

## Analysis of International Capital Mobility in ASEAN-5 Countries: Savings-Investment Nexus

*(Analisis ke atas Mobiliti Modal Antarabangsa dalam Negara ASEAN-5: Tabungan-Pelaburan Nexus)*

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### ABSTRACT

*This paper analyzes the degree of the international capital mobility via the national savings and investment relationship in ASEAN-5 countries, namely Indonesia, Malaysia, Thailand, the Philippines and Vietnam over the period 1980 to 2013 using panel data method. Besides, this paper also investigates the impact of the international capital mobility for three sub-periods: period prior to 1997 Asian financial crisis (1980-1996), period after the 1997 Asian financial crisis (1997-2007) and period after the 2008 global financial crisis (2008-2013). The findings of this paper indicate that the degree of the international capital mobility is at the moderate level for the period 1980 to 2013. However, the finding of the sub-periods after 1997 Asian financial crisis and 2008 global financial crisis indicating an upsurge degree of the capital mobility in ASEAN-5 countries. This might be due to the adoption of export oriented policy and the capital account liberalization in the 1990s and closer economic cooperation in the East Asia region aftermath both of the global and Asian financial crises. It is crucial for government and policy makers to monitor closely on the trend of international capital mobility to prevent financial risks as well as develop efficient policy and financial regulatory to achieve the policy coordination among the ASEAN members.*

*Keywords: Capital mobility; Feldstein-Horioka Puzzle; panel data*

### ABSTRAK

*Kajian ini menganalisis tahap mobiliti modal antarabangsa melalui hubungan antara tabungan negara dan pelaburan untuk negara dalam ASEAN-5, iaitu Indonesia, Malaysia, Thailand, Filipina dan Vietnam dalam tempoh 1980 hingga 2013 dengan menggunakan kaedah data panel. Selain itu, kajian ini juga menganalisis impak mobiliti modal antarabangsa untuk tiga sub-tempoh: tempoh sebelum krisis kewangan Asia 1997 (1980-1996), tempoh selepas krisis kewangan Asia (1997-2007) dan tempoh selepas 2008 krisis kewangan global (2008-2013). Secara keseluruhannya, kajian mendapati bahawa tahap mobiliti modal antarabangsa adalah pada tahap sederhana bagi tempoh 1980 hingga 2013. Walau bagaimanapun, mobiliti modal di negara ASEAN-5 menunjukkan tahap peningkatan untuk sub-tempoh selepas 1997 krisis kewangan Asia dan krisis kewangan global 2008. Ini adalah disebabkan oleh dasar berorientasikan eksport dan liberalisasi akaun modal yang berlaku pada 1990-an dan kerjasama dalam bidang ekonomi yang lebih erat di antara negara-negara rantau Asia Tenggara selepas kedua-dua krisis kewangan. Justeru adalah penting kepada kerajaan dan pembuat dasar untuk memantau rapat trend mobiliti pergerakan modal antarabangsa bagi mengelakkan risiko kewangan dan membentuk dasar ekonomi yang cekap serta struktur kewangan yang kukuh untuk mencapai penyelarasan dasar di kalangan negara-negara ASEAN.*

*Kata kunci: Mobiliti modal; Feldstein-Horioka puzzle; data panel*

### INTRODUCTION

High degree of the international capital mobility in financial market is becoming noticeable and viewed as an important aspect of economic convergence, particularly for developing countries. Most of the developing countries promote capital mobility across countries as capital mobility enables them to gain advantages in term

of efficiency and competitiveness at the international platform. Besides that, developing countries are able to enhance their specialization in the production of financial services and thus improve their international resources allocation. Ultimately, the free flow of capital may generate more investments which subsequently stimulate the economic growth and improve the welfare of the countries. However, there are some drawbacks due

to the high degree of the international capital mobility. A country may be vulnerable or expose to some significant risks such as instability of the real exchange rate, increasing price volatility of financial assets due to the speculation and economic shock, which might disrupt the economic growth of the country. Therefore, monitoring closely on the degree of the international capital mobility is necessary for policy makers and firms to seek for the balance between the benefits and risks that caused by huge influx of capital into host countries as well as use it as guideline to strike a balance between the financial market freedom and government ability in managing their countries.

There are several ways to measure the degree of the capital mobility. Savings-investment approach has been chosen in this study to identify the degree of international capital mobility. Savings and investment approach is not the only approach to examine the degree of international capital mobility. However, it is undeniable that savings and investment nexus has some impacts on international capital mobility as stated in numerous previous literatures. According to Tan (2000), the magnitude of small countries' economic development surpass their national savings is counted on their accessibility to international capital market. Furthermore, international capital mobility is a vital determinant to influence crowd out effect of public deficit towards private investments in a country. The saving- investment approach had drawn great attention since the seminar work of Feldstein and Horioka (1980). Economic theory suggested that extra national savings of any country will flow to other countries that provide favorable investment return and this facilitates capital mobility across countries. In the study of Feldstein and Horioka (1980), they indicated that domestic savings and investments are highly correlated with the absence of capital mobility as the domestic investments are financed by national savings. On the other hand, there should be no correlation between national savings and domestic investment of a country with the existence of perfect capital mobility. However, their finding discovered that 85-95% of national savings were used as investment in their domestic economies for 16 Organization of Economic Cooperation and Development (OECD) countries. This implies high correlation between national savings and investment and signifies low capital mobility among those developed countries. The result is inconsistent with the theory where the developed countries generally experiencing high degree of the capital mobility and thus should exhibit low degree of correlation between national savings and investment. Subsequently, the finding of Feldstein and Horioka (1980) had attracted many economists to further their investigation in the relevant field over the decades (e.g., Dooley, Frankel & Mathieson 1987; Coakley, Kulasi & Smith 1998; Pelgrin & Schich 2008; Herwartz & Xu 2009; Bangake & Eggoh 2011; Jun 2012; Ketenci 2013).

