, Shibata and Shintani (1998) derive an explicit solution for the current account dynamics and estimate the dynamics for 11 countries of the Organisation for Economic Co-operation and Development (OECD). They find evidence showing the existence of international financial market imperfections for Canada, France, Japan, the United Kingdom, and the United States among the 11 countries. Bussière et al. (2010) obtain an estimable current account equation in the presence of global, productivity, and budget

[1]See Kano (2008) for details on consumption-tilting factors.

deficit shocks. Estimating the equation, they investigate the response of the current account to these shocks for the 21 OECD member countries.

Although the empirical literature on the ICA approach has studied the effects that various shocks have on the current account, few researchers have explicitly focused on the effects of domestic financial frictions.[2] Kasa (1998) and Kunieda and Shibata (2005) are notable exceptions.[3] Kasa extends the Kiyotaki and Moore (1997) model to a small open economy and derives closed-form solutions to the land price and current account dynamics. Estimating these dynamics for Japan, Korea, and Hong Kong, Kasa finds that the degree of the credit constraint is quite severe. Based on Kasa's model, Kunieda and Shibata develop a small open economy version of Kiyotaki and Moore's (1997) model to derive a closed-form current account solution in a collaterally constrained economy. Their closed-form solution is associated with the first difference in a land price; if a land price increases from time $t-1$ to t, the current account decreases at time t because of the relaxation of the collateral constraints. Using data on the Japanese economy, the authors estimate the current account dynamics in the Japanese economy and conclude that the Japanese economy was collaterally constrained from 1959 to 2001.

Kunieda and Shibata's (2005) closed-form current account solution is so simple that we can directly estimate the current account dynamics. However, we must prepare the land price data for the estimation, and the number of countries for which we can collect the land price data for long periods is relatively scarce. Additionally, the quality of the land price data is often not good, in that if we try to assemble the land price data, we can hardly avoid using the "house price index" as a proxy for the land price in many countries. Given this situation, we derive a new closed-form solution for the current account dynamics that is associated with the one-period-lagged first difference in *private credit* (abbreviated as "lagged DPC" henceforth). As in Kiyotaki and Moore's (1997) model, unconstrained agents (savers) and constrained agents (borrowers) endogenously appear in equilibrium in our model. In our closed-form solution, if private credit increases from time $t-2$ to $t-1$, the current account decreases at time t because of the presence of collateral constraints. The relaxation of the collateral constraint at time $t-1$ increases the constrained agents' borrowing and promotes the reallocation of land from the unconstrained agents to the constrained agents. In this case, the unconstrained agents' consumption-smoothing behavior does not change without technological shocks that affect their permanent income, but the constrained agents' consumption increases at time t because they can smooth their consumption more optimally. Accordingly, the aggregate consumption increases and the current account decreases at time t in the

[2]Many researchers have emphasized financial frictions as an important factor for understanding macroeconomic phenomena. For business cycles, see Bernanke and Gertler (1989), Kiyotaki and Moore (1997), and Matsuyama (2007) among others. For economic growth, see Galor and Zeira (1993) and Aghion et al. (2005) among others.

[3]Recently, some researchers such as Adam et al. (2012), Ferrero (2012), and Punzi (2012) study current account imbalances in an economy with financial frictions that are associated with housing markets. Differing from the traditional ICA approach, they use calibration to measure the impacts of financial frictions on the current account.

economy.

Although many authors have debated the causes and effects of the East Asian financial crisis (e.g., Woo et al., 2000; Stiglitz, 2002; Ito, 2007), this paper is the first to apply the ICA approach to investigate how the impact of domestic financial frictions on the current account balance changed before and after the East Asian financial crisis. We estimate our newly derived current account equation for six East Asian countries, Indonesia, Korea, Malaysia, the Philippines, Singapore, and Thailand, and investigate how collateral constraints affected the current account dynamics in the six countries before and after the 1997-1998 East Asian financial crisis. In our estimation, the relationship between the current account and the lagged DPC for each country is the key. Our primary results are summarized as follows.

- *Indonesia (1983-2007)*
  - *Before the financial crisis.* The lagged DPC has no effect on the current account. The collateral constraint does not affect the current account.
  - *After the financial crisis.* The lagged DPC has a negative and significant effect on the current account. The collateral constraint is binding and significantly affects the current account.
- *Korea (1973-2007), Malaysia (1962-2007), Thailand (1968-2007)*
  - *Before the financial crisis.* The lagged DPC has a negative and significant effect on the current account. The collateral constraint is binding and significantly affects the current account.
  - *After the financial crisis.* The lagged DPC has no effect on the current account. The collateral constraint does not affect the current account.
- *The Philippines (1962-2007)*
  - Throughout the estimation period, the lagged DPC consistently has an effect on the current account. The collateral constraint is binding and affects the current account.
- *Singapore (1969-2007)*
  - Throughout the estimation period, the lagged DPC has no effect on the current account and the collateral constraint does not affect the current account.

As mentioned before, the ICA approach investigates the short-run determinants of the current account dynamics. In contrast, there is a branch of the literature that focuses on the medium-term determinants of the current account imbalances across countries. A pioneering work by Chinn and Prasad (2003) in this branch is followed by many researchers including Chinn and Ito (2007) and Gruber and Kamin (2007). Among these studies, our study is related to Gruber and Kamin's (2007) work. Applying a panel-regression approach employed by Chinn and Prasad (2003), they find a result for the global pattern of current account imbalances that is consistent with Bernanke's (2005) global saving glut hypothesis, namely, the financial crises that occurred in the late 1990s contributed to the current account surplus in the Asian and Latin America countries after the crises.[4]

Before the East Asian financial crisis in 1997-1998, there were numerous capital inflows into the East Asian emerging economies. According to Bernanke (2005), these emerging economies did not always use these numerous funds in a productive fashions; poorly developed banking systems in these economies allocated these funds to less productive investment projects. Responding to the financial crisis, some governments in the East Asian countries, including those of Korea and Thailand, began to build up large quantities of foreign currency reserves, intervening in the financial markets.[5] Our empirical results obtained from the estimations for Korea, Malaysia, and Thailand, which were affected by the East Asian financial crisis, show that these three countries have an almost identical structural change with respect to the impact of collateral constraints on the current account. The collateral constraints in these three countries were binding before the financial crisis, which is an indication that private credit was not allocated in the most efficient way, but after the financial crisis, the collateral constraints do not affect the current account in these countries. This clear and identical structural change in these three countries is highly likely to indicate the government's intervention in the financial markets as it built up huge quantities of foreign currency reserves after the financial crisis; in this sense, our empirical findings are consistent with Gruber and Kamin's (2007) finding and Bernanke's (2005) global saving glut hypothesis.

