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Exchange Rate Regime and Economic Growth in Asia: Convergence or Divergence

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Abstract: Exchange rates and exchange rate regimes in a constantly changing economy have always attracted much attention from scholars. However, there has not been a consensus on the effect of exchange rate on economic growth. To determine the direction and magnitude of the impact of an exchange rate regime on economic growth, this study uses the exchange rate database constructed by Reinhart and Rogoff. This study also employs the GMM (Generalized Method of Moments) technique on unbalanced panel data to analyze the effect of the exchange rate regime on economic growth in Asian countries from 1994 to 2016. Empirical results suggest that a fixed exchange rate regime (weak flexibility) will affect economic growth in the same direction. As such, results from the study will serve as quantitative evidence for countries in the Asian region to consider when selecting a suitable policy and an exchange rate regime to attain high economic growth.

Keywords: exchange rate regime; economic growth; Asia; Reinhart and Rogoff

1. Introduction

In a market economy with a flexible exchange rate, the exchange rate changes daily, or in fact, by the minute. The fluctuation in exchange rates has an impact on the economy (reflected by macroeconomic variables) and on society. As a result, in addition to policymakers and enterprises, the majority of the public pays attention to exchange rate changes. The selection of an appropriate exchange regime for a country is a very important issue, as it not only affects international finance but also a country's economic development.

In reality, different countries select different exchange rate regimes, and a country can have different exchange rate regimes at different points in time. There is not a universally suitable exchange rate regime for every country in the world. Some countries choose a floating exchange rate regime when the price of a country's currency relative to other currencies entirely depends on the supply and demand of related currencies. One of the representative countries with a floating exchange rate regime is Australia. In Australia, the Reserve Bank of Australia (RBA) does not intervene in the foreign exchange market except for in urgent situations, such as a speculative attack. Some countries may choose a fixed exchange rate (Hong Kong), while others, such as Vietnam, opt for a managed floating system.

From a theoretical angle, the theory of optimum currency areas by American economist Mundell (1961) states that a fixed exchange rate regime can enhance trade and output growth by devaluing the exchange rate and risk premium, while encouraging investment by lowering monetary value with interest rates. The criteria of the theory of optimum currency areas include trade interdependence, a converging trend of macro policies, flexibility of production factors, and uniform responses to shocks.

From an empirical angle, many scholars have examined how the exchange rate regime affects economic growth and have arrived at different conclusions. Empirical studies by Baxter and Stockman (1989); Flood and Rose (1995); Ghosh et al. (2002); Mauro and Juhn (2002) argue that the choice of exchange rate regime has no effect on economic growth. However, the study by Husain et al. (2005) contends that a floating exchange rate regime is more stable and has a stronger relationship with growth, while a managed float in emerging economies is unstable and vulnerable to crises. On the other hand, studies by Mundell (1961); Dubas et al. (2005); and Bailliu et al. (2003) show contradictory results.

The current study is employed to supply additional empirical evidence on growth and exchange rate regimes for Asian countries. To the best of our knowledge, most of the studies used de jure data set on exchange rate regimes such as Husain et al. (2005); Domaç et al. (2004); and Eichengreen and Leblang (2003) but a limited number of studies conducted their research with de facto exchange rate regimes of Asian countries such as Coudert and Dubert (2005). To address this issue, in this paper, we contribute to the discussion by using the unique data set of the exchange rate regime classification by Reinhart and Rogoff (2004) with two types of measurement, by value and by group of dummy variables, to investigate the effect of exchange rate regime on economic growth. This study also covers all Asian countries with data availability.