Although most of the Asian countries imposed the restrictions on capital flows across countries in 1960-1970s, however, the situation changed in the 1980s. This is when the Asian countries started to adopt the floating exchange rate and took progressive and vigilant action in the capital account liberalization. As a result, the degree of the international capital flows increased substantially with the removal of capital control in the Asian countries, particularly in the 1990s and prior to the 1997 Asian financial crisis. Aftermath of the 1997 Asian financial crisis, most of the Asian countries especially countries of Association of South East Asian Nations (ASEAN) experienced financial turmoil, currency value collapsed, deterioration in the stock market and others. ASEAN countries like Thailand, Indonesia and The Philippines obtained the financial assistance from International Monetary Fund to overcome 1997 Asian Financial crisis except Malaysia. Malaysia adopted the capital control after 1997 Asian crisis but it was short-lived as Malaysia government has release them in February 1999. This financial crisis had urged the need of ASEAN countries to emphasize on the economic restructuring and policy reformation in the global financial market in order to recuperate from huge loss caused by the crisis. They implemented various strategies to achieve higher degree of economic integration after recovering from the crisis. These strategies including lowering the trade barriers, established free trade agreements, expansion in international trade by forming the bilateral currency swap as well as financial market deregulation and further capital account liberalization. As a result, ASEAN countries such as Thailand, Malaysia, Indonesia, and Singapore experienced gradual growth in their GDP by the mid-1999. The 2008 global financial crisis had affected many countries in the world especially developed countries like European Union (EU) countries and the United States. Indeed, it had also affected the volume of imports and exports of the ASEAN countries, which played as business partners to most of the developed countries. Some of the ASEAN countries had experienced drastic deterioration in the GDP growth such as Malaysia and Thailand with the declination in output of 6-7% after the crisis. Consequently, several strategies were adopted by ASEAN countries to speed up the recovery process such as the implementation of the fiscal stimulus packages effectively, reformed banking and financial sectors regulation and formed the regional cooperation among them. This eventually improved the stability of ASEAN region and thus led to the increasing the degree of capital mobility over time.

This paper focuses on ASEAN-5 (Indonesia, Malaysia, Thailand, The Philippines and Vietnam). These ASEAN-5 countries experienced economic downturn during the 1997 Asian financial crisis and recovered with an upsurge GDP and capital inflow over years. Among ASEAN member countries, these ASEAN-5 countries become favorite spot for capital inflow due to the attractive environments

with supportive government policies, cheaper labor cost, production capability and favorable demographics. They adopted deregulation policy to attract capital inflow for instance Indonesia, Malaysia and Thailand approved 100% foreign capital ownership in projects with conditions according to individual countries after 1986. Besides that, these countries have been listed as emerging markets by different market index makers<sup>1</sup> and considered as countries that have great potential growth prospect. In term of financial sector development and progress, ASEAN-5 countries are at the different stages of development. According to Chairisawatsuk (2016), Indonesia, the Philippines and Vietnam are at the stage of creating vigilant banking sector for financing investment (access to funding for investment projects), Thailand is at the stage of highly dependence on bond market (both corporate and government for financial investment) meanwhile Singapore and Malaysia are focusing more on development capital market and financial regulations.

The national savings and investment of ASEAN-5 countries are shown below to provide an overview of the capital mobility trend of those countries.

Table 1 shows four years average of national savings for ASEAN-5 countries for the period 1990 to 2013. The figures show that the gross national savings rate increased gradually in the period 1998-2001 compared to the periods before. This can be seen from the increment of the savings rate of 36.6% of GDP, 19.1% of GDP and 30.3% of GDP for Malaysia, the Philippines and Vietnam, respectively. Nevertheless, Indonesia and Thailand experienced downward trend in their gross national savings with 22.4% of GDP and 30.7% of GDP, respectively, in the period 1998-2001 compared to the

previous periods. Meanwhile, most of the ASEAN-5 countries exhibit progressively pace of improvement in their gross national savings rate after the 2008 global financial crisis as shown in the period 2010-2013, except for Malaysia and Thailand.

Table 2 shows the four years average of total investment for ASEAN-5 countries in the period 1990 to 2013. The total investment rate for Indonesia, Malaysia, the Philippines and Thailand has shown downward trends as compared with the period before crisis (1994-1997) and after Asian financial crisis (1998-2001), especially Thailand which experienced the average of total investment deterioration from 39.5% of GDP to 21.9% of GDP. On the other hand, the Philippines experienced the least deterioration of the total investment among the ASEAN-countries that is from 26.3% of GDP to 20.7% of GDP. Vietnam is the exceptional case which experienced the increment of 2.1% of GDP for the average of total investment from 27.3% of GDP to 29.4% of GDP after the 1997 Asian financial crisis (1998-2001). The 2008 global financial crisis did not leave major impact on the total investment for ASEAN-5 countries, particularly the period during global financial crisis (2006-2009) and period after global financial crisis (2010-2013). Indonesia, Malaysia, the Philippines and Thailand have recorded upward trends in the average of total investment after the 2008 global financial crisis. In contrast, Vietnam experienced the declination in the total investment after the crisis, which decreased from 36.8% of GDP in the period 2006-2009 to 29.2% of GDP in the period 2010-2013.