The remainder of this paper is organized as follows. In the next section, we present a dynamic general equilibrium model and derive an estimable closed-form current account solution. In section 3, we provide the data description and in section 4, we obtain the estimation results for the six East Asian countries. We make our concluding remarks in

[4]These financial crises include those in Mexico in 1994, in the East Asian countries in 1997-1998, in Russia in 1998, in Brazil in 1999, and in Argentina in 2002.

[5]Another important implication of Bernanke's (2005) global saving glut hypothesis is the institutional-quality difference between the United States and developing countries. The institutional weaknesses associated with developing countries' investment conditions such as unsecured property rights, corruption, government ineffectiveness, and financial underdevelopment could explain why capital outflows go directly to the United States. Bernanke maintains that adequate financial and institutional development in the East Asian countries would reduce the current account surplus of these countries. Chinn and Ito (2007) find evidence that is apparently consistent with the global saving glut hypothesis, indicating that a fully developed financial sector in a country can lead to a reduction in the current account balance provided that the country is endowed with a fully developed legal system and an open financial market; however, they conclude that few East Asian countries are endowed with these types of legal systems and open markets, implying that most countries would actually experience higher savings with greater financial development. Gruber and Kamin (2007) also demonstrate that the institutional-quality difference fails to explain the large current deficit of the United States. Therefore, this part of the global saving glut hypothesis remains an open empirical question.

section 5.

2 Model

The structure of the model economy is based on Kunieda and Shibata (2005), which is an extension of Kasa (1998). Unlike Kunieda and Shibata (2005), who derived a closed-form solution for the current account dynamics associated with *land prices*, we obtain a closed-form solution associated with *private credit*. Although Kunieda and Shibata's closed-form solution is simple and directly estimable, there is a limited number of countries for which the land price data are available. Additionally, as mentioned in the introduction, the quality of the land price data is poor for many countries. In contrast, the private credit data available in most countries are more reliable. Therefore, the newly derived closed-form current account solution associated with *private credit* benefits us.

A country is assumed to be a small open economy facing a world interest rate. The economy consists of savers and borrowers. As in Kiyotaki and Moore's (1997) model, the borrowers are collaterally constrained. The total population in the economy is normalized to one and the ratio of borrowers to savers is $\lambda{:}1-\lambda$, where $\lambda \geq 0$ is a constant. All of the borrowers are identical in the sense that they have the same preference and technology. Similarly, all of the savers are identical in the same sense. The instantaneous utility functions of both the savers and the borrowers are assumed to be identical; specifically, these are given by $\ln c_t^*$ and $\ln c_t$ where c_t^* and c_t are the consumption of a saver and a borrower, respectively.

2.1 Savers

Each saver is endowed with two types of production technologies. While both of the two production technologies create a consumption good, their inputs are different. One uses land x_t^* as input and the production function is given by the following:

$$G_1(x_t^*),$$

where $G_1' > 0$ and $G_1'' < 0$. G_1 satisfies the Inada conditions: $\lim_{x^* \to 0} G_1'(.) = \infty$, $\lim_{x^* \to \infty} G_1'(.) = 0$ and $G_1(0) = 0$. The other technology uses capital k_t^* as input and the production function is given by the following:

$$G_2(k_t^*),$$

where $G_2' > 0$ and $G_2'' < 0$. G_2 also satisfies the Inada conditions. Because each saver is endowed with the two types of technologies, his output at time $t+1$ is given by the following:

$$y_{t+1}^* = G_1(x_t^*) + G_2(k_t^*),$$

where we note that production takes one gestation period. A saver with a discount factor $\beta \in (0,1)$ solves the following maximization problem:

$$\max \sum_{t=0}^{\infty} \beta^t \ln c_t^* \tag{1}$$

$$\text{s.t.} \quad c_t^* + q_t(x_t^* - x_{t-1}^*) + I_t^* + Rb_{t-1}^* = (1-\tau)[G_1(x_{t-1}^*) + G_2(k_{t-1}^*)] + b_t^*, \tag{2}$$

where $I_t^* = k_t^* - (1-\delta)k_{t-1}^*$, b_t^* is debt if positive or assets if negative, q_t is the land price, and R is the gross world interest rate, which is constant and assumed to be greater than one. Eq. (1) is the saver's life-time utility and Eq. (2) is his flow budget constraint. Note that the government imposes an income tax to finance its spending g_t in each period and τ is a constant tax rate.[6]

The first-order conditions for the saver are given by the following:

$$c_{t+1}^* = \beta R c_t^* \tag{3}$$

$$\frac{(1-\tau)G_1'(x_t^*)}{u_t} = R \tag{4}$$

$$(1-\tau)G_2'(k_t^*) = R + \delta - 1, \tag{5}$$

where $u_t = q_t - q_{t+1}/R$. Eq. (3) is the Euler equation, and Eq. (4) and Eq. (5) are the intra-temporal optimality conditions in the land and capital markets, respectively.[7] The necessary and sufficient conditions for the optimality of this maximization problem consist of Eqs. (3)-(5) as well as the transversality conditions, $\lim_{t\to\infty} R^{-t}b_t^* = \lim_{t\to\infty} = \beta^t(q_t x_t^*/c_t^*) = 0$. It is noted that k_t^* is constant throughout all time periods, whereas x_t^* varies according to the land price.

2.2 Borrowers

Each borrower is endowed with a linear production technology, $y_{t+1} = ax_t$, whose input is land.[8] Here, a, x_t, and y_{t+1} represent a constant productivity parameter, land held by a borrower at time t, and her output at time $t+1$, respectively. While a borrower

[6] Government spending g_t is exogenously determined by the government, which runs a balanced budget in each period, collecting tax from the savers and borrowers. Although any governmental services do not explicitly appear in our model, one could consider that government spending covers governmental services such as maintaining the rule of law, property rights, and other functions of markets.

[7] To be accurate, to ensure that all of the savers remain savers over their lifetimes, the assets held by the savers in the steady state, $-\hat{b}^*$, must be greater than zero. As seen later, $-\hat{b}^*$ is given by $-\hat{b}^* = [\delta\hat{k}^* - (1-\tau)(G_1(\hat{x}^*) + G_2(\hat{k}^*))]/(R-1)$, where $\hat{x}^* = G_1'^{-1}(R\beta a)$ and $\hat{k}^* = G_2'^{-1}((R+\delta-1)/(1-\tau))$ are the land and capital stocks, respectively, held by a saver in the steady state. We impose parameter conditions so that $-\hat{b}^* > 0$.

