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RETHINKING THAILAND'S GROWTH POLICIES

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This paper applies Johansen's cointegration and error-correction model to examine the relationships among a set of economic reform policies, the contribution of external factors, and Thailand's economic growth. The Johansen's cointegration results reveal that fiscal reform, openness, and deregulation have a positive effect on economic growth, while financial development has no significant effect on economic growth. Meanwhile, we also find that some external shocks have a highly significant effect, with a large magnitude, on Thailand's economic growth. Additionally, the estimation of the VECM indicates that the variables in the model may be in disequilibrium in the short run since the short-run adjustment coefficient is significantly negative.

Keywords: Economic Growth, Economic Policy Reform, External Shocks, Thailand
JEL classification: E60, O20, O40

1. INTRODUCTION

Similar to a large number of emerging and transition economies, Thailand's economic growth was remarkable during the 1990s. The economic growth of Thailand accelerated significantly post-1985, and there was a double-digit rate of growth in some periods a few decades ago. Many economists believe that Thailand's economy, especially in East Asian countries during the 1990s, was the result of the successful implementation of economic reform policies, which intensified market-oriented and outward-looking policies[1] (e.g., World Bank, 2005; Rodrik, 1996, 2003; Krongkaew, Chamnivickorn and Nitithanprapas, 2006; Sussangkarn, 2000).

The pro-markets and globalization policies which John Williamson (1990) infelicitously termed the "Washington Consensus" were seriously implemented as a set of policy principles for economic reform in Latin America in the late 1980s. The first generation of the Washington Consensus, which focused on fiscal discipline, competitive currencies, trade and financial liberalization, privatization, and deregulation,

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[1] "Trade Reform and Free Trade were at the Heart of the Washington Consensus." (Edwards, 2008a)

brought about the impressive short-term results in most Latin America economies (Edward, 2008b). At the close of this period, and jumping on this reform bandwagon, Thailand along with East Asian countries, followed a path of high-performance economies. For this reason, therefore, it is not surprising that there are many economists and policy-makers in many countries (as well as in Thailand), who believe that there is a significant relationship between the Washington Consensus set of policies and economic growth, even though there is still little empirical evidence (see the outward-oriented policy's supporter, Krueger, 1997; Edwards, 1993; Dollar, 1992; Fisher and Sahay, 2000).

However, at a time when several economists and policy-makers believed that a set of policy principles for economic reform were similar to good medicine, a series of crises commencing from Mexico's "Tequila" crisis in 1994, the East-Asian crises in 1997, the sub-prime financial crisis in 2007, and finally the EU crisis in 2012, brought about skepticism and criticism regarding the pro-markets and globalization policies of the "Washington consensus." This skepticism and criticism still exists, despite the launch of second-generation reform in the late 90's that was more institutional in nature and targeted at problems of "good governance" (Rodrik, 2003).[2]

After the East-Asian crises in 1997, Thailand policy makers were nevertheless still confident in the positive relationship between the set of policy principles for economic reform of the Washington Consensus and economic growth. They still proceeded according to the Washington Consensus's principles and tried to add institutional reform as another principle for economic growth policy (Sussankarn, 2000). This took place though there was little empirical evidence to prove that Thailand's economic growth was the result of following the Washington Consensus's principles. This proceeding may have led to a huge benefit for the Thai economy if the ideal relationship had been true. However, what if the relationship was false? A false relationship can occur if the influence of external shocks on the economic growth model is overlooked (see Easterly, Kremer, Pritchett and Summers, 1993; Hausmann, Pritchet and Rodrik, 2005). At the same time, there was the possibility of counterfeit growth of Thai economy from the result of the external economic environment, such as increased terms of trade, world demand growth, and oil prices (Akrasanee, Dapice and Flatters, 1991). Therefore, it would be better if Thailand's policy-makers would rethink their growth policies before they move forward into the complexity of globalization by examining the relationship between the old set of growth policies and actual economic growth to ensure whether Thailand's economic growth is the result of good polices or good luck.

As a result of using Johansen's cointegration and error-correction model, the empirical results show that fiscal reform, openness, and deregulation have a positive effect on economic growth, while financial development has no significant effect on

[2] see the skepticism and criticism in Stiglitz (2002), Hausmann, Pritchett and Rodrik (2005), Edwards (2008a), and Rodrik and Subramanian (2008).

economic growth. We also find that significant external factors contribute highly to economic growth. Some of them have a large impact on Thailand's economic growth. Furthermore, some of them also have the greater effects than the set of specific policies. Additionally, the estimation of the VECM also indicates that the variables in the model may be in disequilibrium with disturbances causing an equilibrium error in the short run.

The remainder of the paper is organized as follows: Section 2 reviews the theoretical background concerning the growth theorem for policy analysis. Section 3 develops an empirical model for examining the relationship between specific policy principles for economic reform and economic growth, and explains the econometric technique which will be used in this paper. Additionally, the definition and sources of data will also be discussed in this section. In Section 4, the empirical results are described, and Section 5 contains the concluding remarks.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

In this section, a theoretical framework for empirical growth analysis is sketched, as well as a review of the literature on the relationships between specific policy reform and growth. The framework for the determination of growth follows the extended version of the neoclassical model as developed by Ramsey (1928), Solow (1956), Swan (1956), Cass (1965), and Koopmans (1965).