This paper aims to determine the degree of the international capital mobility of ASEAN-5 countries by

TABLE 1. Gross National Savings in ASEAN-5 Countries (% of GDP)

Country	1990-1993	1994-1997	1998-2001	2002-2005	2006-2009	2010-2013
Indonesia	28.2	29.1	22.4	26.5	28.8	32.5
Malaysia	31.5	35.4	36.6	34.7	37.4	32.9
Philippines	16.8	17.2	19.1	23.6	22.0	22.8
Thailand	34.3	33.8	30.7	27.9	30.4	29.3
Vietnam	13.7	22.6	30.3	30.7	29.8	30.9

Note: The four years average of gross national savings is reported.

Source: International Monetary Fund, World Economic Outlook Database, October 2013.

TABLE 2. Total Investment in ASEAN- 5 Countries (% of GDP)

Country	1990-1993	1994-1997	1998-2001	2002-2005	2006-2009	2010-2013
Indonesia	41.2	31.4	18.2	24.0	27.3	33.8
Malaysia	36.3	42.3	25.1	23.2	21.4	24.9
Philippines	24.7	26.3	20.7	22.7	17.8	19.5
Thailand	40.9	39.5	21.9	26.8	26.3	28.1
Vietnam	11.5	27.3	29.4	33.7	36.8	29.2

Note: The four years average of total investment is reported.

Source: International Monetary Fund, World Economic Outlook Database, October 2013.

examining the savings and investment linkage for the period 1980 to 2013 as well as a series of sub-periods via the panel data methods. This paper varies from other studies on the Feldstein and Horioka Puzzle in several aspects. First, this paper contributes to the literatures by accommodating a series of sub-periods in measuring the capital mobility via the savings-investment relationship despite the full sample period from 1980 to the current year 2013. The classification of the sub-periods is as followed: sub-period 1980-1996 (prior to the 1997 Asian financial crisis); sub-period 1997-2007 (after the 1997 Asian financial crisis); sub period 2008-2013 (after the 2008 global financial crisis). The purposes of conducting this study based on different sub-periods are to provide comparative views on the degree of the capital mobility for ASEAN-5 countries before and after both financial crises. Second, the finding of this paper will provide some evidences to the policy makers as reference and enable them to make conscious decision in promoting the financial integration and capital account liberation especially when dealing with massive capital inflow and global economics uncertainty. This will be helpful to prevent ASEAN countries from experiencing negative impacts brought by previous financial crises. Furthermore, outcomes of this study offers foreign investors with different perspective other than interest rate and higher rate of return for ASEAN countries by considering the country's national savings and investments nexus.

The remainder of this paper is organized as follows. Section 2 reviews the literatures of the Feldstein and Horioka Puzzle through different panel methods for OECD countries and Asian countries. Section 3 explains on the data and empirical methods and strategies. Meanwhile, Section 4 discusses on the empirical results and discussion. The last section contains summary and conclusions.

## LITERATURE REVIEW

In general, international capital mobility can be defined as the movement of capital which consists of foreign direct investment and foreign portfolio investment across different markets and countries for the purpose of investment, business trade and production. Theoretically, free flow of capital across countries benefit both countries in term of promote investment and growth, enhance production efficiency, technological spillover and others. In contrast, massive flow of international capital might cause some negative effects such as destabilize financial market and financial risks. Literatures that studied on the degree of the international capital mobility through savings-investments relationship started with the seminar work by Feldstein and Horioka (1980) for 16 developed OECD countries. In their study, they discovered high correlation between national savings and domestic investment, which indicated low international capital

mobility among those developed countries. However, they argued that the finding had contradicted with the view of developed countries who should achieve high degree of the capital mobility. This is because according to the economic theory, the domestic savings of any country will be invested in the other world capital market, which then provides higher marginal return as compared to the home country. The discrepancy of their finding with the standard economic expectation was known as "Feldstein and Horioka Puzzle" (FHP). The FHP has elicited a wide range of literatures to discuss and provide solution to this puzzle. Those literatures have been conducted through different terms of methodologies such as times series methods and panel data methods. Panel data methods have become preferable method among economists recently due to its combination of cross-sectional data and time series data that provide more information. This study classifies the previous literatures of the FHP from the panel data method perspective into two strands. The first strand of the literatures focuses on the discussion of FHP for the OECD countries while the second strand of literatures emphasizes on the ASEAN countries.