[8] For simplicity, it is assumed that each borrower is endowed with only one production technology, whose input is land. One could imagine that while each borrower can access another production technology that is linear with respect to capital, its productivity is extremely low compared to the world interest rate when the borrowers use it.

borrows resources from the financial market, she faces a credit constraint associated with the value of the collateral in each period. Following Kiyotaki and Moore (1997), technical conditions on the parameters are imposed:

$$a > R\beta a > G_1'\left((1 - R\beta)\bar{X}/(1 - \lambda)\right), \tag{6}$$

where $\bar{X}$ is the total amount of land. Through Eq. (6), we exclude economically meaningless solutions from the model.

A borrower with a discount factor $\beta \in (0, 1)$ maximizes her lifetime utility as follows:

$$\max \sum_{t=0}^{\infty} \beta^t \ln c_t \tag{7}$$

$$\text{s.t.} \quad c_t + q_t(x_t - x_{t-1}) + Rb_{t-1} = (1 - \tau)ax_{t-1} + b_t, \tag{8}$$

$$b_t \leq R^{-1} q_{t+1} x_t, \tag{9}$$

where Eqs. (8) and (9) are the flow budget constraint and the credit constraint, respectively, and again τ is the constant tax rate imposed on her income. The appendix proves that there exists time T, such that from time T onward, the credit constraints given by Eq. (9) are always binding. Henceforth, we focus on a case where the credit constraints are always binding.

The first-order conditions for the borrower are given by the following:

$$\frac{1}{c_t} - \beta R \frac{1}{c_{t+1}} - \phi_t = 0 \tag{10}$$

$$-\frac{q_t}{c_t} + \beta[(1 - \tau)a + q_{t+1}]\frac{1}{c_{t+1}} + R^{-1} q_{t+1} \phi_t = 0, \tag{11}$$

where ϕ_t is a co-state variable of the credit constraint at time t. The necessary and sufficient conditions for the optimality of this maximization problem consist of Eqs. (10) and (11) as well as the transversality conditions, $\lim_{t\to\infty} R^{-t} b_t = \lim_{t\to\infty} = \beta^t (q_t x_t / c_t) = 0$.

2.3 Equilibrium

A competitive equilibrium in this small open economy with the world interest rate R is expressed by sequences of a land price, $\{q_{t+1}\}$, and allocation, $\{(c_t^*, c_t), (x_t^*, x_t), (b_t^*, b_t), k_t\}$ for $t \geq 0$, so that the savers and borrowers' optimization conditions hold and the land market clears. As demonstrated by Kunieda and Shibata (2005), an equilibrium exists and is uniquely determined under the parameter conditions assumed in Eq. (6).

The saver's lifetime utility is log-linear and thus his optimal consumption is derived as follows:

$$c_t^* = (1 - \beta)[(1 - \tau)y_t^* - I_t^* + q_t x_{t-1}^* - Rb_{t-1}^* + \sum_{j=0}^{\infty} R^{-j} \pi_{t+j}], \tag{12}$$

where $\pi_t = (1/R)((1 - \tau)y_{t+1}^* - I_{t+1}^*) - u_t x_t^*$.

On the other hand, because Eq. (9) is binding, the budget constraint of a borrower, Eq. (8), is reduced to

$$c_t + u_t x_t = (1 - \tau) a x_{t-1}. \tag{13}$$

From Eqs. (10) and (11), we obtain a new Euler equation:

$$c_{t+1} = \frac{(1 - \tau) a \beta}{u_t} c_t. \tag{14}$$

From Eqs. (13) and (14), the borrower's optimal consumption is obtained as follows:

$$c_t = (1 - \beta)[(1 - \tau) a x_{t-1} + q_t x_{t-1} - R b_{t-1}] = (1 - \beta)(1 - \tau) a x_{t-1}. \tag{15}$$

Proposition 1
Suppose that $\hat{x}$ is the land held by borrowers in the steady state and Z_t, a so-called net output, is defined by the output minus the sum of investment and government expenditure. Then, the closed-form solution for the current account dynamics around the steady state of the economy is given by the following:

$$CA_t = \beta R \, CA_{t-1} + \beta \Delta Z_t - (1 - \beta) \Psi \lambda \hat{x} \Delta PC_{t-1}, \tag{16}$$

where CA_t, PC_{t-1}, and Ψ are the current account, private credit, and a particular constant, respectively, and Δ stands for the first difference in the variable.

Proof: See Appendix.

We have derived the closed-form current account solution associated with ΔPC_{t-1} or, equivalently, the lagged DPC. Eq. (16) is directly estimable. Intuitively, the production resources are allocated inefficiently if the agents in the economy are collaterally constrained. More concretely, less land is allocated to borrowers and more to savers in our model compared to an economy with a perfect credit market. In the current model economy, if the collateral constraint is relaxed at time $t - 1$ due to the anticipation of an increase in the land price, the constrained borrowers increase their borrowing and investment in land. Accordingly, production inefficiency is corrected and the aggregate production in the entire economy will increase at time t. The increase in production leads to an increase in total savings for the entire economy, which positively affects the current account. The term $\beta \Delta Z_t$ in Eq. (16) reflects this effect.

The reallocation of land from unconstrained agents to constrained agents that is induced by the relaxation of the collateral constraint does not affect the consumption behavior of the unconstrained agents. There is no effect because their investment in the land market and savings in the credit market are perfect substitutes in their consumption smoothing. Therefore, the Euler equation for an unconstrained agent, Eq. (3), is not subject to the land price. Therefore, without technological shocks that affect the agents' permanent income, the reallocation of land does not affect the consumption of the unconstrained agents. In contrast, the consumption behavior of constrained agents is affected by the land price, as observed with Eq. (14). As the land price increases, each constrained agent's consumption increases as well. Due to credit constraints, the constrained agent's investment in the land market and savings in the credit market are not perfect substitutes. It is better for the constrained agent to increase borrowing and invest more in land because their marginal revenue involving an increase in the land price is greater than the market interest rate. Then, their consumption smoothing is subject to the land price even if no technological shocks occur that affect their permanent income. As a consequence, the aggregate consumption in the entire economy increases as the land price increases. This phenomenon is reflected in the third term of Eq. (16), which negatively affects the current account. Although Eq. (16) has a similar form to that of Eq. (22) in Kunieda and Shibata (2005), we note a key difference between them. In Eq. (22) in Kunieda and Shibata (2005), the first-difference in a land price has a negative impact on the current account, whereas the lagged DPC has a negative impact on the current account in our newly derived solution (16).