Based on the Solow growth model, the neoclassical growth model focuses on four variables: output (Y), capital (K), labor (L), and the level of technology (A). At any time, output depends on capital, labor, and the level of technology. This can be stated in terms of the neoclassical production function as follows:

$$Y_t = F(K_t, L_t, A_t)\,. \tag{1}$$

With the model's critical assumptions, such as constant returns to scale and exogenous technological progress,[3] the growth rate of output in the non-steady state depends on the growth rate of the factors of production (capital and labor) and the technology process or "the Solow residual." Nonetheless, in a steady state, the growth rate of output is determined solely by the rate of technological progress. Additionally, the economy will always converge to a steady state condition.

In the 1990s, a revival of interest in economic growth led to the development of a new model which established a synthesis, now known as the endogenous growth theory. The synthesized version of the endogenous growth model was developed by various economists, for example, Romer (1990), Grossman and Helpman (1991), and Aghion and Howitt (1992). Endogenous growth models still retain the role of factor inputs,

[3] For further assumptions see Barro and Sala-i-Martin (2004).

which are the key variables, but have added various shift variables such as human capital, R&D, openness of the economy, government policy, financial reforms, imperfect competition, quality of institutions, etc. There are, therefore, two main groups of variables in the synthesized version of the endogenous growth model: i) the key variables and ii) the shift variables, which we may extend Equation (1) into a form of the endogenous growth version as follows:

$$Y_t = F(K_t, L_t, A_t, X_t), \tag{2}$$

where X_t is a vector of some potential shift variables. Contrary to the critical assumption of the neoclassical model, the endogenous growth model is characterized by the assumption of non-decreasing returns to scale. The economy thus need not converge in income per capita, even if it has the same preferences and technology. In addition, from these frameworks, the long-term growth which depends on the Solow residual, which is exogenous in the neoclassical growth model, depends on various shift variables rather than only the key variables. Especially, there are the national economic policies, which have great potential for good or ill through their influence on the long-term rate of growth.

Over a few decades, there has been a large amount of literature which has investigated the relationship between national economic policies and growth. Most literature nonetheless focuses on the relationship between growth and specific policy reform, such as trade policy (openness), fiscal policy, financial reforms, foreign direct investment (FDI), etc. The empirical results mostly are not in consensus with the effect of the policy on growth due to the socioeconomic and political context of each country. The authors who focus on trade policy include Dollar (1992), Edwards (1993), Krueger (1997), Vamvakidis (2002), Yanikkaya (2003), Estekadeordal and Taylor (2008), and others. The authors who focus on fiscal policy include Jorgensen and Yun (1990), King and Rebelo (1990), Barro (1990), Easterly and Rebelo (1993), and Aizenmen, Kletzer and Pinto (2007). The role of financial development was investigated by Roubini and Sala-i-Martin (1992), King and Levine (1993), Levine (1997) and Arestis and Demetriades (1997), while the role of the FDI was investigated by Borensztein, Gregorio and Lee (1998).

However, after the implementation of the set of policy principles for economic reform of the Washington Consensus, (even though there was still continuous investigation into the role of economic policies on growth), the study focused more on the relationship between growth and the set of economic reform policies rather than specific policy. The empirical results of the relationship between growth and the set of economic reform policies is still not consensus, but it explained the various views for the better outcome of reform; for example, the proposition of institutional reform concerning the sequencing of reform: big ban strategies or gradualist reform packages. The authors that examined the effect of a set of economic reform policies on growth included Levine and Renelt (1992), Dewatripoint and Roland (1995), Hall and Jones

(1997), Skogstod and Everhart (1997), Fisher and Sahay (2000), Fisher (1993), Rodrik (2004), Hausmann, Pritchett and Rodrik (2005), and Rodrik (2005).

3. METHODOLOGY

3.1. Specified Growth Model

Even though there has been wide development in growth theories over the past few decades, it is still generally accepted that growth theories are not explicit enough concerning the exogenous variables that belong in true regression. Some economists have attempted to identify the exact determinant of growth but the results are still not in consensus (see Levine and Renelt, 1992; and Sala-i-Martin, 1997). There are, nonetheless, three models that have figured prominently in the recent empirical growth literature: those of Barro (1997), Easterly and Levine (1997), and Sachs and Warner (1997). Since this paper is quite consistent with Levine and Renelt's paper, (which presents an alternative specification for the empirical growth equation), this paper thus follows theirs in building up the base specification.

Since the objective here is to test what really determines Thailand's economic growth, this paper focuses only on the role of two main sets of exogenous variables; that is, a set of economic reform policies and external shock variables on economic growth.[4] The specified model in this paper therefore can be characterized simply as:

$$Y_t = F(X_t, Z_t), \tag{3}$$

where Y_t is real per capita GDP ($PRGDP_t$), X_t is a vector of economic reform policies which consists of

GOV_t = the ratio of government consumption to real GDP, which is a proxy of fiscal reform,

$M2_t$ = the ratio of the broad money supply ($M2$) to real GDP, which is a proxy of financial development,

EX_t = the ratio of export to real GDP, which is a proxy of trade openness,

FDI_t = the ratio of foreign direct investment (FDI) to real GDP, which is a proxy of deregulation,

and Z_t are three main external shocks which consist of,

[4] Another paper which used an alternative specification of empirical growth model include Fisher (1993), Savvides (1995), Bleaney (1996), Havrylyshyn, Izvorski and Rooden (1998), Skogstad and Everhart (1997), and Burnside and Dollar (2000).