Moreover, this paper pays much attention to Asian countries. Asia is one of the world's most dynamic economic regions and plays an essential role in the world's economy. Figure 1 shows that the growth rates of Asian countries are always much higher than the average growth of the world. Referring to papers on the exchange rate regime and economic growth, most studies focused either on all the world such as Ghosh et al. (1997); Moreno (2001); Levy-Yeyati and Sturzenegger (2003); Husain et al. (2005); and Dubas et al. (2005), or indispensable Asian countries which suffered from the financial crisis of 1997 such as Huang and Malhotra (2005); and Coudert and Dubert (2005). Moreover, the empirical evidence of Asian countries over the time period of the study confirms the theory of Mundell (1961) on optimum currency areas, which requires trade interdependence, convergence of macro policies, and flexibility in production factors. Asian countries are increasingly open to trade, and financial markets play an increasingly important part of the world economy. Asia also has a high number of emerging and developing countries. Therefore, the stability of currency values plays an important role in the balance of trade, thereby contributing positively to a country's economic growth. The choice of exchange rate regime ultimately aims to boost growth, improving the standard of living and executing international responsibilities. As a result, the study of these countries will provide many vital implications in the choice of exchange rate regime for Asian countries.
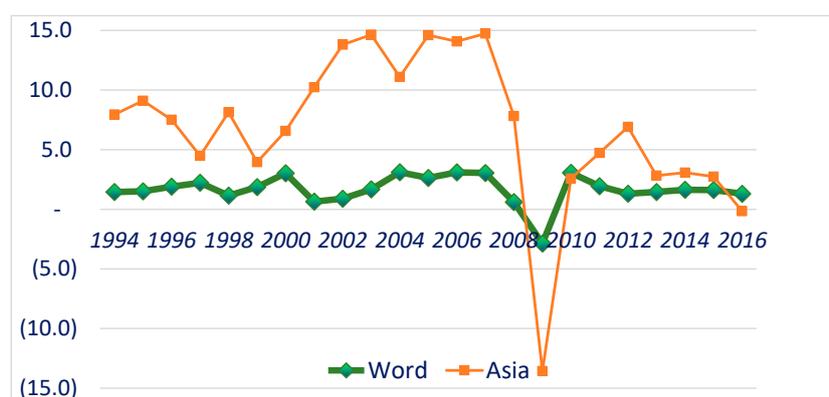
Figure 1. Average growth rate of GDP per capita of World and Asian countries in 1994–2016.

Despite these miraculous developments, Asian economies have fell into crisis in the 1990s. This currency crisis started Thailand in 1997 (Stiglitz 2000; Wang 1999; Wade 1998) then spread to the rest of southeast Asia, to the Taiwan, Hong Kong, Korea, Russia, and even countries such as Australia and New Zealand (Wade 1998; Jang and Sul 2002; Athukorala and Rajapatirana 2003). These countries

were also affected by the 2008 economic crisis. The global economic crisis in 2008 saw the banks panic, with a sudden drop in lending in the US (Ivashina and Scharfstein 2010) cause recessions in many western countries (Burdekin et al. 2012; Barth et al. 2012), falling stock prices, and large-scale currency depreciation in the US and Europe, before spreading to other countries (Ivashina and Scharfstein 2010; Kotz 2009).

The contributions of this paper are as follows: (1) economic theory and empirical evidence provides conflicting predictions about the effects of exchange rate regimes on economic growth. This paper attempts to help close this gap by examining the effect of exchange rate regimes on economic growth using de facto exchange rate classification which is considered to be a better indicator for exchange rate policy; (2) This is a unique study using two datasets (the dataset of Reinhart and Rogoff, which reflects the foreign exchange market, and the dataset of Laeven and Valencia, which identifies the crisis year of each Asian country); (3) This research investigates the role of crisis (two measurement techniques of crisis) in the impact of exchange rate regimes on economic growth.

The rest of this paper is structured as follows: Section 2 presents a literature review. Section 3 presents the methods and data. Empirical results and a discussion are given in Section 4. Lastly, Section 5 includes some conclusions and policy recommendations.

2. Theoretical Reviews on the Effect of Exchange Rate on Economic Growth

2.1. Exchange Rate Regime

According to Ilzetzki et al. (2017) and International Monetary Fund (IMF), types of exchange rate regime classification based upon official statements of the jure policy include (1) exchange arrangement with no separate legal tender; (2) currency board arrangement; (3) conventional peg arrangement; (4) stabilized arrangement; (5) crawling peg; (6) crawling-like arrangement; (7) pegged exchange rate within horizontal bands; (8) floating; (9) free floating; and (10) other managed arrangements.

Since the IMF classification of exchange rate regimes is based on information provided by member countries, it does not reflect the differences between the actual implementation versus the official statements. According to Rose (2011), there are some other de facto exchange rate regime classifications such as Levy-Yeyati and Sturzenegger (2003); Reinhart and Rogoff (2004) (RR); and Shambaugh (2004). The ratio of observations is similar between these methodologies of classifications and IMF one is 59%, 59%, and 68% respectively. RR classification is based on market-determined exchange rates, dividing regimes into 5 groups: (1) the fixed exchange rate regime: a fixed regime that is announced and maintained, with monetary policy pegged to foreign policy; (2) the peg regime: the central exchange rate is pegged to another currency on a fixed rate with a small margin of fluctuation, the central bank is ready to intervene to maintain the rate, central bank may intervene but not frequently; (3) the managed float regime: the exchange rate is determined by the market, which means there is no officially announced exchange rate though the government has an underlying target exchange rate; the central bank proactively intervenes to soften the fluctuations; (4) the free float regime: the exchange rate is entirely determined by the market as the central bank has no underlying target rate and does little intervention; and (5) the "free-falling" regime: a regime that can be any type legally but the country is in fact suffering from a crisis.