There are several literatures that emphasize on the OECD countries. Among them are Coakley, Fuertes & Spagnolo (2004) who have re-estimated savings and investment relationship by investigating a group of 12 OECD countries from 1980 to 2000 using mean group (MG) regression approach, which was introduced by Pesaran and Smith (1995). They applied MG approach to capture the important effects of country heterogeneity and control the cross-section dependence despite evading the conceptual problems in panel unit root and cointegration testing. Their results contradicted with the findings of Feldstein and Horioka (1980). However, it is consistent with the economic point of view. This implied the existence of high degree of the capital mobility among the OECD countries in the long-run. Meanwhile, Pelgrin and Schich (2008) applied the Dynamic Panel Error Correction method, which was introduced by Pesaran and Smith (1999) to examine the short and long run savings-investment relationship from the perspective of solvency constraint and degree of the capital mobility. The advantage of this method is to provide a better capture of the capital mobility in large sample of countries jointly instead of individual countries. Their study on 20 OECD countries from 1960 to 1999 displayed significant long-run relationship between savings and investment, which signifies the existence of the solvency constraint among those developed countries. Besides, their study also indicated evidence of increment of the degree of the capital mobility among OECD countries over time. This can be seen via greater persistence of deviations of savings and investment from their long-run equilibrium relationship. Subsequently, Herwartz and Xu (2009) had conducted study on the saving-investment relationship on most of the OECD countries for the period 1971 to 2002.

This study aims to determine the most appropriate model in explaining the ratio of domestic savings and investment to GDP by using the cross-validation techniques. They discovered that country specific panel model has performed better than pooled and time dependent specific model. Besides, they concluded that there was no evidence of cointegration relation between domestic savings and investment. Recent research done by Ketenci (2013) who investigated the changes of savings and investment relationship with the existence of structural shifts for panels of developed countries. The study classified the developed countries into four groups; OECD as whole, the European Union (EU) 15, North America Free Trade Area (NAFTA) and the G72 countries. Econometric methods such as Kao (1999) and Pedroni (1999) cointegration test as well as Westerlund (2006) panel cointegration test were adopted in the study. The main advantage of Kao (1999) and Pedroni (1999) cointegration test is that both methods allow testing without the structural shifts in series. Meanwhile, Westerlund (2006) panel cointegration test is beneficial in terms of allowing multiple structural shifts in series. Besides, saving-retention coefficients were estimated through the stability test of Hansen (1992) and Dynamic Ordinary Least Squared (DOLS) estimators. The saving-retention coefficient for all various groupings of developed countries was estimated into three categories: total, unstable, and stable. Empirical finding indicated that the results were not robust and sensitive to the different group of countries classifications. Most of the panel samples were experiencing high level of the capital mobility except for the panel of stable G7 countries such as France, Germany, Japan and United Kingdom.

On the other hand, the second strand of literatures of FHP focused on the Asian region. There are few relevant literatures that discussed on the FHP that applied panel estimation methods for the Asian region as follows. Tan (2000) who studied on the savings, investment and capital flows for ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore and Thailand) through time series method of cointegration and vector error-correction modeling (VECM) indicated that there is high degree of short run capital flow for ASEAN countries after 1997 Asian finance crisis. The increasing trend of investment for Malaysia, the Philippines and Thailand for the period of 1980 to 1996 was supported by the net foreign capital inflow. Study of Kim, Oh and Jeong (2005) who investigated the international capital mobility for 11 Asian countries, namely India, Indonesia, Japan, Korea, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka and Thailand over the period 1960-1998. The Fully Modified Ordinary Least Squared (FMOLS) and Dynamic Ordinary Least Squared (DOLS) techniques were adopted in the study. They applied the between-group instead of pooled panel FMOLS because it allows the flexibility of alternative hypothesis and minimize the problem occurs

from small sample size alteration than the within group estimator. Furthermore, they examined the degree of the international capital mobility in Asian countries as a group rather than individual countries. The results of their study showed that the savings and investment coefficients for the period 1960-1979 are 0.58 and 0.76, respectively based on FMOLS and DOLS. Meanwhile the savings and investment coefficients for the period 1980 to 1998 are 0.39 and 0.42, respectively. Their finding indicated decreasing value of savings and investment coefficients for the two-sub-periods and thus implied that there was an upsurge trend in the degree of the capital mobility for Asian countries over the period 1980s and 1990s. Eng and Habibullah (2006) studied on the financial integration and international capital mobility in the East Asian region for the period 1970 to 2000. They examined the dynamics of national savings-investment using panel error-correction model, introduced by Pesaran and Smith (1999). They considered the effect of the dynamics between the savings and investment relationship by capturing the heterogeneity of short run responses, which have been ignored by most of the previous studies. Their findings suggested that national savings and investment are associated in long-run perspective. Furthermore, the low values of the significant error-correction term indicated evidence of some degree of the capital mobility in Asian countries. Recent literature that applied the panel estimation methods to investigate the international capital mobility for 28 Asia-Pacific countries was conducted by Jun (2012). In the study, the author applied three types of panel cointegration methods; Canonical cointegration regression (CCR), Dynamic OLS (DOLS) and Fully Modified OLS (FMOLS), to examine the long-run equilibrium relationship for the savings and investment relationship. In addition, different sub-sample periods were also incorporated in the study in order to observe the changes of the degree of the capital mobility over time. The results revealed that there was a descending trend in the saving-retention coefficients. This implies the increasing degree of the capital mobility among those Asia-Pacific countries over the period 1960-2006. Moreover, similar estimation results had been found in all the sub sample periods, which signify that the capital mobility increase substantially in the period of 1980s and 1990s.