If there are collaterally constrained agents, then it follows that $\lambda > 0$ in Eq. (16), but if there are no collaterally constrained agents, then $\lambda = 0$. Whether $\lambda = 0$ or not is statistically examined, where the null hypothesis is $\lambda = 0$ and the alternative hypothesis is $\lambda > 0$. If we reject the null hypothesis, we think of the country as being collaterally constrained.[9] The rejection of the null hypothesis implies that the collateral constraint in a country is binding and matters to the current account dynamics.

3 Data

3.1 Description and Source

We prepared an annual dataset of six East Asian countries: Indonesia, Korea, Malaysia, the Philippines, Singapore, and Thailand. We assembled the data for each country for as long a period as possible until 2007. We did not include the data from 2008 onward so that the estimation would avoid the effect of the global financial crisis in 2008-2009. The initial year for each country is different due to the data availability. To obtain the data on the current account, CA, and the net output, Z, we assembled the gross national product (GNP), the gross domestic product (GDP), aggregate consumption, aggregate investment (which is defined as the sum of gross fixed capital formation and changes in inventories), and government expenditure from the database of International Financial Statistics, which was issued by the International Monetary Fund (IMF) on January 2011. All of these variables are deflated by the consumer price index.

The data on the current account, CA, are computed as the GNP minus the sum of aggregate consumption, aggregate investment, and government expenditures. The net output, Z, is computed as GDP minus aggregate investment and government ex-

[9] As in the Kiyotaki-Moore model, land is used as collateral in our model. One might argue that other assets can be used as collateral. For instance, asset-based lending to small firms associated with inventories is becoming popular in the United States. Nevertheless, land is still considered to be common collateral in many countries.

penditure. The data on private credit were collected from the database of the financial structure created by World Bank (2012). In the database, we have a variable entitled "private credit by deposit money banks and other financial institutions to GDP," which is the private credit/GDP ratio. To obtain the data for real private credit, PC, we multiply the real GDP by the ratio.

Although we used the ordinary least squares (OLS) method for the basic estimation for Eq. (16), we are concerned about an endogeneity problem associated with ΔZ_t. For example, an increase in the demand for foreign investment may cause a decrease in domestic investment that increases ΔZ_t, implying that a reverse causality from CA_t to ΔZ_t can appear. Alternatively, there may be omitted variables such as the aging of the population that cannot be captured by Eq. (16) but that certainly has an effect on the current account. As such, we also performed an instrumental variable (IV) estimation for Eq. (16) to check the robustness for the results from the OLS estimation. We used the two-period-lagged aggregate investment and the two-period-lagged government expenditure as instrumental variables for ΔZ_t. These variables were assembled from the aforementioned database of International Financial Statistics. In reality, production will take a certain gestation period and the past investment should have a positive impact on the current production without correlating with the current error term. Additionally, the past government expenditure could construct infrastructure that increases the productivity of the entire economy without correlating with the current error term. Considering realities, it is appropriate to use these variables as instrumental variables for the net output ΔZ_t.

3.2 Stationarity

We examined the stationarity of each variable. Table 1 provides the Mackinnon approximate p-values for the augmented Dickey-Fuller test (henceforth, the ADF test) under the null hypothesis of a unit root. The statistics of the Kwiatkowski-Phillips-Schmidt-Shin (1992) test (henceforth, the KPSS test) under the null hypothesis of stationarity are presented in Table 1 as well.[10] The last column of Table 1 provides a diagnosis for the stationarity of each variable. In the diagnosis, "pass" means that at the conventional significance level, the hypothesis of no unit root is accepted both by the ADF test without trend and by the KPSS test without trend, or both by the ADF test with trend and by the KPSS test with trend. "Mixed" means that the hypothesis of no unit root is accepted either by the ADF test without trend or by the KPSS test without trend, or either by the ADF test with trend or by the KPSS test with trend. "Caution" means that none of the tests accept the hypothesis of no unit root.

Regarding the first difference in the net output, three cases out of six are labeled "pass," while the other three are labeled "mixed." However, for these three "mixed" cases, the ADF test with trend or without trend rejects the null hypothesis of a unit root at the 0.1% significance level. Therefore, we judge that the first difference in the net

[10] See Kwiatkowski et al. (1992).

output of these three cases follows stationary processes with or without trend. Regarding the first difference in private credit, three cases out of six are labeled "pass" and the other three are labeled "mixed." The stationarity of the first difference in private credit for the three "mixed" cases cannot be determined. However, if the first difference in private credit follows a unit root process and the first difference in the net output is stationary in a country, then the intertemporal budget constraints of individuals in the country do not hold. Therefore, we reasonably assume that the first difference in private credit is stationary (with or without trend) for all countries. Regarding the current account, two cases out of six are labeled "pass," two cases are labeled "mixed," and the other two cases are labeled "caution." These two "caution" cases are those for Malaysia and Singapore. The stationarity (with or without trend) of the current account cannot be accepted in the "caution" countries and cannot be determined in the "mixed" countries. However, for the intertemporal feasibility constraint of a country to be satisfied, the country's current account must follow a stationary process with or without trend.[11] The current account should be adjusted in the future so that the feasibility condition in a country holds. In sum, from a theoretical viewpoint, if DZ follows a stationary process (with or without trend), then the variables, CA and DPC, must follow stationary processes and we assume that all variables are stationary with or without trend.

[Table 1 around here]

4 Estimation Results

4.1 Benchmark Results

We estimated the current account dynamics given by Eq. (16). Following the convention, a constant term is always included in our estimation, although we do not report the estimated constant. The benchmark results on the six countries obtained from the OLS method are presented in Table 2.

[Table 2 around here]

Indonesia

The estimated coefficient of ΔPC_{t-1} is negative and significant as predicted by our model, implying that the null hypothesis that the collateral constraint does not affect the current account is rejected at the conventional significance level for the one-sided test. The coefficients of CA_{t-1} and DZ_t are positive as predicted by our model, but the impact of DZ_t is insignificant while that of CA_{t-1} is significant.

[11] This claim is proven by Trehan and Walsh (1991).

Korea, Malaysia, and Singapore

These three countries obtain a similar result, namely, although the coefficients of CA_{t-1} and DZ_t are positive and significant, the coefficient of ΔPC_{t-1} is positive as opposed to our model prediction.

The Philippines

The result for the Philippines is totally consistent with our model prediction; the coefficients of CA_{t-1} and DZ_t are positive and significant and the coefficient of ΔPC_{t-1} is negative and significant.

Thailand

As predicted by our model, the coefficients of CA_{t-1} and DZ_t are positive and significant, and the coefficient of ΔPC_{t-1} is negative; however, the impact of ΔPC_{t-1} on the current account is insignificant.