International Monetary Fund (IMF) presents a set of common principles regarding the size of the economy, openness, diversification of production/export, diversification of export market, difference between domestic and external inflation, extent of economic development, finance, extent of freedom in capital movement, exchange rate fluctuation, and trustworthiness of policies to control inflation. The choice of an appropriate exchange rate regime depends on the characteristics of each country and may vary with time.

2.2. Theoretical Background and Previous Studies on Exchange Rate Regime and Economic Growth

Ghosh et al. (1997); Bailliu et al. (2003); and Jakob (2016) point out that economic theory which explains how the exchange rate regime affects economic growth is relatively modest. Theories mainly refer to the exchange rate regimes that can affect trade, investment, and productivity, and thereby affect growth. Furthermore, the magnitude of these effects is upon the development level of each country. Two notable theories concerning this relationship are the theory of optimum currency areas (OCA) of Mundell (1961) and Penne hypothesis of Balassa (1964); Samuelson (1964). The leading theoretical basis for exchange rate regime selection is the theory of OCA, first proposed by Mundell (1961) and McKinnon (1963). According to his theory, a fixed exchange rate regime can promote trade and output growth by devaluing the exchange rate and risk insurance premium, while encouraging investment by lowering the monetary value with interest rate. However, on the other hand, it reduces trade growth potential and output growth by suspending, delaying, or slowing the necessary relative price adjustment process. The Balassa–Samuelson hypothesis is also considered to be a well-known theory indirectly explaining exchange rate regime, trade, and growth. The Penne effect is explained by productivity increases in the tradable sector tending to be higher than that of non-tradable ones. In turn, the productivity increases are expected to contribute to higher growth rates of prices in the tradable sector. Moreover, exchange rates tend to appreciate in countries with high growth rate and be underestimated in countries with low growth rate (Balassa 1964; Samuelson 1964).

Because theories do not present the foundations of the relationship between exchange rate regimes and economic growth, the research framework is built on neoclassical economic growth theory, endogenous growth theory, and empirical evidence.

For economic theory, the neoclassical theory by Solow (1956) introduces labor and technology into the growth equation with decreasing marginal returns to production factors. The production function is Y = f (K, L, R, T) in which Y = output (GDP), K = capital, L = labor force, R = natural resources and T = technology. According to Mankiw et al. (1995), capital does not flow to developing countries to make use of the high rates of return, as Solow and subsequently Lucas (1988) have predicted. Countries that invest more in physical and human capital will not only achieve an income in the steady state that is higher than in Solow's model, but also continue to grow at a faster rate. This means that the growth rate is not simply a reflection of external factors such as labor force growth rate or rate of global technological change, but also an endogenous variable in the model. Since then, economists have developed more sophisticated models and brought many endogenous variables into the model. This contribution has formed the research of Lucas (1988); Romer (1986); Romer (1990).

For empirical evidence, there are various studies on the impact of exchange rate regime on economic growth. The studies using descriptive statistics on panel data have provided very different results. Baxter and Stockman (1989) examined 49 countries in the 1946–1984 period, concluding that the impact does not exist. Meanwhile, a study by Mundell (2002), which looked into the 1947–1993 period in the US, Japan, Canada, and European countries, and a study by Moreno (2001), which investigated 98 developing countries in East Asia in 1974–1999, show a same-direction impact. Ghosh et al. (1997) conducted a study on 145 countries in the 1960–1990 period, which found no clear impact.

Following the studies using descriptive statistics, many post-2002 studies opt to use econometric models, most commonly pooled ordinary least squares. Similar to those using descriptive statistics, the econometric studies yield inconsistent results on the impact of exchange rate regime on economic growth.

A lot of the studies, with different data types, different time periods, and different estimation techniques, find no conclusive evidence on whether exchange rate regime makes a difference to economic growth. Huang and Malhotra (2005) used regression on panel data of 18 developed countries in 1976–2001. Domaç et al. (2004) employed the switching estimation technique for 22 different countries in different time periods in 10 years in the 1990s. Garofalo (2005) used OLS and 2SLS for Italy in the 1861–1998 period.

Besides the studies that give inconclusive results, there are studies that prove the inverse relationship between the fixed extent of the exchange rate and economic growth, such as Husain et al. (2005), Levy-Yeyati and Sturzenegger (2003) (183 countries in 1974–2000), and Eichengreen and Leblang (2003) (21 countries in 1880–1997). Most notably, Husain et al. (2005) argues that a floating exchange rate regime is more stable and has a strong relationship with economic growth. This is because richer and more financially developed countries benefit more from the flexibility of the exchange rate system. On the other hand, as developing countries are less sensitive to the capital markets, a pegged exchange rate regime brings lower inflation and more stability for the economy, even though this regime is least stable and more susceptible to risks when crises occur.