$REER_t$ = real effective exchange rate,
$Oil\ Price_t$ = world's oil price,
$US\ growth_t$ = growth of the United States of America.

3.2. Empirical Specifications

To investigate the relationship between economic growth and a set of economic reform policies, as well as external shock variables, we may transform Equation (3) into three simple growth specifications. These empirical growth specifications are set separately as a result of the different external shocks in each model.

$$Model\ I: \ln RPGDP_t = \alpha_0 + \alpha_1 \ln GOV_t + \alpha_2 \ln M2_t + \alpha_3 \ln EX_t + \alpha_4 \ln FDI_t + \alpha_5 \ln REER_t + \alpha_6 DUM97 + \varepsilon_t, \quad (4)$$

$$Model\ II: \ln RPGDP_t = \gamma_0 + \gamma_1 \ln GOV_t + \gamma_2 \ln M2_t + \gamma_3 \ln EX_t + \gamma_4 \ln FDI_t + \gamma_5 \ln Oil\ price_t + \gamma_6 DUM97 + \varepsilon_t, \quad (5)$$

$$Model\ III: \ln RPGDP_t = \delta_0 + \delta_1 \ln GOV_t + \delta_2 \ln M2_t + \delta_3 \ln EX_t + \delta_4 \ln FDI_t + \delta_5 US\ growth_t + \delta_6 DUM97 + \varepsilon_t, \quad (6)$$

where DUM97 is the dummy variable for the financial crisis in 1997, which is included in the model to lessen the structural break problem,[5] and ε_t is the error term.

Table 1. The Chow Breakpoint Test

	Model I	Model II	Model II
Breakpoint date	1997Q4	1997Q4	1997Q3
F-statistic	1.907	0.436	4.253
Log-likelihood ratio	12.550	3.068	25.516

[5] With the Chow break point test in Table 1, the results show that a break may have occurred since the third quarter of 1997. To take into account the structural break, therefore, we also include a dummy variable for the 1997 financial crisis. This approach is adopted by several studies such as Perron (1989), Schmukler and Vesperoni (2001), Jiranyakul (2011), Kotrajaras (2010), Afonso, Gruner and Kolerus (2010), Raz, Indra, Artikasih and Citra (2012).

3.3. Data Description and Hypothesis

Even though this paper applies time series regression, the data characteristic and the hypothesis of this paper are still similar to the vast empirical growth literature which uses cross-section regressions. Therefore, a brief summary of the data characteristic and the hypothesis are provided here:

(i) The Ratio of Government Consumption to Real GDP: (GOV_t)

The ratio of government consumption to real GDP is a proxy of fiscal reform. Government consumption is a type of nonproductive government spending. It thus is a kind of government spending which does not improve productivity. Most studies have used the ratio of the government consumption per real GDP as a proxy of fiscal policy (e.g., Barro, 1990; Levine and Renelt, 1992; Gregorio, 1993; Rodrik, 2005). A few studies have used the budget balance per GDP (e.g., Easterly and Rebelo, 1993; Skogstad and Everhart, 1997; Sachs and Warner, 1997), or even tax revenue (Jorgenson and Yun, 1990). Nonetheless, since the ratio of government consumption to real GDP is used in this paper, negative association between this proxy and growth was expected.

(ii) The Ratio Broad Money Supply (M_2) per real GDP: (M_{2t})

The pioneering contribution of Goldsmith in 1969, McKinnon in 1973, and Shaw in 1973 brought to the forefront the key role played by financial development in the process of economic growth. Up to now, there has been a variety of work that had examined the relationship between financial development and economic growth. King and Levine (1993) examine various indicators of financial development such as the ratio of liquid liabilities to GDP (M2/GDP) and the ratio of claims on the nonfinancial private sector to GDP, etc. They concluded that the various indicators of financial development yielded similar conclusions, that is, there is a strong positive correlation between the extent of financial development and economic growth. In addition, the same conclusion has been found among a large number of authors, e.g., Roubini and Sala-i-Martin (1992), Gregorio and Guidotti (1995), and Arestis and Demetriades (1997).

(iii) The Ratio of Export per real GDP: (EX_t)

The relationship between trade and economic growth has been discussed for over two centuries. The proposition that more outward-oriented economies tend to grow faster, has been tested extensively and most literature has tended to support it. As with financial development, there are a large number of measurements of outward-oriented policy or openness such as export per GDP, export plus import per GDP, trade barriers and bilateral payment arrangements (BPAs) (see Harrison, 1996; Yanikkaya, 2003). A measure frequently used, nonetheless, is either export per GDP or export plus import per GDP. In this paper, export per real GDP was used and a positive coefficient on this indicator was expected.