From the benchmark results, we note that only in Indonesia and the Philippines are the collateral constraints binding and only for these countries do they matter to their current account dynamics throughout the estimation period. We must be careful, however, in several respects when we interpret these results from the OLS method. The error term of the estimation equation may be serially correlated as often occurs in time-series analyses. We then tested whether there is serial correlation in the error term by using the Ljung-Box Q test (Ljung and Box, 1978). The Q statistics of all six countries do not reject the null hypothesis of no serial correlation.

In addition, as discussed in section 3, ΔZ_t may be an endogenous variable. We then conduct a robustness check by estimating Eq. (16) with the IV technique. The results are presented in Table 3, which shows that the patterns for the significance and signs of the coefficient of ΔPC_{t-1} for all six countries are exactly the same as those in the OLS results in Table 2.[12] Lastly, the benchmark results are obtained from the entire sample estimations. However, the entire sample estimations cannot uncover the structural changes in the current account dynamics. As discussed in Bernanke's (2005) global saving glut hypothesis, it is highly likely that the pattern for the current account dynamics in the East Asian countries changed before and after the financial crisis in 1997-1998. Motivated by the global saving glut hypothesis, we performed the F-test to determine if there is a structural change in the current account dynamics in the next section.

[Table 3 around here]

[12] Although in Indonesia, Korea, and Malaysia, the patterns for the significance and signs of the coefficient of ΔZ_t are different from those in the OLS results, our interest is in the coefficient of ΔPC_{t-1}.

4.2 Structural Change

We examined whether there was a structural change in the impact of lagged DPC before and after the 1997-1998 East Asian financial crisis by applying the F-test. We opened a test window from 1995 to 2000. Fig. 1 shows the F-values of the test for the structural change. As seen in the figure, the F-values for Indonesia, Korea, Malaysia, and Thailand are greater than the 5% significance level from 1997-1999, whereas the F-values for the Philippines and Singapore are never greater than the level throughout the test window. From the F-values in the figure, we judge that Indonesia, Korea, Malaysia, and Thailand have structural changes in the pattern for the current account dynamics in 1999, 1997, 1998, and 1997, respectively.

[Fig. 1 around here]

Table 4 presents the results obtained from the OLS estimations, dividing the data at each breaking point. The comparison between Tables 2 and 4 is remarkable.

Korea, Malaysia, and Thailand

Korea, Malaysia, and Thailand have an almost identical experience. Although Table 2 shows that the collateral constraints appear to not affect the current account dynamics in these three countries throughout the estimation period, Table 4 indicates that before the financial crisis, the collateral constraints affect the current account dynamics, with the current account being reduced by an increase in the lagged DPC. Moreover, these three countries' results before the financial crisis are consistent with our model prediction, implying that the coefficients of CA_{t-1} and DZ_t are positive and significant. After the financial crisis, however, the impact of the lagged DPC becomes positive.[13] The results obtained from the piecewise OLS estimations are consistent with Bernanke's (2005) global saving glut hypothesis. According to this hypothesis, before the financial crisis, significant amounts of capital had flowed in the East Asian countries and the capital inflows had not been used efficiently; after the crisis, some governments intervened in the financial markets and built up large quantities of foreign currency reserves.[14] Table 4 shows that the collateral constraints are binding before the crisis in these three countries, which is an indication that the production resources had not been used efficiently. In contrast, the collateral constraints do not affect the current account dynamics after the crisis, as opposed to our model prediction. The post-crisis estimations are highly likely to prove the presence of government interventions in the financial markets to build up significant quantities of foreign currency reserves.

[13] In the Philippines, the F-value of the test for the structural change is never greater than the 5% level over the test window. Nevertheless, the F-value peaks in 1998, as seen in Fig. 1. We therefore performed the piecewise OLS estimations, separating the data at this breaking point. The result indicates that the Philippines had a similar experience to that of Korea, Malaysia, and Thailand, although we do not report it here.

[14] In particular, the IMF got the monetary and fiscal policies of Indonesia, Korea, and Thailand under control immediately after the financial crisis.

Indonesia

The result for Indonesia is somewhat puzzling. Although the IMF controlled the monetary and fiscal policies in Indonesia immediately after the financial crisis, as mentioned in footnote 14, Table 4 shows that the collateral constraint affects the current account dynamics from 1999 to 2007. This result contrasts with those for Korea, Malaysia, and Thailand. As discussed by Hill and Shiraishi (2007) and Ito (2007), Indonesia in 1997-1998 was involved not only in the financial crisis but also in a political crisis with respect to the end of the Soeharto regime. Our estimation result might be affected by the political chaos at this time. Of course, this interpretation is tentative, and a caveat to our result is that there are only 9 observations after the financial crisis.

[Table 4 around here]

5 Concluding Remarks

We applied a small-open-economy version of Kiyotaki and Moore's (1997) model to derive a closed-form solution for the current account dynamics and investigated how collateral constraints impact the current account dynamics in the East Asian countries before and after the East Asian financial crisis. If Kiyotaki and Moore's model is statistically accepted for a country, we consider that the collateral constraint is binding and affects the current account dynamics in the country. Because the entire-sample analysis cannot uncover the structural change in the coefficient of the one-period-lagged first-difference in *private credit*, which is an indicator of the impact of collateral constraints, we have conducted an F-test for the structural change and estimated the current account dynamics, dividing the data at the breaking point of the structural change. Korea, Malaysia, and Thailand have an almost identical experience with respect to the current account dynamics before and after the financial crisis: namely, our estimations have demonstrated that the collateral constraints significantly affect the current account dynamics before the financial crisis in these three countries, but after the crisis, the collateral constraints have no effect on the current account. These results are consistent with Bernanke's (2005) global saving glut hypothesis. Our study provides researchers and policymakers with a new perspective with regard to financial crises in the era of globalization in that it clarifies how the impact of domestic financial frictions on the current account dynamics changes before and after the financial crisis.

In this paper, we have focused on estimations of the current account dynamics. However, there is another dynamic equation that can be directly estimated in our model, that is, Eq. (A.3) in the appendix. Eq. (A.3) is a closed-form solution for the consumption dynamics. In particular, the second term of the right-hand side represents the wealth effect of land holdings, and this term can be rewritten in terms of the one-period-lagged first difference in *private credit*. It is important to investigate the consumption dynamics in the East Asian countries. We leave this empirical question for future research.