In sum, almost all the literatures above provided contradict results to the finding of Feldstein and Horioka (1980) on the savings-investment relationship for OECD countries. On the other hand, few numbers of literatures which examined on the capital mobility for Asian countries through different panel estimator methods had provided the evidence of increasing trends in the degree of the capital mobility over the periods of 1980s and increased gradually after the 1997 Asian financial crisis. Thus, the degree of the international capital mobility is increasing not only in developed countries but also in developing countries over the years.

## METHODOLOGY

### DATA

This analytical study is based on the annual macroeconomics data of gross national savings and total investment for ASEAN-5 countries, namely Indonesia, Malaysia, Thailand, the Philippines and Vietnam over the period 1980 to 2013. Data for this empirical study were obtained from International Monetary Fund, World Economic Outlook Database 2013. The dependent variable in this study refers to total investment meanwhile the independent variable is national savings. Data of total investment for these five ASEAN countries expressed in percent of GDP and measured by the sum of gross fixed capital formation and the changes in inventories and acquisitions minus disposals of valuables for a unit. Meanwhile, data of gross national savings in this study expressed in percent of GDP and measured on the gross disposable income deduct final consumption expenditure after take consideration on the pension funds adjustment.

### ESTIMATION MODEL: SAVING-INVESTMENT MODEL

The most common measurement for the level of the capital mobility is gross national savings and investment. Based on the basic model suggested by Feldstein and Horioka (1980) in their previous study is stated as following:

$$\left(\frac{I}{Y}\right)_i = \alpha + \beta \left(\frac{S}{Y}\right)_i + e_i \quad (1)$$

where  $I$  refers to the domestic investment,  $S$  denotes the gross national savings and  $Y$  is gross domestic product of considered country  $i$ . Coefficient  $\beta$  is known as the saving retention coefficient, which measure the degree of the capital mobility for a country and  $e_i$  is the error terms. According to Feldstein and Horioka (1980), the value of  $\beta$  has to be close to 0 with the presence of perfect capital mobility in a country. This implies that investment is financed by capital inflow. In contrast, if the value of  $\beta$  is close to 1, this implies the capital immobility in the country where the investment is financed by national savings. In their previous study on the 16 OECD via cross-sectional, data showed the value of  $\beta$  range from 0.87 to 0.91. The results implies that the international capital immobility among the respective countries and around 90% of national savings are used to finance domestic investment among them. This controversial result leads to extensive arguments and debate among researchers and subsequently known as Feldstein and Horioka Puzzle.

### PANEL DATA MODEL

This study analyzes the degree of the international capital mobility by adopting the panel data. Panel data is the combination of cross sectional data and time series

data. There are few advantages of using the panel data according to Hsiao (2003) and Klevmarken (1994) as listed as follows. First, panel data is able to capture the individual heterogeneity as compared to the time series and cross section studies. Second, this combination of cross-sectional data and time series data provides more information with less collinearity problem among the variables as compared with pure time series data or cross-sections data. Third, panel data is beneficial in studying complex behavior, economic duration and the dynamic of adjustment.

There are two basic models for the analysis of panel data, which are fixed effect model and random effect model. The fixed effect model investigates the relationship between the independent variable and dependent variable within an entity. Each entity has its own individual characteristic that may or may not influence the independent variable. The important assumption of using the fixed effect model is if there are unobserved individual-specific factors that are correlated with the independent or dependent variables and believed that those unobservable factors are time invariant, the fixed effect model may be used to control the omitted variable bias. The fixed effect model can be written as following based one-way error components by controlling the time-invariant unobserved country-specific effect:

$$I_{it} = \beta_1 S_{it} + \alpha_i + u_{it} \quad (2)$$

where

$I_{it}$  is domestic investment as dependent variable where  
 $i$  = entity and  $t$  = time

$\beta_1$  is the coefficient for that independent variable

$S_{it}$  represents gross national savings as independent variable where  $i$  = entity and  $t$  = time

$\alpha_i$  ( $i = 1 \dots n$ ) is the unknown intercept for each entity  
( $n$  entity-specific effects)

$u_{it}$  is the error terms

In contrast, the assumption of using the random effect model is that the unobserved entity-specific effects that are uncorrelated with the independent variables. Furthermore, Hsiao (2007) highlighted several advantages of using the random effect model as alternative to the fixed effect model. First, the random effect model allows the number of parameter to be held constant even when the sample size increases. Second, it also able to provide efficient estimation based on both within and between group variations. Third, the random effect model considers the effect of the time invariant variables.

It is stated that only the mean and variance will be estimated in the random effect model instead of estimating the  $N$  of the  $\alpha_i$  in the fixed effect models if the sample has a large number of cross-section units. The rationale is to save a lot of degree of freedom. Secondly, if  $u_{it}$  is treated as a random variable, then the  $\alpha_i$  should be treated as random variable as well. This is due to the reason that

researcher ignore the  $\alpha_i$  the same way that  $u_{it}$  are ignored. Thirdly, researchers should treat  $\alpha_i$  as fixed if inference is based on sample. On the other hand, they should treat  $\alpha_i$  as random if inference is based on population. Finally, the random effect model allows the inclusion of the time-invariant variables but not the fixed effect model. Therefore, both the fixed effect model and random effect model have the advantages and disadvantages. However, only one model will be applied in this research paper. One way to determine the option of employing either the fixed effect model or random effect model is by applying the Hausman test in the panel data. The Hausman test is used to determine whether the random effect modelling assumption hold, where the independent variable(s) are orthogonal to the unit effect or existence of correlation between them. Both the estimate of  $\beta$  in the fixed effect model ( $\hat{\beta}_{FE}$ ) and the estimate of  $\beta$  in the random effect model ( $\hat{\beta}_{RE}$ ) should be identical if there is no association between the independent variable(s) and the unit effects. The Hausman test statistic  $H$  is a measure of the variance between two estimates and as shown below:

$$H = (\hat{\beta}_{RE} - \hat{\beta}_{FE})' [Var(\hat{\beta}_{FE}) - Var(\hat{\beta}_{RE})]^{-1} (\hat{\beta}_{RE} - \hat{\beta}_{FE}) \quad (3)$$