In particular, Levy-Yeyati and Sturzenegger (2003) examined the relationship between growth and exchange rate regime of 183 countries in the post-Bretton–Woods era between 1974 and 2000. Developing countries that have a less flexible exchange rate regime have a slower growth rate and more volatile output fluctuation. Meanwhile, in industrial countries, exchange rate regime does not have any impact on growth. Even though this result is later rebutted by Bleaney and Francisco (2007) as having a weak basis, it prompts much thinking on the diverging or converging nature of the effect of exchange rate regime on economic growth.

Contrary to this viewpoint, according to the theoretical analysis by Mundell (1961), who establishes the foundation of the theory of exchange rate regime selection, a fixed exchange rate regime can enhance trade and output growth rate by devaluing the exchange rate and risk premium, while encouraging investment by lowering the monetary value with interest rate. Criteria to achieve this include trade interdependence among countries in the area, a converging trend in macro policies, flexibility of production factors, and uniform responses to shocks. This result is supported by empirical studies conducted by Dubas et al. (2005); De Grauwe and Schnabl (2005); Bailliu et al. (2003); and Baldwin (1989). In their study, Ghosh et al. (2002) state that "one of the most surprising discoveries is that the growth results of a fixed exchange rate regime are not worse than the floating regimes". Dubas et al. (2005) prove that there is a meaningful symmetrical effect between fixing the exchange rate and economic growth. Notably, countries with exchange rate regimes that show "fear of floating" (in which the exchange rate regime is announced to be floating but exposes characteristics of a fixed regime) have a significantly higher growth rate than other countries. Other than in developing countries, De Grauwe and Schnabl (2005) point out that a fixed exchange rate does not reduce economic growth in Central and East European countries, and that it is unconvincing to think that joining the European common currency area will dampen economic growth. In support of this argument, Baldwin (1989) in his analysis of the European monetary union asserts that a common currency such as the euro can stimulate economic growth in Europe by reducing the exchange rate premium on capital within the continent. In addition to the effect of exchange rate regime, economic growth is affected by other factors, which are compiled in Table 1.

Table 1. List of explanatory variables used in previous studies.

Author	Time and Region Regime	Independent Variables	Methods	Results
Baxter and Stockman (1989)	1946–1984; 49 countries; pegged and floating		Comparative	No effect
Mundell (2002)	1947–1993; US, Japan, Canada, EC, other Europe; De jure		Descriptive statistics	Positive
Moreno (2001)	1974–1999; 98 East Asian developing countries; De facto		Descriptive statistics	Positive
Ghosh et al. (2002)	1960–1990; 145 countries; De jure		Descriptive statistics	Unclear relationship

Table 1. *Cont.*

Author	Time and Region Regime	Independent Variables	Methods	Results
Levy-Yeyati and Sturzenegger (2003)	1974–2000; 183 countries; De facto	investment/GDP; terms of trade; Government spending; political instability; average initial GDP; population; trade openness; enrollment rate of secondary school; dummy variable for the region and exchange rate regime	OLS; 2SLS	Negative
Eichengreen and Leblang (2003)	1880–1997; 21 countries; de jure	income per capita/total income, enrollment rate of primary, and secondary students, capital control, dummy exchange rate regime	GMM	Negative
Bailliu et al. (2003)	1973–1998; 60 countries; de facto and de jure	initial GDP, investment rate/GDP, number of secondary students, real government spending/GDP, trade openness, M2/GDP, private sector credit/GDP, domestic credit/GDP, net private capital/GDP, exchange rate dummy variable	GMM	Positive
Domaç et al. (2004)	10 years (1990s, different period for each country); 22 transition countries; de jure	net government spending, lagged financial openness, inflation, number of years in socialism, urbanization degree, the proportion of trade in CMEA	Switching estimation technique	Depend on development level
Husain et al. (2005)	1970–1999; 158 countries; De jure	Investment/GDP; Trade openness; term of trade growth, average years of schooling, tax rates, net government spending; initial average annual income/gross income; population growth; population; exchange rate dummy variable	OLS	Developing countries: positive Developed countries: Negative, emerging: insignificant
Garofalo (2005)	1861–1998; Italy; De facto	investment/GDP; Government spending; political instability; initial GDP; population; trade openness; enrollment rate of secondary school students; dummy variable for the region and exchange rate regime	OLS; 2SLS	Depend on development level
Dubas et al. (2005)	1960–2002; 180 countries; De facto	initial GDP, initial population, population growth, investment /GDP; civil responsibility, trade openness; terms of trade, dummy variables for transition countries, Latin America and Africa, time dummy variables, exchange rate dummy variables	REM	Positive
Huang and Malhotra (2005)	1976–2001; 12 developing Asian countries and 18 developed European countries; De facto	financial crisis, trade openness; initial GDP, fertility rate, enrollment rate of secondary school students, dummy exchange rate regime	Pooled OLS	Depend on development level
Coudert and Dubert (2005)	1990–2011; 10 Asian countries	initial GDP, investment/GDP, population, trade openness, education spending	2SLS	Positive
De Grauwe and Schnabl (2005)	1994–2002; 10 Eastern Europe countries; de facto	investment rate/GDP; export, net government spending/GDP; Short-term capital/GDP ratio, EU-15 real growth rate, exchange rate dummy variable	GMM	Positive
Bleaney and Francisco (2007)	1984–2001; 91 developing countries; de facto	growth rate, time, exchange rate regime (all are dummy)	Pooled OLS	Negative