Appendix

Proof of Proposition 1

To derive the current account dynamics, we aggregate the consumption functions over all of the agents. From Eqs. (15) and (12), the aggregate consumption function is given by the following:

$$C_t = (1-\beta)[Z_t + q_t\bar{X} + RF_{t-1} + (1-\lambda)\sum_{j=0}^{\infty} R^{-j}\pi_{t+j}], \tag{A.1}$$

where $C_t = \lambda c_t + (1-\lambda)c_t^*$, $Z_t = (1-\tau)[\lambda y_t + (1-\lambda)y_t^*] - (1-\lambda)I_t^*$, and $F_{t-1} = -(\lambda b_{t-1} + (1-\lambda)b_{t-1}^*)$. Here, F_{t-1} is the net foreign assets held by the country at time $t-1$. The first difference of Eq. (A.1) is obtained as follows:

$$\Delta C_t = (1-\beta)[\Delta Z_t + \Delta q_t\bar{X} + R\Delta F_{t-1} + (1-\lambda)\sum_{j=0}^{\infty} R^{-j}\Delta\pi_{t+j}]. \tag{A.2}$$

By linearizing $\sum_{j=0}^{\infty} R^{-j}\Delta\pi_{t+j}$ around the steady state, we have $\sum_{j=0}^{\infty} R^{-j}\Delta\pi_{t+j} = -\hat{x}^*\Delta q_t$ where $\hat{x}^*$ is the land held by a saver in the steady state. By using this equation, Eq. (A.2) is reduced to

$$\Delta C_t = (1-\beta)[\Delta Z_t + (\bar{X} - (1-\lambda)\hat{x}^*)\Delta q_t + R\Delta F_{t-1}]. \tag{A.3}$$

Meanwhile, it follows from the national income identity that:[15]

$$CA_t = RCA_{t-1} + \Delta Z_t - \Delta C_t, \tag{A.4}$$

where $CA_t = \Delta F_t$ is the current account at time t. From Eqs. (A.3) and (A.4), we obtain a dynamic equation with respect to the current account:

$$CA_t = \beta R\ CA_{t-1} + \beta\Delta Z_t - (1-\beta)(\bar{X} - (1-\lambda)\hat{x}^*)\Delta q_t. \tag{A.5}$$

Eq. (A.5) is the closed-form solution for the current account associated with land prices derived by Kunieda and Shibata (2005).

Linearizing $Rb_t = q_{t+1}x_t$ around the steady state, we have

$$R(b_t - \hat{b}) = \hat{x}(q_{t+1} - \hat{q}) + \hat{q}(x_t - \hat{x}).$$

By taking the first difference of this equation, it follows that:

$$R\Delta b_t = \hat{x}\Delta q_{t+1} + \hat{q}\Delta x_t. \tag{A.6}$$

Because $\bar{X} = \lambda x_t + (1-\lambda)x_t^*$, Eq. (A.5) becomes

$$CA_t = \beta RCA_{t-1} + \beta\Delta Z_t - (1-\beta)\lambda\hat{x}\Delta q_t. \tag{A.7}$$

[15] We should note that the national income identity is $Z_t + RF_{t-1} = F_t + C_t$.

Because we have $x_t - \hat{x} = \Phi(x_{t-1} - \hat{x})$, where $\Phi := \beta Ra/\left[\beta Ra - \hat{G}_1''\hat{x}\lambda/(1-\lambda)\right]$ around the steady state, it follows that

$$\Delta x_t = \Phi \Delta x_{t-1}$$

and thus

$$\Delta x_t = \Phi^{t-1}\Delta x_1. \tag{A.8}$$

From Eq. (4), we have $(1-\tau)G_1'\left((\bar{X} - \lambda x_t)/(1-\lambda)\right) = Rq_t - q_{t+1}$, which is expanded around the steady state as follows:

$$-\frac{\lambda(1-\tau)}{1-\lambda}\hat{G}_1''(x_t - \hat{x}) = R(q_t - \hat{q}) - (q_{t+1} - \hat{q}),$$

where $\hat{G}_1'' = G_1''(\hat{x}^*)$. From this, we obtain

$$\Delta q_{t+1} = R\Delta q_t + \frac{\lambda(1-\tau)}{1-\lambda}\hat{G}_1''\Delta x_t. \tag{A.9}$$

By substituting Eq. (A.8) into Eq. (A.9), we have

$$\Delta q_{t+1} = R\Delta q_t + \frac{\lambda(1-\tau)}{1-\lambda}\hat{G}_1''\Phi^{t-1}\Delta x_1. \tag{A.10}$$

The solution of Eq. (A.10) is given by the following:

$$\Delta q_t = (\frac{\Delta q_1}{\Phi} - \lambda\tilde{\Phi})\Phi R^{t-1} + \lambda\tilde{\Phi}\Phi^t, \tag{A.11}$$

where $\tilde{\Phi} = (1-\tau)\hat{G}_1''\Delta x_1/\left[(1-\lambda)(\Phi^2 - R\Phi)\right]$. It must hold that $\Delta q_1 = \lambda\tilde{\Phi}\Phi$ so that the transversality condition can be satisfied. Therefore, we obtain

$$\Delta q_t = \lambda\tilde{\Phi}\Phi^t. \tag{A.12}$$

From Eqs. (A.9) and (A.12), we have $\Delta x_t = \Delta x_1/(\lambda\tilde{\Phi}\Phi^2)\Delta q_{t+1}$. From the latter equation and Eq. (A.6), we obtain the following equation:

$$\hat{x}\Delta q_{t+1} = \frac{R\lambda\tilde{\Phi}\Phi^2\hat{x}}{\lambda\tilde{\Phi}\Phi^2\hat{x} + \hat{q}\Delta x_1}\Delta b_t. \tag{A.13}$$

Substituting Eq. (A.13) into Eq. (A.7), we have

$$CA_t = \beta RCA_{t-1} + \beta\Delta Z_t - (1-\beta)\lambda^2\Psi\hat{x}\Delta b_{t-1}, \tag{A.14}$$

where $\Psi := R\tilde{\Phi}\Phi^2/(\lambda\tilde{\Phi}\Phi^2\hat{x} + \hat{q}\Delta x_1)$. Because the increase in loans to each borrower contributes to the increase in the aggregate private credit, we have $\lambda\Delta b_t := \Delta PC_t$. By substituting this equation into (A.14), we obtain

$$CA_t = \beta RCA_{t-1} + \beta\Delta Z_t - (1-\beta)\Psi\lambda\hat{x}\Delta PC_{t-1}. \;\square$$

Binding Credit Constraints

The claim that there exists T such that from time T onwards, Eq. (9) is always binding is proven taking two steps. Step 1 claims that each borrower faces credit constraints at least once over her lifetime. Step 2 claims that if a borrower faces a credit constraint at time T, then the credit constraints are binding from T onward.