(iv) The Ratio of Foreign Direct Investment per real GDP: (FDI_t)

There have been several papers that have investigated the idea that FDI has a positive impact on growth. Borensztein, De Gregorio and Lee (1998) suggested that FDI is an important vehicle for the transfer of technology, contributing to growth in a larger measure than domestic investment. Moreover, they found that there was a strong complementary effect between FDI and human capital; that is, the contribution of FDI to economic growth is enhanced by its interaction with the level of human capital in the host country. However, to attract FDI, the host country needs to find the specific strategies of each country. Campos and Kinoshita (2008) found that there was a strong empirical relationship from reforms to FDI. Busse and Groizard (2006) found evidence that excessive regulations restrict growth through FDI. Therefore, we also use FDI as a proxy of regulation and a positive relationship between FDI and growth as was expected.

(v) Real Effective Exchange Rate: ($REER_t$)

The importance of international trade and finance to Thailand's economic growth can hardly be rejected, especially in the globalization era. The exchange rate, that is the price of one currency in terms of another, is one of the main determinants of the magnitude and the direction of trade and capital flow. However, since there are several partners involved with trade and finance with Thailand, this paper thus uses the real effective exchange rate which calculates the effective exchange rate, based on the real exchange rate instead of the nominal rate.[6] If the real effective exchange rate increases, it means appreciation of domestic currency relative to its main trading partners.[7] This may lead to a decrease in the country's export as well as capital flow, and this may then lead to an economic slowdown. On the other hand, if the real effective exchange rate decreases, economic growth tends to rise. It nevertheless should be noted that an increase or decrease in the real effective exchange rate not only depends on the home currency but also the trading partners' currency, especially in a country that has big partners.

(vi) Oil price ($Oil\ price_t$)

Price stability is one of the main factors that contribute to economic growth. If the price of goods and services is stable, economic activity will not stagnate, and it should then contribute to economic growth. The world's oil prices have a main role in price stability of a country that is not a major exporter of oil. If the world's oil price rises, it can lead to an inflation problem, and then economic growth will decrease. Therefore, this paper also selects oil price as another external shock of which there is a high

[6] The measure of average relation strength of a given currency, called the effective exchange rate (EER).

[7] Alternatively, several papers used term of trade as another proxy of external shocks. However, with the limitation of the availability of this variable, this paper uses real effective exchange rate instead.

influence on the Thai economy. Further, it was expected that it will have a significant negative effect on the economic growth of Thailand.

(vii) U.S growth ($US\ growth_t$)

In the globalization era, world economic growth contributes mainly to the economic growth of every country. This paper thus uses U.S. growth as a proxy of world economic growth due to the high involvement of the US economy with many countries around the world over the past several decades. It was expected that world economic growth may also contribute to Thailand's economic growth since the Thai economy is linked with several countries either in terms of trade exchange or capital exchange. It was therefore also hypothesized that world economic growth, proxied by U.S growth, should have a positive impact on Thailand's economic growth.

3.4. Econometric Technique

In contrast to several cross-section growth studies, this paper implements quarterly time series data: (1994: Q1-2012:Q2). Country-specific studies based on time series data are useful since cross-section growth studies assume similar structures for all countries in the sample. It thus may be inaccuracy to identify country specific growth policies with cross-sectional data.

To investigate the relationship between real GDP per capita and its determinants with time series data, this paper applies both cointegration analysis to examine the possible existence of a steady state or long-run equilibrium relationship, and an error correction model (ECM) to examine the short-run dynamics of the model. Cointegration analysis was introduced by Engle and Granger in the early 1980s. However, up to now there have been two main approaches in applying the cointegretion analysis: i) Engle-Grangers Two Step Estimation Method; and ii) Johansen's Maximum Likelihood Method. Both the Engle-Grangers approach and the Johansen approach can avoid a spurious problem that occurs when a nonstationary variable is regressed on another nonstationary variable. Under these two approaches, even though all variables are nonstationary, an appropriate linear combination can cancel out the stochastic trends in these variables. The resulting linear combination of these variables will be stationary, which means that the relevant variables are cointegrated. Specifically the relevant variables will be cointegrated if they have a long-run relationship among them.

Although the Engle-Grangers approach was initially developed, and is easier to the implement than the Johansen approach, this approach has two main shortfalls: i) it can be applied to only the case of two variables; and ii) as a result of two-step estimation, any error occurring in the first step can be carried into the second step. Therefore, to avoid these shortfalls, this paper uses the Johansen approach to solve these problems. The Johansen approach not only circumvents the use of two-step estimation but also can estimate and test for the presence of multiple cointegrating vectors. Furthermore, these tests also allow the researcher to test restricted versions of the cointegrating vector(s)

and the speed of adjustment parameters (Enders, 2004).

However, because the Johansen approach is multivariate cointegration, which is based on the Vector Autoregressive (VAR) model, and because a nonstationary regressor invalidates many standard empirical results, an economic time series for stationary properties is thus usually required before estimating the VAR model. In order to validate the stationary properties of the economic time series data, we utilize unit root test, namely the Augmented Dickey-Fuller Test (ADF). The optimal lag-length used in these two unit root tests was selected by minimizing the Schwarz Criteria (SC) since it is appropriate with a small number of observation cases (Pesarn and Shin, 1998). Then, after completion of the unit root test, and by cointegration definition, (if all of the time series data are integrated in the same order), we can proceed in testing the long-run relationship by using the Johansen approach. The Johansen approach is a maximum likelihood method that can determine the presence of a cointegrating vector or long-run equilibrium relationship among the variables.