Source: Authors' synthesis.

Levy-Yeyati and

3. Data and Model

3.1. Data

The study spans the 1994–2016 period and covers 46 countries according to geographical classification of the World Bank (Appendix A, column 1). Among them, 34 countries have sufficient data on the exchange rate regimes following RR classifications (Column 2), and 23 countries were present in systemic banking crisis data of Laeven and Valencia (2018). Therefore, all available data studies the impact of exchange rate regimes on economic growth. Moreover, Georgia and Russia were considered to be "dual market in which parallel market data is missing" in 1997, 1998 and 1997, 1998, 2011–2016, respectively. Data comprises an unbalanced panel with 525 observations.

Most variables, such as economic growth, trade openness, government expenditure, and education, are extracted from the World Development Indicator database (WDI) of World Bank.

Exchange rate regime (ER), the independent variable in the model, is the measurement of the exchange rate policies of various countries, and taken from the publications of Reinhart and Rogoff at http://www.carmenreinhart.com, a website updated by the two professors. They re-classify actual exchange rate regimes based on reports of member countries to IMF. According to Reinhart and Rogoff (2004), exchange rate regimes are sorted from the most rigid to the most flexible {1; 2; 3; 4; 5} = {fixed; pegged; managed float; free float; "free-fall"}.

Crisis data is updated in the database on systemic banking crises presented in Laeven and Valencia (2018) and can be downloaded at https://sites.google.com/site/laevenl/des. This data set provides more comprehensive information of the crisis over time. In contrast to other research, this dataset points out the crisis year of each country. The descriptive variables are presented in Table 2.

Table 2. A summary of variables.

Variables	Definition	Calculation
Dependent variable		
$Y_{i,t}(g)$	Economic growth	Growth rate of GDP per capita (measured in USD with 2010 as the base year)
Independent variable		
$Y_{i,t-1}$		GDP per capita of the year preceding year t
ER	Exchange rate regime	taking on the values 1, 2, 3, 4, 5
CRISIS	Crisis	dummy variables: 1 in crisis year (model 1)
		dummy variables: 1 in 1997 and 2008 (model 2)
OPEN	Trade openness	(Export + Import)/GDP
GOV	Government spending	General government final consumption expenditure (% of GDP)
EDU	A measurement of human capital	Total secondary school enrollment/Total population
GDP initial	A measurement of catching-up process	Ln (Real GDP per capita of 1993)

3.2. Research Model

Drawing from the theoretical basis and empirical studies, and from the process of trial and error, the research model is constructed with the following factors: (1) GDP per capital growth; (2) exchange rate regime; (3) frequency of monetary crisis, magnitude of crisis; (4) openness of the economy; (5) government spending; and (6) human capital. To examine the impact between exchange rate regime and economic growth, the study is based on theoretical and empirical studies (Table 1), and makes use of the two approaches, in which Model 1 uses a proportionate variable for exchange rate regime while Model 2 uses dummy variables for types of exchange rate regime as follows:

Model 1:

$$Y_{i,t(g)} = a + Y_{i,t-1} + \mu_1 ER + \mu_2 CRISIS + \mu_3 OPEN + \mu_4 GOV + \mu_5 EDU + GDPinitial + \varepsilon \quad (1)$$

Model 2:

$$Y_{i,t(g)} = a + Y_{i,t-1} + \mu_{11} dregime_1 + \mu_{12} dregime_2 + \mu_{13} dregime_3 + \mu_{14D} dregime_4 + \mu_2 CRISIS + \\ \mu_3 OPEN + \mu_4 GOV + \mu_5 EDU + GDPinitial + \varepsilon \quad (2)$$