First, step 1 is proven by contradiction. Suppose that Eq. (9) is never binding. Then, $\phi_t = 0$ for all $t \geq 0$, and thus the Euler equation for a borrower becomes

$$c_{t+1} = \beta R c_t, \tag{B.1}$$

and the dynamic equation for the land price is given by

$$q_{t+1} = R q_t - a(1-\tau). \tag{B.2}$$

From Eq. (B.2) and the transversality condition, q_t must be constant for all $t \geq 0$ and is given by

$$q_t = \frac{a(1-\tau)}{R-1}.$$

From this equation, Eq. (4) is reduced to

$$G_1'(x_t^*) = a,$$

which implies that both x_t and x_t^* are constant. Then the borrower's budget constraint (8) becomes

$$c_t + R b_{t-1} = a(1-\tau)\tilde{x} + b_t, \tag{B.3}$$

where $\tilde{x} := \bar{X}/\lambda - (1-\lambda)G_1'^{-1}(a)/\lambda$. From Eqs. (B.1), (B.3), and the transversality condition, we can obtain the dynamics of b_t as follows:

$$b_t = \frac{\beta c_0}{\beta - 1}(\beta R)^t + \frac{a(1-\tau)\tilde{x}}{R-1},$$

where c_0 is the initial value of consumption. Because $\beta < 1$ and $R\beta < 1$, b_t is increasing and converges to $a(1-\tau)\tilde{x}/(R-1)$. However, this result is a contradiction because the right-hand side of Eq. (9) is equal to $a(1-\tau)\tilde{x}/R(R-1) < a(1-\tau)\tilde{x}/(R-1)$.

Next, we will show step 2. Suppose that the claim of step 2 does not hold. More concretely, suppose that Eq. (9) is not binding at time t when it is binding at time $t-1$. In this case, we have the Euler equations at time $t-1$ and t, respectively, as follows:

$$c_t = \frac{(1-\tau)a\beta}{u_{t-1}} c_{t-1} \tag{B.4}$$

$$c_{t+1} = \beta R c_t, \tag{B.5}$$

which implies that u_t becomes constant and is given by $\tilde{u} := (1-\tau)a/R$. From Eq. (4), x_t^* and x_t are constant and given by $\tilde{x}^* := G_1'^{-1}(a)$ and $\tilde{x} := \bar{X}/\lambda - (1-\lambda)G_1'^{-1}(a)/\lambda$, respectively.

Because the first equality of Eq. (15) holds whether Eq. (9) is binding or not, it follows from Eq. (15), Eq. (B.5) and $q_{t+1} = Rq_t - (1-\tau)a$ that $b_t = q_t\tilde{x} - \beta a(1-\tau)x_{t-1}$. From the last, however, we have

$$\begin{aligned} Rb_t - q_{t+1}\tilde{x} &= (\lambda\tilde{x} - \beta R\lambda x_{t-1})(1-\tau)a/\lambda \\ &> (\lambda\tilde{x} - \beta R\bar{X})(1-\tau)a/\lambda \\ &= \left[(1-\beta R)\bar{X}/(1-\lambda) - G_1'^{-1}(a)\right](1-\tau)(1-\lambda)a/\lambda > 0, \end{aligned}$$

where the last inequality comes from Eq. (6). This result is a contradiction. From mathematical induction, we have a desired conclusion. □

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Table 1: Test for stationarity

Country	Variable	Observation	ADF test without trend	ADF test with trend	KPSS test without trend	KPSS test with trend	Diagnosis
Indonesia	CA	29	0.016	0.077	0.102	0.073	Pass
	DZ	28	0.006	0.001	0.420	0.131	Pass
	Lagged DPC	24	0.135	0.379	0.111	0.074	Mixed
Korea	CA	41	0.038	0.015	0.577**	0.101	Pass
	DZ	40	0.004	0.000	0.558**	0.097	Pass
	Lagged DPC	34	0.471	0.490	0.611**	0.084	Mixed
Malaysia	CA	47	0.988	0.983	0.464**	0.188**	Caution
	DZ	46	0.003	0.000	0.714**	0.190**	Mixed
	Lagged DPC	45	0.036	0.047	0.464**	0.056	Pass
Philippines	CA	47	0.999	1.000	0.359	0.159**	Mixed
	DZ	46	0.011	0.001	0.527**	0.195**	Mixed
	Lagged DPC	45	0.025	0.111	0.053	0.054	Pass
Singapore	CA	39	1.000	0.997	0.711**	0.216**	Caution
	DZ	46	0.161	0.000	0.725**	0.148**	Mixed
	Lagged DPC	41	0.029	0.059	0.420	0.084	Pass
Thailand	CA	47	0.231	0.432	0.180	0.125	Mixed
	DZ	46	0.000	0.000	1.200***	0.073	Pass
	Lagged DPC	39	0.332	0.675	0.102	0.081	Mixed

Notes: The null hypothesis of the ADF test is that the time series has a unit root, for which the Mackinnon approximate p-values are entered. The null hypothesis of the KPSS test is that the time series does not have a unit root for which the test statistics are entered. The asterisks *** and ** indicate significance at the 1% and 5% level, respectively, for the KPSS test. In the diagnosis column, "pass" means that the hypothesis of no unit root is both by the ADF test without trend and by the KPSS test without trend, or both by the ADF test with trend and by the KPSS test with trend. "Mixed" means that the hypothesis of no unit root is accepted either by the ADF test without trend or by the KPSS test without trend, or either by the ADF test with trend or by the KPSS test with trend. "Caution" means that none of the tests accept the hypothesis of no unit root.

Table 2: OLS estimation

Country	Period	Lagged CA	DZ	Lagged DPC	R^2
Indonesia	1983-2007	0.390**	0.275	-0.173***	0.41
		(0.209)	(0.227)	(0.066)	
Korea	1973-2007	0.576***	0.646**	0.120	0.60
		(0.115)	(0.380)	(0.146)	
Malaysia	1962-2007	0.858***	0.905***	0.058	0.95
		(0.062)	(0.221)	(0.112)	
Philippines	1962-2007	0.915***	0.711***	-0.099*	0.97
		(0.026)	(0.105)	(0.063)	
Singapore	1969-2007	0.864***	1.041***	0.198	0.98
		(0.044)	(0.100)	(0.093)	
Thailand	1968-2007	0.846***	0.982***	-0.077	0.83
		(0.131)	(0.212)	(0.065)	

Notes: The dependent variable is the current account. All estimations include constant terms, although we do not report the estimated constants here. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively, for the one-sided tests. The numbers in parentheses are the heteroskedasticity-robust standard errors.