Under the null hypothesis of orthogonality in term of the association between independent variable and the unit effect,  $H$  is distributed chi-square with degree of freedom equal to the number of explanatory variable in the model. An outcome of  $p < 0.05$  indicating that the two models are dissimilar and reject the null hypothesis at the significant level. Thus, fixed effect model will be preferred than random effect model (Greene 2008).

### RESULTS AND DISCUSSIONS

This section provides discussion on the results of the estimation on savings and investment relationship based on panel data fixed effect model and random effect model. The data are analyzed into two parts: full sample period from 1980 to 2013 and a series of sub-periods from 1980 to 1996, 1997 to 2007 and 2008 to 2013.

Table 3 presents the outcomes of the savings-investment coefficients via fixed effect model and random

effect model that indicate the degree of the international capital mobility of ASEAN-5 countries from 1980 to 2013. In this case, the savings-investment coefficients are rejected at the 1% levels of significance. The results from fixed effect model and random effect model display positive and significant savings-investment coefficients with the value of 0.647 and 0.636 respectively. In order to determine the most appropriate model between fixed effect model and random effect model in this study, Hausman's chi-square test is employed. The Hausman test statistic is 0.11 with  $p$ -value of 0.735 where the statistically insignificant  $p$ -values imply the non-rejection of the null hypothesis of orthogonality association between independent variable and the unit effect. Therefore, random effect model is the ideal model comparatively to fixed effect model.

Based on the explanation of Feldstein and Horioka (1980), the perfect international capital mobility occurs where the correlation between savings and investment is zero, otherwise it would be one for capital immobility. The result from random effect model in Table 3 displays positive value for savings-investment coefficient with coefficient of 0.636 for the full sample period. This estimated value signifies a moderate degree of the capital mobility among the ASEAN-5 countries from 1980 to 2013. This result is fairly consistent with the findings of Kim et al. (2005), who obtained the savings and investment coefficients of 0.54 based on FMOLS method and 0.62 based on DOLS method for eleven Asian countries over the period of 1980-1998. Nevertheless, this outcome is inconsistent with the findings from Eng and Habibullah (2006) where they reported the coefficient of 0.843 in the long-run (implies high degree of the capital immobility) and findings from Jun (2012) with coefficient of 0.310 based on FMOLS method and 0.320 based on DOLS method ((implies high degree of capital mobility). One of the reasons for the divergence results are due to the dissimilarities in the sample period used in their study. For instance, the full sample period from 1970 to 2000 used in the study of Eng and Habibullah (2006) and 1980 to 2006 used in the study of Jun (2012). Furthermore, the low coefficient of savings-investment which reported by Jun (2012) is due to the larger sample countries used in the study, which are 28 Asia-Pacific countries and consists of several developed countries such as Australia, Japan and New Zealand.

The interpretation of the empirical evidence of considerably moderate degree of the capital mobility in long-run for ASEAN-5 countries can be based on the dynamic development in the region. These developments lead to the gradually higher degree of integration among the countries. The ASEAN-5 countries had experienced significant transformation from agricultural based to manufacturing based. The adoption of the exportation strategy in the 1980s further enhances the trade and capital liberalization in the region. Subsequently, effort in fostering higher degree of integration among the

TABLE 3. Savings-Investment Relationship of ASEAN-5 Countries from 1980-2013

	Fixed Effect Model	Random Effect Model
Savings	0.647* (0.094)	0.636* (0.088)
Hausman Test		0.110 [0.735]
Number of Countries	5	5
Number of Observation	170	170

Notes: Standard error in parentheses;  $p$ -value in bracket. Asterisk (\*) denotes statistically significant at 1% level.

ASEAN countries as well as neighboring region can be seen in the 1990s via the formation of ASEAN Free Trade Area (AFTA) and Asia-Pacific Economic Cooperation (APEC). Economic cooperation efforts further expanded to East Asia, particularly as consequences of the 1997 Asian financial crisis, such as the ASEAN+3 Cooperation and Chiang Mai Initiative (bilateral swap agreement). These integration developments had contributed to the higher degree of the international capital mobility in the ASEAN-5 countries.