In which:

- Crisis is a dummy variable reflecting the effect of the global financial crisis of 2008 and Asian financial crisis of 1997 on output (Ma and Lin 2016). In addition to Ma and Lin (2016), the currency crisis of 1997 was recognized in the studies of Stiglitz (2000); Wang (1999); Wade (1998); Jang and Sul (2002); and Athukorala and Rajapatirana (2003) while the financial crisis of 2008 was emphasized in the studies of Ivashina and Scharfstein (2010); Munir (2011); Kotz (2009). To cross check and increase the reliability of empirical evidence, this study uses another database of crisis, which is introduced and updated by Laeven and Valencia (2018).
- Openness reveals trade openness level. The effect of trade openness is not clear cut. Studies supporting fixed exchange rates suggest that the fixed exchange rate will reduce exchange rate risk, thus stimulating trade, investment, and especially technology transfer, increasing the openness of the economy and in turn promoting economic growth (Moreno 2001; De Grauwe and Schnabl 2005; Sachs et al. 1995). Unsupported studies such as Bailliu et al. (2003); Domaç et al. (2004) suggest that the flexible exchange rate will smooth the adjustment to shocks, thereby quickly and easily and absorbing economic shocks, enhancing the expected growth. They also pointed out that when uncertainty exists, trade and investment activities will become hesitant and many countries are claimed as mentioned in McKinnon (1963); Calvo and Reinhart (2002). In particular, Rodriguez and Rodrik (2000) could not find any linkage. However, given that most countries in our sample have based their development strategy on exports, a positive impact can be expected.
- Government spending and education enrollment should have a positive impact on growth, since such expenditure is generally viewed as an improvement in investment and human capital and helps to increase the factors of production. Both variables are represented by the resources in standard economic growth model.
- GDP initial is designed to stand for the catching-up process. According to neoclassical theory, initial per-capita income has a negative relationship with economic growth (Bailliu et al. 2003; Huang and Malhotra 2005; Coudert and Dubert 2005). Countries with a lower level of initial per-capita growth will grow faster than higher ones because they must go out of their steady state and must catch up.

For estimation technique, initially, the study uses pooled OLS estimation. However, a heteroskedasticity test using the Greene test (Greene 2000), and autocorrelation test using Wooldridge (2010) and Drukker (2003) show the presence of heteroskedasticity and autocorrelation. Moreover, the relationship between government spending and economic growth is theoretically endogenous, as confirmed by Lee and Gordon (2005) and Halko et al. (2012). Moreover, the existence of endogeneity in the model has been demonstrated in background theory. Endogenous problems in the model are mentioned by Garofalo (2005). In addition, the simultaneous relationship between economic growth and the exchange rate regime is also mentioned in the study of Levy-Yeyati and Sturzenegger (2003), and potential two-way causality between economic performance and the exchange rate regime also are pointed out by Bailliu et al. (2003).

As a result, this study will conduct the regression using the GMM (Generalized Method of Moments) on unbalanced panel data. According to results from Arellano and Bond (1991) and

Arellano and Bover (1995), GMM is an effective solution to control for autocorrelation of residuals, heteroskedasticity and endogeneity, ensuring that the estimation is strong and robust.

4. Analysis and Discussion of Results

4.1. Descriptive Statistics of Data

From Table 3, it can be seen that the standard variations are not too high compared to the mean values. The data are relatively uniform, with no presence of anomaly. A sample size of 525 observations is a large size in statistics according to Green (1991).

Table 3. Descriptive statistics of variables.

Variable	Sample Size	Mean	Standard Variation	Min	Max
Y	525	3.56	4.99	−20.78	32.99
GDP initial	525	4212.14	7890.64	180.19	35,451.30
ER	525	2.34	1.06	1.00	5.00
OPEN	525	81.52	37.92	16.10	220.41
GOV	525	14.02	4.87	5.46	33.92
EDU	525	8.54	2.33	3.98	14.14

The average economic growth of the countries being studied is 3.56 in the 1994–2016 period. Since a standard variation of 4.99 is not too high compared to the mean, the growth in this period is relatively stable. Tajikistan has the lowest growth rate of (−22.48%) in 1994. Azerbaijan has the highest growth rate of 33.03% in 2006.

Figure 1 shows that the trend in the growth rate of countries and territories in Asia is similar to that of the world economy, with two slowdowns in 1997–1998 and 2008–2009.