Table 3: IV estimation

Country	Period	Lagged CA	DZ	Lagged DPC	First-stage F-value	Hansen test (p-value)	LM test (p-value)
Indonesia	1983-2007	0.100	-0.133	-0.202**	3.09	0.84	0.48
		(0.271)	(0.213)	(0.089)			
Korea	1973-2007	0.512***	0.378	0.214	4.13	0.67	0.25
		(0.089)	(0.577)	(0.146)			
Malaysia	1962-2007	1.020***	0.150	0.272	3.99	0.83	0.79
		(0.099)	(0.443)	(0.253)			
Philippines	1962-2007	0.887***	0.824***	-0.113**	12.03	0.51	0.00
		(0.026)	(0.090)	(0.061)			
Singapore	1969-2007	0.846***	1.109***	0.211	17.40	0.44	0.00
		(0.063)	(0.222)	(0.099)			
Thailand	1968-2007	0.825***	0.790***	-0.069	19.80	0.13	0.01
		(0.126)	(0.191)	(0.068)			

Notes: The dependent variable is the current account. All estimations include constant terms although we do not report the estimated ones. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively, for the one-sided tests. The numbers in parentheses are the heteroskedasticity-robust standard errors. The instrumental variables for DZ are the two-period-lagged aggregate investment and the two-period-lagged government expenditure. The Hansen tests of overidentifyng restrictions do not reject the orthogonality conditions in all estimations. The LM test is robust to weak instruments and the p-values are associated with the significance of the coefficient of DZ. See Finlay and Magnusson (2009) for more information on the LM test.

Table 4: OLS estimation before and after the financial crisis

Country	Period	Lagged CA	DZ	Lagged DPC	R^2
Indonesia	1983-1998	-0.122	0.171	-0.024	0.09
		(0.274)	(0.367)	(0.295)	
	1999-2007	0.597**	0.399	-0.231***	0.77
		(0.247)	(0.332)	(0.067)	
Korea	1973-1996	0.860***	0.783***	-0.646***	0.82
		(0.142)	(0.159)	(0.085)	
	1997-2007	0.364*	0.624	0.198	0.22
		(0.247)	(0.762)	(0.175)	
Malaysia	1962-1997	0.903***	0.725***	-0.118***	0.80
		(0.124)	(0.163)	(0.026)	
	1998-2007	0.794***	0.485**	0.464	0.95
		(0.074)	(0.200)	(0.156)	
Thailand	1968-1996	0.580***	0.574***	-0.236***	0.93
		(0.153)	(0.141)	(0.061)	
	1997-2007	0.912***	1.068***	0.025	0.60
		(0.270)	(0.350)	(0.109)	

Notes: The dependent variable is the current account. All estimations include constant terms, although we do not report the estimated constants here. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively, for the one-sided tests. The numbers in parentheses are the heteroskedasticity-robust standard errors.

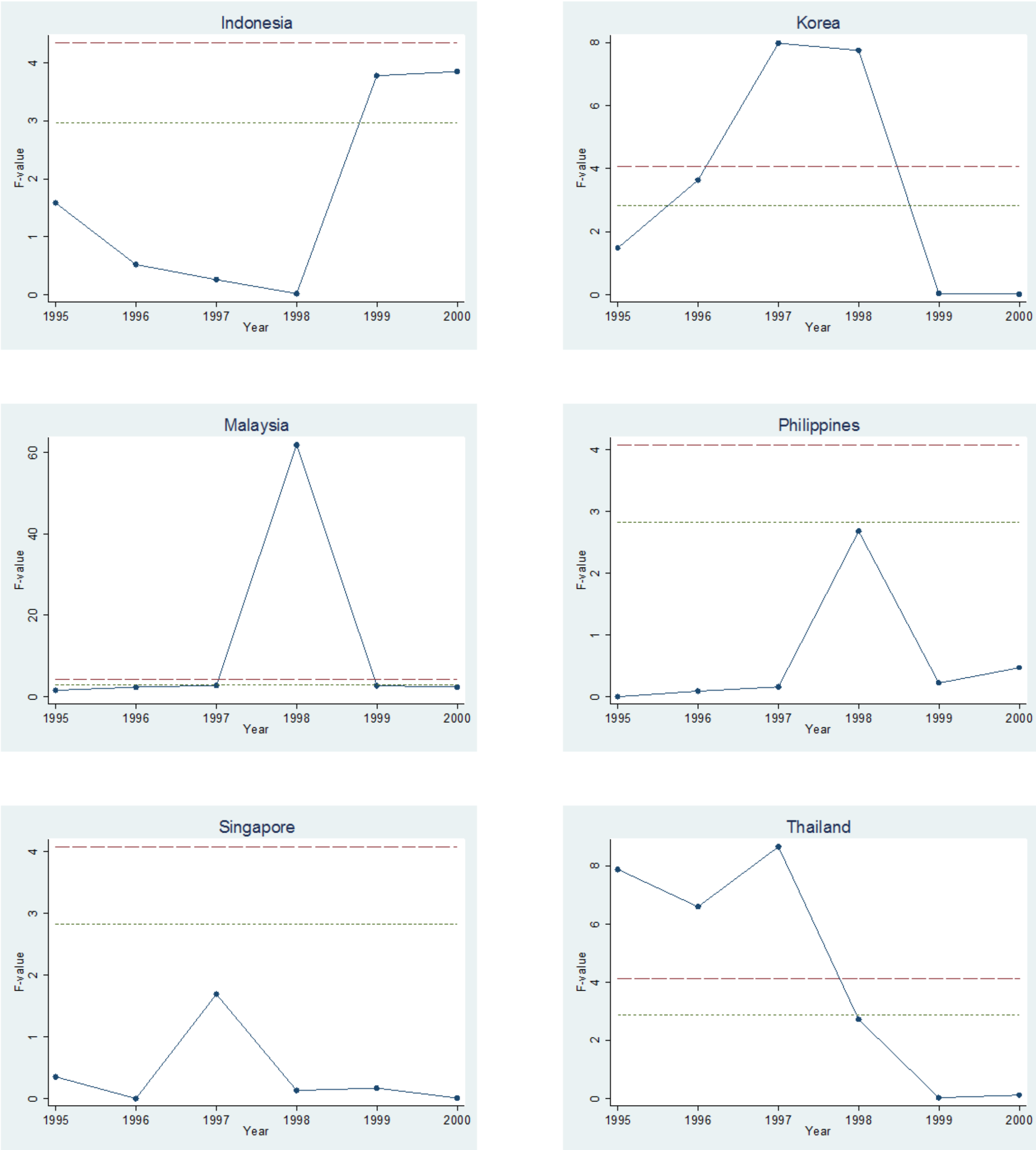

Fig. 1: Test for the structural change of lagged DPC

Notes: Each of the F-values is calculated under the null hypothesis that the coefficient of lagged DPC is not structurally changed after a given year. The long- and short-dash lines indicate the 1% and 5% significance levels, respectively.