Since the Johansen approach is multivariate cointegration, it can be initially expressed in an unrestricted VAR model as follows:

$$X_t = A_1 X_{t-1} + A_2 X_{t-2} + ... + A_p X_{t-p} + \varepsilon_t \,, \tag{7}$$

where X_t is the $(n \times 1)$ vector $(X_1, X_2, ..., X_n)'$, A_t is a $(n \times n)$ matrix of parameters, and ε_t is the $(n \times 1)$ vector $(\varepsilon_1, \varepsilon_2, ..., \varepsilon_n)'$ together with $\varepsilon_t \sim$ iid with zero mean and variance matrix $\sum$. From Equation (7), we can transform it to be a VAR with restriction, known as the vector error correction model (VECM) as follows:

$$\Delta X_t = \Pi X_{t-1} + \sum_{i=1}^{p-1} \tau_i \Delta X_{t-i} + \varepsilon_t \,, \tag{8}$$

where $\Pi = -(I - \sum_{i=1}^{p} A_i)$ indicates the long-run information, $\tau_i = -\sum_{j=i+t}^{p} A_j$ captures the short-run aspects of the relationship between the elements of X_t, I is an identity matrix, and p is the optimal lag which is selected by minimizing SC.

The number of cointegrating relations among the components of the vector X_t is represented by the rank of Π, denoted by r. In addition, the matrix Π can be decomposed in two matrices, α and β, and thus $\Pi = \alpha\beta'$. α is $(n \times r)$ matrix of error correction coefficients. The weights or the speed of adjustment β is $(n \times r)$ matrix of cointegrating vectors (r), which summarize the long-run cointegrating relationships among the variables. There are three possibilities of cointegrating vectors among the variables from the estimated Equation (8): i) Rank $(\Pi) = 0$; all elements of this matrix are zero. Therefore, in (8) the error correction mechanism ΠX_{t-1} does not exist, meaning that there is no long-run equilibrium relationship between the variables. These variables thus are not cointegrated. The VAR model could be formulated in terms of the

first differences: ii) with Rank $(\Pi) = n$, known as full rank, its rows are linearly independent, all variables are stationary, or all variables are integrated in order zero, and the question of cointegration thus does not arise. All variables in the VAR model could be formulated in terms of the level; iii) Rank $(\Pi) = r$ and $0 < r < n$, its rows are not linearly independent, and therefore these are *r* cointegrating vectors in the model. The VAR model could be formulated in terms of a VECM (Seddighi *et al*., 2000, p. 303).

Johansen and Juselius (1990) have presented two likelihood ratio tests to determine the number of cointegrating vectors in X_t. These are namely the trace test and the maximum-eigenvalue test. The trace test is a joint test that evaluates the null hypothesis that the number of cointegrating vectors is less than or equal to *r* against the alternative hypothesis, that there are more than *r*. The maximum eigenvalue test conducts a test on each eigenvalue separately. It tests the null hypothesis, where the number of cointegrating vectors is *r* against the alternative of $r+1$ cointegrating vectors. There two tests are expressed by

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n} \ln(1-\hat{\lambda}_i)\,, \tag{9}$$

$$\lambda_{trace}(r, r+1) = -T\ln(1-\hat{\lambda}_r + 1)\,, \tag{10}$$

where $\hat{\lambda}$ is the estimated values of the characteristic roots (also known as eigenvalues) from the estimated $\alpha\beta'$ matrices. *T* is the number of observations.

Finally, if the variables are cointegrated, according to the Granger representation theorem (Engle and Granger, 1987), there also must exist an error correction mechanism to describe the short-run dynamics or adjustments of the cointegrated variables towards their equilibrium values. We can express this model as follows:

$$\Delta Y_t = a_0 + \varphi U_{t-1} + \sum_{j=1}^{k} \delta_{1j}\Delta Y_{t-j} + \sum_{j=1}^{k} \delta_{2j}\Delta X_{t-j} + \varepsilon_{1t}\,, \tag{11}$$

$$\Delta X_t = b_0 + \varphi U_{t-1} + \sum_{j=1}^{k} \varphi_{1j}\Delta X_{t-j} + \sum_{j=1}^{k} \varphi_{2j}\Delta Y_{t-j} + \varepsilon_{2t}\,, \tag{12}$$

where U_{t-1} is the error-correction term (also known as the equilibrium error), ε_{1t} and ε_{2t} are white noise, and φ is the coefficient of U_t that represents the speed of adjustment towards the long-run equilibrium.

4. EMPIRICAL RESULTS

By following the econometric method as presented in the previous section, the empirical results are shown for each statistic test separately in this section.

Table 2. ADF Test for Unit Root

Variables	Model		
	Constant	Constant & Trend	None
$\ln RPGDP_t$	-1.141 (1)	-3.127(1)	-1.087(1)
	[-11.891***(2)]	[-11.803***(2)]	[-11.414***(2)]
$\ln GOV_t$	-1.469(6)	-2.056(7)	-0.915(6)
	[-5.662***(6)]	[-5.622***(7)]	[-5.605***(7)]
$\ln M2_t$	-2.555(8)	-3.115(8)	1.211(11)
	[-3.022***(8)]	[-3.066***(7)]	[-2.128***(3)]
$\ln EX_t$	-1.323(6)	-2.578(8)	-2.101(7)
	[-4.845***(6)]	[-4.892***(6)]	[-3.957***(6)]
$\ln FDI_t$	-4.323***(0)	-5.143***(0)	-1.155(0)
	[-14.071***(0)]	[-14.065***(0)]	[-14.125***(0)]
$\ln REER_t$	-2.589(1)	-2.433(1)	-0.367(3)
	[-6.671***(2)]	[-6.823***(2)]	[-6.703***(2)]
$\ln Oil\ price_t$	-0.817(2)	-3.829(1)	1.171(2)
	[-6.934***(1)]	[-6.885***(1)]	[-6.767***(1)]
$US\ growth_t$	-3.165**(2)	-5.011***(2)	-2.331(3)
	[-13.107***(0)	[-13.015***(1)]	[-13.192***(0)]