In the Asian region, the exchange rate regime is very diverse. During the period of research, most countries are under pegged or managed to float regimes: Kazakhstan, Kyrgyz, Sri Lanka, and Vietnam follow pegged exchange rates (except for crisis time); Brunei, Israel, and Turkey adopted managed flow; the others apply both. Small countries or demand economy countries adopt fixed regimes such as Lebanon (23 years), Jordan (21 years), Azerbaijan (19 years), Kuwait (14 years), and China (12 years). The "free-fall" exchange rate regimes most frequently occurred in 1994, 1995 (8 countries), 1996 (5 countries), 1997, 1998 (3); in other years, only 1999 (2), 2001, 2002, 2015 (1 countries) occurred, and no countries face free-fall in the remaining years. The application of free-fall exchange rate mechanisms in Asian countries is probably considered to be an indicator for the fluctuations in their financial markets. The most common regime is pegged and managed float. This data also shows that before the 1997 crisis countries often chose either fixed or floating exchange rates, also called "hollow middle" according to Hernández and Montiel (2001) or bipolar (Fischer 2001) or corner solutions (Calvo and Reinhart 2002). All five worst-hit Asian economies, except for Japan (Hernández and Montiel 2001), pegged their currencies to USD (McKinnon and Schnabl 2003).

After the crisis, the countries involved are more floating than before: after falling into free-fall in 1998, Korea moved to managed float so far, Indonesia moved from free-fall to managed float (1998) and pegged (2006), Thailand from fixed to managed float (1998), and the Philippines shift to both managed and pegged. As can be seen, with the strong impact of the crisis on economic growth, many countries have changed their exchange rate regime selection. Not only the five most affected countries (Korea, Malaysia, Indonesia, Thailand, and the Philippines) but also the remaining others must be changed. This movement is also consistent with Ilzetzki et al. (2017); Hernández and Montiel (2001); Coudert and Dubert (2005); Grewal and Tansuhaj (2001); Rajan (2012); Hernández and Montiel (2001); and Ellis and Gyoerk (2019).

Although shifting to the more floating mechanism, the movement of the exchange rate regimes of Asian countries shows the "fear of floating" tendency, which announces floating in theory but still keeps fixed in practice. Currently, in 2016, the dominant exchange rate regime remains pegged

and managed (9 countries) followed by fixed and "free-fall" and pegged (with 3 countries of each). Only Japan maintained an exchange rate of "free float" during the period 2004–2016 and Malaysia adopted this regime only in 2008.

4.2. Analysis of Results

Results of the GMM model following the Arellano Bond test on AR(1) and AR(2) correlation of the first different order satisfy the conditions as *p*-value AR(1) < 0.05 and *p*-value AR(2) > 0.05 (see Table 4). At the same time, the Hansen test for the validity of the GMM model based on instrumental variables is sufficient and valid at 5% significant level. Hence, the GMM model is highly reliable for the analysis.

Table 4. Regression results of panel data.

	GMM (Model 1)	GMM (Model 2)
y	0.357 ***	0.368 ***
	(5.36)	(0.069)
er_regime	−0.938 ***	−1.044 ***
	(−2.64)	(0.298)
Inigdppc	−0.0002	−0.000
	(−0.86)	(0.000)
Open	0.020	0.021
	(1.21)	(0.018)
Gov	−0.039	−0.037
	(−0.29)	(0.130)
EDU	0.863 ***	0.862 ***
	(5.13)	(0.160)
Crisis	−4.868 ***	−0.919
	(−2.78)	(0.605)
cons	−3.116	−3.085
	(−1.20)	(2.618)
AR(1)	0.000	0.000
AR(2)	0.133	0.214
Hansen	1.000	1.000

Notes: ***, **, and * denote significance at the level of 1%, 5%, 10% respectively. Figures in parenthesis denote *t* statistics.

In the first model (financial crisis measured by dummy variables for the crisis year) and the second model (using dummy variables for 1997 and 2008), it can be seen from the results that the higher the ER value, the lower the growth rate at 5% significant level. Specifically, when the exchange rate regime as classified by Reinhart and Rogoff (2004) increases by 1, the average growth rate decreases by 0.938% and 1.044% respectively (Table 4). Therefore, the more flexible the regime, the lower the growth rate. Moreover, the inconsistent results of the two models (using dummy variables in 1997 and 2008 and using the above dataset) show that Asian countries are quite different, so the simultaneous selection of two years of 1997 and 2008 as the crisis year is not reasonable.

Regarding control variables, they are significant, and expected. The study finds same-direction impacts exerted by the openness of the economy (OPEN) and human capital (EDU) on economic growth. On the other hand, government spending (GOV), economic crises (CRISIS), and GDP per capita of previous year have a negative relationship with growth.