Table 4 displays the result of capital mobility through the national savings and investment relationship based on the fixed effect model and random effect model. The results encompass the consideration of different time periods: sub-period from 1980 to 1996, sub-period from 1997 to 2007 and sub-period from 2008 to 2013. The purpose of examining the behavior of the saving-investments in a series of sub-periods is to capture the development of the capital mobility such as prior and after the 1997 Asian financial crisis as well as prior and after the 2008 global financial crisis. These outcomes eventually will provide essential insight on the consequences of the financial crises towards the capital mobility in the ASEAN-5 countries. The Hausman test shows the result of insignificant  $p$ -value for all the three sub-periods, which are 0.763, 0.749 and 0.067 respectively. Thus signifies that the random effect model is preferred. Therefore, the outcomes of random effect model are referred in this study for further discussion. The significant savings-investment coefficient for the first sub-period 1980-1996 displays coefficient of 0.943 that indicates strong relationship between the national savings and investment of ASEAN-5 countries. This estimation also signifies the low degree of the capital mobility occurred in ASEAN-5 countries prior to the 1997 Asian financial crisis. However, the savings-investment coefficient for the sub-period 1997-2007 stood at 0.488, which indicates low level of relationship between savings and investment. This implies the moderate high degree of capital mobility during the period aftermath of the 1997 Asian financial crisis. Comparatively, the reduction of the

savings-investment coefficient from 0.943 for sub-period 1980-1996 to 0.488 for sub-period 1997-2007 shows the existence of an increasing trend of the international capital mobility among the ASEAN-5 countries aftermath of the 1997 Asian financial crisis. Interestingly, the savings-investment coefficient of the sub-period 2008-2013 indicates coefficient of -0.196 but is insignificant. This result leads to the following interpretations. First, the low and insignificant coefficient of the savings-investment relationship indirectly implies high degree of the capital mobility in the sub-period 2008-2013. This is consistent with the findings of Jun (2012) where the author revealed that the small number of observations is the main reason of the low significant result. Second, the negative saving-retention coefficient is consistent with the previous study of Ozmen (2007) and Ketenci (2013). Among the reasons are the insufficient domestic financial structures that contribute to the national savings flight abroad rather than financing the domestic investment. Besides, the high world interest rate will lead to the increment of domestic interest rate, which in turn stimulates growth in national savings and caused a decline in domestic investment (Westphal 1983). Thus, the sub-period 2008-2013 has the lowest savings-investment coefficient value among the three sub-periods. Intuitively, this result implies that the degree of the international capital mobility is substantially increasing from the sub-period of 1997-2007 to the sub-period of 2008-2013.

The results of the saving-investment nexus based on a series of sub-periods provide evidences that the ASEAN-5 countries had experienced increasing higher degree of the capital mobility. This is consistent with the findings of Kim et al. (2005), Eng and Habibullah (2006) and Jun (2012), where there is evidence of increasingly international capital mobility in the Asian region. The capital mobility is less mobile in the period of the 1980s for ASEAN-5 countries due to some restrictions on their capital account and economic policies. However, the capital mobility becomes an important source for ASEAN-5 after both the financial crises. There are few reasons contributed to the substantial increment degree of the international capital mobility among the ASEAN-5 countries, particularly after both financial crises. First, ASEAN-5 countries are playing active roles in international trade since the adoption of the export-oriented strategy. Furthermore, capital account liberalization and the high level of trade openness lead to the increment of the capital mobility, even prior to the 1997 Asian financial crisis. Second, economic cooperation and integration at regional level had become increasingly imperative among the ASEAN countries and become obvious aftermath of the 1997 Asian financial crisis. This cooperation is crucial in order to combat with the global economic shock as consequences of the 1997 Asian financial crisis. There are some efforts that enhance the regional cooperation among the members such as ASEAN+3, which consists of 10 members of

TABLE 4. Panel Data of Sub-Periods for ASEAN-5 Countries

	1980-1996	1997-2007	2008-2013
<b>Savings</b>			
<i>Fixed Effect</i>	0.929*	0.515*	- 0.374
<i>Random Effect</i>	0.943*	0.488*	- 0.196
Hausman Test	0.090 [0.763]	0.100 [0.749]	3.350 [0.067]
Number of Countries	5	5	5
Number of Observation	85	55	30

Notes:  $p$ -value in bracket. Asterisk (\*) denotes statistically significant at 5% level. Random effect model is preferable based on Hausman Test.

ASEAN countries plus China, Japan and South Korea; for instance, capital inflow from China to ASEAN countries showed upsurge trend from approximately USD 8 billion in 2007 to USD 16 billion in 2012 (UNCTAD bilateral FDI statistics 2014). Moreover, the Chiang Mai Initiative (CMI) was established in 2012 with the objectives to provide reserve pooling or currency swap arrangement for its member countries in the event to cushion the effect of the severe economic downturn in the future. Meanwhile, the creation of ASEAN Economic Community (AEC) by 2015 with the aims to form a single market which allow free movement of goods, services, skilled labor, investment and capital, further enhance the capital mobility among the ASEAN members. In viewing of this, government or policymakers of ASEAN countries have to strengthen their current financial structure and develop efficient policy in order to support an integrated banking system for the further financial integration. Ongoing improvement of regional macroeconomic surveillance and financial safety net is essential for member countries to prevent from the financial sector vulnerabilities. The Blueprint of AEC 2015 which calls for regulatory harmonization and policy coordination enhancement among ASEAN members will be great challenges to them by viewing the different economic development stages.