Notes: *** denote significance at 1%, ** denote significance at 5% and * denote significance at 10%. The optimal lag-length (p) in the unit root tests is selected by minimizing Schwarz Criteria (SC), and standard error in bracket.

Table 2 reports on the ADF unit root test for all eight variables in the model. A unit root test for stationary was performed on both levels and the first differences under three different models: (i) the model with intercept, (ii) the model with intercept and trend, and (iii) the model without intercept and trend. The result shows that for the null hypothesis, the series is non-stationary and is not rejected at the level of all variables for at least some models. On the contrary, all variables reject the null hypothesis in the first difference, which implies that all time series are integrated of order one, I(1). That means that all the variables have achieved stationary after the first difference.

After the results confirmed that the time series had a unit root, then we proceed in the next step by implementing the Johansen's cointegration technique to examine whether there exist a long-run relationship among the variables. Since the objective of the Johansen cointegration test is finding the number of cointegration vectors (r_0) that summarize the long-run cointegrating relationship among the variables, the two likelihood ratio tests, (the trace test and the maximum-eigenvalue test), are implemented. Under the null hypothesis $r = r_0$ against the alternative of $r > r_0$ for the trace test, and the null hypothesis $r = r_0$ against the alternative of $r \geq r_{0+1}$ for the maximum eigenvalue test, these two tests are applied for our three growth models. Table 3 presents

the Johansen's cointegration result for Model I. With this model, the null hypothesis with zero and one cointegrating vector is clearly rejected since the trace statistic (=177.206) and the maximum-eigenvalue test (=87.869) are above the critical values 125.615 and 46.231, respectively. However, the null hypothesis, with one and two cointegrating vectors, the trace statistic (=89.336) and the maximum-eigenvalue test (=25.442) turn out to be below the critical value 95.753 and 40.077, respectively. Consequently it is concluded that there is exactly one conintegrating relationship among the variables in this model. The normalized cointegration confidents, as shown below the table, are depicted this relationship. These coefficients show that GOV_t, EX_t, and FDI_t variables have a statistically significant positive effect on $RPGDP_t$, while $REER_t$ and dummy for crisis variables have a significantly negative effect on $RPGDP_t$. Only $M2_t$ has no significant impact on $RPGDP_t$. These imply that this exogeneous variables have an influence on Thailand economic growth following our hypothesis. Moreover, it should be noted that the impact of $REER_t$ on $RPGDP_t$ has a comparatively large magnitude with other factors, even though this variable is not directly controlled by the Thai government. This indicates that changes in $REER_t$ have a strong influence on Thailand's economic growth, especially when compared with other main economic growth factors. In other words, we may imply that $REER_t$ has been one of the main determinants of Thailand's economic miracle over the past three decades.

Table 3. Johansen's Cointegration Results: Model I

H_0	H_1	Eigen value	Trace statistic	Critical value 0.05(trace)	Max-Eigen statistic	Critical value 0.05(Max)
$r = 0$	$r \geq 1$	0.709	177.206***	125.615	87.869***	46.231
$r \leq 1$	$r \geq 2$	0.301	89.336	95.753	25.442	40.077
$r \leq 2$	$r \geq 3$	0.293	63.894	69.819	24.711	33.876
$r \leq 3$	$r \geq 4$	0.214	39.183	47.856	17.155	27.587
$r \leq 4$	$r \geq 5$	0.149	22.028	29.797	11.494	21.131
Normalized cointegration coefficients						
ln$RPGDP_t$	lnGOV_t	ln$M2_t$	lnEX_t	lnFDI_t	ln$REER_t$	Crisis
1.000	3.272	0.148	2.079	0.215	-2.000	-1.971
	(0.384)***	(0.640)	(0.335)***	(0.085)***	(0.534)***	(0.348)***

Notes: *** denote significance at 1%, ** denote significance at 5% and * denote significance at 10%, *r* is the number of cointegrating vector, the optimal lag selected by SC is 1, and standard error in parentheses.

Table 4. Johansen's Cointegration Results: Model II

H_0	H_1	Eigen value	Trace statistic	Critical value 0.05(trace)	Max-Eigen statistic	Critical value 0.05(Max)
$r = 0$	$r \geq 1$	0.665	182.265***	125.615	77.711***	46.231
$r \leq 1$	$r \geq 2$	0.368	104.554***	95.753	32.658	40.077
$r \leq 2$	$r \geq 3$	0.308	71.896**	69.819	26.171	33.876
$r \leq 3$	$r \geq 4$	0.247	45.724	47.856	20.169	27.584
$r \leq 4$	$r \geq 5$	0.178	25.55	29.797	13.917	21.131
Normalized cointegration coefficients						
ln$RPGDP_t$	lnGOV_t	ln$M2_t$	lnEX_t	lnFDI_t	ln*Oil price*$_t$	Crisis
1.000	1.746	-0.121	1.347	0.181	-1.33E-05	-0.868
	(0.242)***	(-0.374)	(0.341)***	(0.054)***	(-0.055)	(-0.184)***

Notes: *** denote significance at 1%, ** denote significance at 5% and * denote significance at 10%, *r* is the number of cointegrating vector, the optimal lag selected by SC is 1, and standard error in parentheses.