While controlling the likely impact of human capital, government spending, crisis, economic openness, the econometric results reveal that the empirical evidence supports the hypothesis that the more flexible the exchange rate regime, the lower the growth rate. This result persists after changing methods of measurement exchange rate regimes (Model 1 and 2) and correcting for endogeneity by using GMM.

The empirical evidence of Asian countries in 1994–2016, which shows that countries with less flexible exchange rate regimes have a higher growth rate, concurs with an empirical study by Dubas et al. (2005), which states that economic growth will be high under a fixed exchange rate regime.

The more fix, the more growth is quite strange in the context of the increase in capital flows and the increase in trade openness. This may be because small countries, which have high trade and financial openness, are easily affected by world economy fluctuations, and choose more fixed exchange regimes to ensure stability. In addition, many countries in the study experienced two shocks in 1997 and 2008, thus having more experience in adjusting the exchange rate (not anchoring with a currency, using foreign exchange reserves to avoid currency speculation). Moreover, most countries in the sample are leading exporting countries; nevertheless, they keep the exchange rate stable to gain from trade and then higher growth.

These findings are consistent with the results of Levy-Yeyati and Sturzenegger (2003), and Huang and Malhotra (2005) that countries with lower levels of development will have higher growth when applying a more fixed exchange rate regime. This conclusion is also in line with the judgment of Rose (2011); Calvo and Reinhart (2002) that small economies often pursue fixed exchange rate regimes.

Results of the study are also consistent with the fundamental values of the theory of OCA by Green (1991), as well as with other studies undertaken in the past on various regions in different time periods. Therefore, the results of this study can serve as quantitative evidence for Asian countries that are deliberating on the choice of appropriate exchange rate policies and regime to achieve high economic growth.

5. Conclusions and Policy Recommendations

The question of whether exchange rate regimes influence the performance of Asian countries has attracted attention among researchers. However, the number of these studies in Asia is relatively limited and the answer is controversial. Thus, this paper adds to the literature by supplying new evidence on the impact of exchange rate regimes on economic growth. Using unbalanced panel data of 23 economies over 23 years, we find that a country with a less flexible exchange rate regime will have a higher growth rate.

With this result, the study suggests that the approach in government's choice of policy is to intervene in the exchange rate to lower the flexibility, depending on the ability of each government. To do this, policymakers should prepare the tools of exchange rate intervention, such as foreign exchange reserve or the power and effectiveness of the central bank. Moreover, depending on the context, when formulating exchange rate policies, governments should look at trade interdependence, convergence of macro policies, flexibility of production factors, and uniformity of responses to economic shocks in comparison to other countries.

In addition, passively adopting a fixed exchange rate mechanism is a failure of this mechanism. Therefore, it is necessary to have flexible policies, and a good strategy for this adjustment. The experience of countries that have experienced crisis shows that developing countries should stay away from corner solutions, i.e., solutions that are at the poles, either too floating or fixed to sole currency.

It is worth noting that although our empirical results prove the abovementioned hypothesis, the theoretical foundations underlying this impact largely remain absent due to the lack of robustness check to extended period of time as well as sub-samples. Therefore, pointing out detailed information on financial crises and expanding the sample size by increasing the number of countries being observed, thus increasing the years under observation, should be undertaken in future research.

Appendix A

Table A1. List of Countries under Observation in the Study.

NO.	Country	RR	LV	NO.	Country	RR	Crisis
1	Afghanistan			24	Lebanon	x	x
2	Armenia	x	x	25	China, Macao	x	
3	Azerbaijan	x	x	26	Malaysia	x	x
4	Bahrain	x		27	Maldives		
5	Bangladesh			28	Mongolia	x	x
6	Bhutan	x		29	Myanmar		
7	Brunei Darussalam	x		30	Nepal	x	x
8	Cambodia	x		31	Oman	x	
9	China	x	x	32	Pakistan		
10	Georgia	x	x	33	Philippines	x	x
11	China, Hong Kong	x		34	Qatar		
12	India	x	x	35	Russia	x	x
13	Indonesia	x	x	36	Singapore		
14	Iran	x		37	Sri Lanka	x	x
15	Iraq			38	Syrian Arab Republic		
16	Israel	x	x	39	Tajikistan	x	
17	Japan	x	x	40	Thailand	x	x
18	Jordan	x	x	41	Timor-Leste		
19	Kazakhstan	x	x	42	Turkey	x	x
20	Korea	x	x	43	United Arab Emirates		
21	Kuwait	x	x	44	Vietnam	x	x
22	Kyrgyz	x	x	45	West Bank and Gaza	x	
23	Laos	x		46	Yemen		

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