As a conclusion, there are significant evidences demonstrating that the capital mobility in the ASEAN-5 countries experienced an increasing degree of the capital mobility. Although the occurrence of the 1997 Asian financial crisis caused severe economic implications in the East Asia region, nevertheless, the cooperation efforts among the countries in the region in the 2000s contributed to the stability in the region. This eventually leads to the favorable condition for international capital flow in the region. In addition, the effect of the 2008 global financial crisis also depict continuous trend of higher level of the capital mobility. Viewing the current global economic uncertainty such as volatility in global oil price and financial environment after the financial crises, the degree of international capital mobility will

still demonstrate increasing trend. However, the source of capital inflow may shift to the intra-regional due to the closer cooperation between ASEAN countries with China, Japan and South Korea.

## ROBUSTNESS CHECKING

In order to provide robustness checking on the result obtained from the Random-Effects model, we examine the saving-investment relationship using panel cointegration to test the existence of the long-run equilibrium as shown in Table 5. In addition, the coefficient of the saving-investment relationship is estimated via Fully-Modified OLS and Dynamic OLS as shown in Table 6 and Table 7. Panel cointegration results indicate existence of long-run relationship between saving and investment in the full sample period and sub-periods 1980-1996 and 1997-2007. The results from FMOLS and DOLS shown in Table 6 refer to the full sample period 1980-2013. These results are fairly consistent with the results from the Random-Effects which imply moderate degree of the capital mobility among the ASEAN-5 countries. Meanwhile, Table 7 depicts the results of saving-investment relationship based on the sub-periods. The conclusion on the degree

TABLE 6. Savings-Investment Relationship of ASEAN-5 Countries from 1980-2013

	Fully-Modified OLS	Dynamic OLS
Savings	0.662* (0.168)	0.704* (0.186)
R-Squared	0.364	0.396
Number Countries	5	5
Number Observation	165	161

Notes: Standard error in parentheses. Asterisk (\*) denotes statistically significant at 1% level.

TABLE 5. Savings-Investment Relationship of ASEAN-5 Countries from 1980-2013

	1980-2013	1980-1996	1997-2007	2008-2013
<i>Within-dimension (Panel):</i>				
v-stat	2.457**	3.721**	2.144**	-0.169
$\rho$ -stat	-1.518	-2.189**	-3.244**	-0.125
PP-stat	-1.696**	-2.276**	-4.369**	-0.665
ADF-stat	-1.701**	-2.276**	-2.429**	-0.493
<i>Between-dimension (Group):</i>				
$\rho$ -stat	-0.451	-0.884	-1.338	1.265
PP-stat	-1.884**	-2.677**	-5.060**	-0.614
ADF-stat	-1.805**	-2.677**	-1.656**	-0.443

Notes: Asterisk (\*\*) denotes statistically significant at 5% level.

TABLE 7. Savings-Investment Relationship of ASEAN-5 Countries based on Sub-Periods

	Fully-Modified OLS			Dynamic OLS		
	1980-1996	1997-2007	2008-2013	1980-1996	1997-2007	2008-2013
Savings	1.032* (0.176)	0.519* (0.198)	-0.647 (0.317)	1.121* (0.248)	0.554 (0.334)	-2.353 (0.561)
R-Squared	0.786	0.509	0.759	0.821	0.721	0.979
Number Countries	5	5	5	5	5	5
Number Observation	80	55	30	75	55	25

Notes: Standard error in parentheses. Asterisk (\*) denotes statistically significant at 1% level.

of the capital mobility also consistent with the results from Random-Effects model.

### CONCLUSIONS

This study examines the degree of the international capital mobility in the ASEAN-5 countries via the savings and investment relationship. The findings of this study indicate that existence of significant saving-investment nexus and increasing trend of higher degree of the capital mobility when taking into consideration the different time periods. This result is consistent with the previous studies such as Kim et. al (2005) and Jun (2012) that the degree of the international capital mobility increased gradually for Asian countries. This empirical results indicate that the high degree of the capital mobility can be seen in ASEAN-5 countries aftermath of the 1997 Asian financial crisis and even further expand aftermath of the 2008 global financial crisis. This signifies that the international capital in ASEAN-5 countries has been more mobile after both of the financial crises. The adoption of the export orientation strategy, increasing level of trade openness and continuous effort in capital liberalization contributed to the mobility of the international capital in the ASEAN-5 countries, particularly in the 1990s. The international capital mobility enhance subsequently aftermath of both financial crises may due to the stability in the region as a result of closer economic cooperation among the countries in East Asia. However, greater financial integration exposes country to the volatility risk of unpredictable capital flows. Therefore, government and policy makers should monitor closely with the upsurge trend of international capital mobility to prevent the financial sector vulnerabilities and risks. There are some challenges for ASEAN countries which are at the different stages in their economic development and financial integration in order to achieve the single ASEAN market as stated in AEC 2015. It is crucial for government and policymaker of ASEAN countries to develop efficient policy and financial regulatory to support the integrated financial system as well as achieving the regulatory harmonization and establishment of policy coordination among the countries in Asian region. For future study,

it will be interesting to look at the disaggregate level of savings and investment nexus which is the limitation for this study. This may provide more insight on the capital mobility as either dominated by domestic or foreign saving and investment.

### ENDNOTES

- 1 International monetary Fund List, FTSE list, MSCI list, Standard and Poor's list, Dow Jones list, BBVA Research, Emerging Markets Index.
- 2 G7 countries consists of Canada, France, Germany, Italy, Japan, United Kingdom and United States.

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