Table 4 presents the Johansen's cointegration test for Model II, where $Oil\ price_t$ is used instead of $REER_t$. Unlike Model I, for the trace statistic, the null hypothesis is rejected not only with zero and one cointegrating vector (since the trace statistic (=182.265) is above the critical value 125.615), but also with one and two cointegrating vectors as well as two and three cointegrating vectors. The trace statistic (104.554) is above the critical value 95.753 for the null hypothesis with one and two cointegrating vectors, while the trace statistic (71.896) is above the critical value of 69.819 for the null hypothesis with two and three cointegrating vectors.

Unlike the trace statistic, the maximum eigenvalue test indicates that there exists only one significant cointegrating vector. Only the null hypothesis with zero and one cointegrating vector is rejected since the maximum eigenvalue test (=77.711) is above the critical value of 46.231. In sum, however, the trace statistic and the maximum eigenvalue tests indicate that, at least, there exists exactly one significant cointegrating vector. This implies that there exists minimally one long-run relationship between $RPGDP_t$ and its major determinants. According to the normalized cointegration coefficient, therefore, the result shows that the GOV_t, EX_t, and FDI_t variables still have a statistically significant positive effect on $RPGDP_t$, while the dummy for crisis variables has significantly negative effect on $RPGDP_t$. Only $M2_t$ still has no impact on $RPGDP_t$ as with Model I. On the contrary, $Oil\ price_t$, which is another external factors, has no influence on $RPGDP_t$ even though it has a negative impact on $RPGDP_t$. This implies that $Oil\ price_t$ has no influence on Thailand's economic growth. This evidence is nevertheless consistent with many studies, which have found that a current oil price shock has small impact, especially in the long-run, on the world

economy (see Blanchard and Jordi, 2010; Segal, 2011), and Asian countries, including Thailand (see Cunado and Gracia, 2004; Salim and Rafiq, 2011; Bank of Thailand, 2008).

Not only $REER_t$ and $Oil\ price_t$, but also US growth which is a proxy of world economic growth, are used to examine whether Thailand's economic growth is a result of good policy. The results of this model are presented in Table 5. In a way similar to Model II, the null hypothesis is rejected, not only with zero and one cointegrating vector, but also with one and two cointegrating vectors, as well as two and three cointegrating vectors for the trace statistic. The null hypothesis with zero and one cointegrating vector is rejected since the trace statistic (178.004) is above the critical value of 125.615, while the trace statistics (97.812) and (66.127) are above the critical value of 95.753 and 69.318 for the null hypothesis with one and two cointegrating vectors, and with two and three cointegrating vectors, respectively.

Table 5. Johansen's Cointegration Results: Model III

H_0	H_1	Eigen value	Trace statistic	Critical value 0.05(trace)	Max-Eigen statistic	Critical value 0.05(Max)
$r = 0$	$r \geq 1$	0.677	178.044***	125.615	80.232***	46.231
$r \leq 1$	$r \geq 2$	0.350	98.812***	95.573	31.684	40.077
$r \leq 2$	$r \geq 3$	0.279	66.127**	69.818	23.263	33.876
$r \leq 3$	$r \geq 4$	0.228	42.864	47.856	18.415	27.587
$r \leq 4$	$r \geq 5$	0.194	24.412	29.797	15.342	21.131
Normalized cointegration coefficients						
$\ln RPGDP_t$	$\ln GOV_t$	$\ln M2_t$	$\ln EX_t$	$\ln FDI_t$	$US\ growth_t$	Crisis
1.000	1.706	-0.171	1.415	0.180	0.001	-0.868
	(0.232)***	(-0.368)	(0.198)***	(0.051)***	(0.006)	(-0.152)***

Notes: *** denote significance at 1%, ** denote significance at 5% and * denote significance at 10%, *r* is the number of cointegrating vector, the optimal lag selected by SC is 1, and standard error in parentheses.

Turning now to the maximum eigenvalue test, the result shows that only the null hypothesis with zero and one cointegrating vector is still rejected, as found in the previous model. The maximum eigenvalue (80.232) is above the critical value 46.231 only in this hypothesis. Therefore, in sum, the results from the trace statistic and the maximum eigenvalue indicate that it has at least one significant cointegrating vector in this model. The result from the normalized cointegration coefficients shows that there is one long-run relationship among the variables in this model. The result indicates that while the dummy for crisis variable still has a significantly negative effect on $RPGDP_t$, the GOV_t, EX_t, and FDI_t have a statistically significant positive effect on $RPGDP_t$,

and only $M2_t$ still has no impact on $RPGDP_t$. As the same with *Oil price*$_t$, however, the US growth variable has no influence on $RPGDP_t$. This may be a result of the diversification of Thai exports over the past two decades. Although the US growth is still one of the major importers of Thailand's goods and services, the main importers of these goods and services are now several groups, such as China, Asia, the European Union (EU), etc. Therefore, the growth of US economy has little direct influence on Thailand's economic growth.

Table 6. Estimates of the VECM for Economic Growth

	Model I	Model II	Model III
ECM_{t-1}	-0.094	-0.170	-0.163
	(-7.671)***	(-7.951)***	(-7.368)***
$\Delta \ln Gov_{t-1}$	-3.272	-1.746	1.706
	(-8.512)***	(-7.211)***	(-7.351)***
$\Delta \ln M2_{t-1}$	-0.147	0.121	0.171
	(-0.231)	(0.324)	(0.464)
$\Delta \ln EX_{t-1}$	-2.079	-1.347	-1.415
	(-6.193)***	(-3.952)***	(-7.117)***
$\Delta \ln FDI_{t-1}$	-0.215	-0.180	-0.179
	(-2.511)***	(-3.330)***	(-3.462)***
$Crsis97_{t-1}$	1.971	0.868	0.868
	(5.666)***	(4.701)***	(5.693)***
$\Delta \ln REER_{t-1}$	1.999	-	-
	(3.728)***		
$\Delta \ln Oil\ price_{t-1}$	-	1.33E-05	-
		(0.001)	
$\Delta US\ growth_{t-1}$	-	-	-0.001
			(-0.189)

Notes: *** denote significance at 1%, ** denote significance at 5% and * denote significance at 10%, and standard error in parentheses.

As mentioned in section II, if the variables are cointegrated, there must exist an error correction mechanism to describe the adjustment of the cointegrated variables toward their long-run equilibrium value. In other words, the variables in the model may be in disequilibrium with the disturbances being the equilibrium error in the short-run. To show this situation, the estimation of the VECM model in Table 6 will convey this process. Two main results of each model are always derived from this VECM model: (1) the coefficient of each explanatory variable, which represents the short-run relationship between each explanatory variable and $RPGDP_t$, and (2) the coefficient of the

equilibrium back to equilibrium. For each model, the short-run adjustment coefficient (ECM_{t-1}) is significantly negative. This implies that the equilibrium error will decrease continuously when it leads to a long-run equilibrium relationship. The speed of adjustment is nevertheless slightly different for each model. The short-run adjustment coefficient (=-0.094) for Model I indicates that the deviation of the actual $RPGDP_t$ from its long-run equilibrium level will be corrected by a decrease of about 0.094 for each quarter, while the short-run adjustment coefficient (= -0.170) for Model II and (=-0.163) for Model III indicates that the deviation of the actual $RPGDP_t$ form its long-run equilibrium level will be corrected by a decrease of about 0.170 and 0.163 for each quarter, respectively.[8]

5. CONCLUSION

To examine the hypothesis whether Thailand's economic growth over the past few decades is a result of the successful implementation of a set of economic reform policies based on the Washington Consensus or if it is a result of the good luck from the contribution of external factors, this paper applies Johansen's cointegration and error-correction model to examine the relationship between a set of economic reform policies (i.e., fiscal reform financial development, openers, and deregulation), the contribution of external factors (i.e., real effective exchange rate, oil price, and U.S growth), and Thailand's economic growth.

The Johansen's cointegration result reveals that there exists at least one cointegrating relationship among the variables for each model. In each model, the normalized cointegration coefficient indicates that fiscal reform, openness, and deregulation have a positive effect on economic growth, while financial development does not have a significant effect on economic growth. Surprisingly, it also finds that the real effective exchange rate which is one of an external shocks used in this paper has a significant effect with the expected sign. Moreover, when we compare the magnitude of this significant external shock, we find that this significant external factor contribute highly to economic growth. The magnitude of the significant external factors is slightly lower than the magnitude of fiscal reform, and close to the magnitude of openness and deregulation. Therefore, the hypothesis that Thailand's economic growth is not only determined by economic reform policies but also by the contribution of external shocks, cannot be rejected.

Additionally, as a result of the Johansen's cointegration results, the estimation of the VECM model indicates also that the variables in the model may be in disequilibrium,

[8] In other words, this may imply that the $RPGDP_t$ is higher than the desired $RPGDP_t$ in the short-run, and the $RPGDP_{t+1}$ will always revert back to its equilibrium.

with the disturbances being the equilibrium error in the short-run. For each model, the short-run adjustment coefficient is significantly negative, with a small magnitude. This indicates that if Thailand's per capita real GDP during the current period is higher than the desired per real GDP, Thailand's per capita real GDP in the next period will decrease slowly to back to its equilibrium.

In sum, although the result shows that Thailand's economic reform policies still have a significant effect on Thailand's economic growth, Thailand's policy makers should realize the actual power of these policies. These policies seem to have a large effect on growth if we estimate only their impact on the growth model without taking into account the role of external shocks, which may implicitly impact on growth. Regarding the process of policy implementation, therefore, they should ensure that their policies have a real impact on the economy, and the extent of their power. According to this ambiguous effect, it thus would be better if Thailand's policy-makers rethink their economic reform policies before they move forward into the complexity of globalization by examining the relationship between a set of growth policies and economic growth. This will ensure that Thailand's economic growth will be the result of good policies and not good luck.

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