

ON THE CAUSALITY RELATIONSHIP OF ECONOMIC GROWTH AND DOMESTIC SAVINGS IN THE ASEAN ECONOMIES: A CO-INTEGRATION ANALYSIS

By

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ABSTRACT

This article proposes to estimate the causality relationship between economic growth and domestic savings. A co-integration and Granger Causality methods are employed with panel data from the Association of South East Asian Nations (ASEAN); the authors excluded Myanmar from the sample due to unavailability of data. To this end, they extracted time series annual data from the World Bank and Asian Development Bank for the period of 1980 to 2014. The results demonstrate the significant differences of relationship between economic growth and savings among the countries. The study finds that the domestic savings cause the economic growth of Singapore, The Philippines, Brunei and Vietnam. Meanwhile, the economic growth causes the domestic savings of Indonesia, Malaysia and Thailand. A bi-directional causality relationship is showed for Cambodia and Lao PDR.

Keywords: GDP (Gross Domestic Product), Granger Causality, Unit Root ADF (Augmented Dickey-Fuller Test), Savings, the ASEAN.

INTRODUCTION

The higher levels of savings always are widely considered as a vehicle of economic growth (GDP) for all countries. This is because of the fact that the savings can be transferred to investment purpose and eventually economic growth. There is a belief that economic growth is one of the most important indicators affecting the sustainable development (Pradeep Agrawal et al, 2007). Others believed that savings contribute to the economic growth (Levine and Renelt, 1992).

Over three decades, the Association of South East Asian Nations (ASEAN) has experienced a higher economic growth and savings by attracting foreign direct investment (Rudra Pradhan, 2009). Thus, the financial sector becomes one of the most dynamic and has continued contributing to the economic growth by stimulating investment. However, the ASEAN 5 which comprises Indonesia, Malaysia, Singapore, Thailand and the Philippines were among countries attracting the most FDI during the 1980s, which leads to the fact that economic growth caused domestic savings, while other ASEAN

members concentrated on the domestic savings to stimulate the economic growth (Seng Sothan, 2014).

Research on the relationship between economic growth and domestic saving provides the knowledge for policy makers to be aware of the impacts of the monetary and fiscal policies on the households' savings. In the ASEAN countries, the domestic savings is growing very rapidly.

This paper aims to contribute to the literature on the link between economic growth and domestic savings in the ASEAN economies by: firstly, Augment Ducky Flore (ADF). This method has been employed if there are unit roots among the variables. Secondly, Johansen Fisher Panel has been used to find whether the economic growth has a co-integration with domestic savings in the ASEAN. Finally, Granger Causality method is used to estimate whether economic growth in the ASEAN has causal relation with domestic savings. Specifically, it tries to estimate whether economic growth in the ASEAN has causal relation with domestic savings.

Augment Ducky Flore (ADF) analysis indicates the significant differences of relationship between economic

growth and savings among the countries. Johansen Fisher Panel analysis showed that the domestic savings cause the economic growth of Singapore, The Philippines, Brunei and Vietnam. Meanwhile, the economic growth causes the domestic savings of Indonesia, Malaysia and Thailand. Lastly, Granger Causality analysis revealed the causality relationship for Cambodia and Lao PDR.

The article is structured as follows. The section following this provides the overview of the ASEAN economies. Section 2 presents the literature review on the long growth and its impacts on the savings. The data set and the empirical models are described in section 3. Empirical results are reported in section 4 and finally conclusion section is given.

1. An Overview of the Domestic Savings and Economic Growth in the ASEAN

The Association of the South East Asian Nations(ASEAN)is one of the most dynamic regions in the world. The ASEAN as one group, ranks on the top 10 economies (Standard & Poor's, 2012). It comprises of 10 countries, namely, Indonesia, the Philippines, Malaysia, Thailand, Singapore, Vietnam, Brunei, Cambodia, Loa PDR and Myanmar. In 2012, the ASEAN combined had GDP of \$2.5tn with GDP growth of 4.9% in average.

However, there is evidence that the economic growth of the ASEAN countries is slowing down since the last ten years. For instance, in 2012, an annual average growth was 4.9% compared with 7.1% in 2005 and 2006. In 2014, GDP growth was estimated as 5.1% excluding Myanmar. Despite Myanmar which was a rich country, Brunei's economic growth has declined from 5% in 1995 to -2%

and -1% in 2013 and 2014 respectively.

However, the ASEAN countries have experienced domestic savings on an annual average growth of 10% during the 2005 and 2014. For example, Brunei has ranked on the top, while Cambodia, Lao PDR and the Philippines have a lower domestic savings compared to the other ASEAN members. Singapore has ranked the second, but also has experienced lower domestic savings in 2005.

Figure 1 shows that Malaysian economy has experienced both a slowest and a highest growth and domestic savings, for instance, in 1980 the GDP growth was 7.1%, and then it decreased to 5.9% in 1983. The second half of the 1980 as shown in Figure 1 was the highest growth for the country; the economic growth was stabilized in 10% from 1987 until the early 1996, then the growth was slowed down due to the eruption of the 1997-98 Asian financial crisis, where the growth become negative at -7.6%. However, in the last three years, the economic growth has also slowed down at 5.6% in 2014. The domestic savings follows the economic growth in the same direction; this confirms the fact that a higher savings creates investment, then causes economic growth.

Figure 2 shows the volatility of the Philippines's GDP growth; the country experienced the slowest growth during middle 1980s, where the GDP growth reached -7.4%. The 1997-98 Asian financial crisis also affected the country, where the GDP has decreased from 5.8% in 1996 to -0.7% in 1998. Last three years, the GDP growth has declined to stabilize between 7% and 6.1%.

Over the previous three decades, the domestic saving

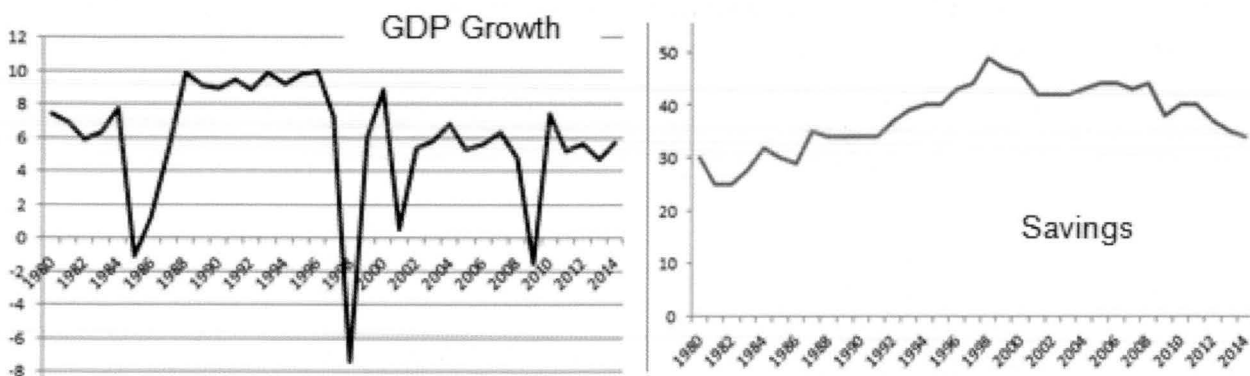


Figure 1. Malaysia- GDP Growth and Savings

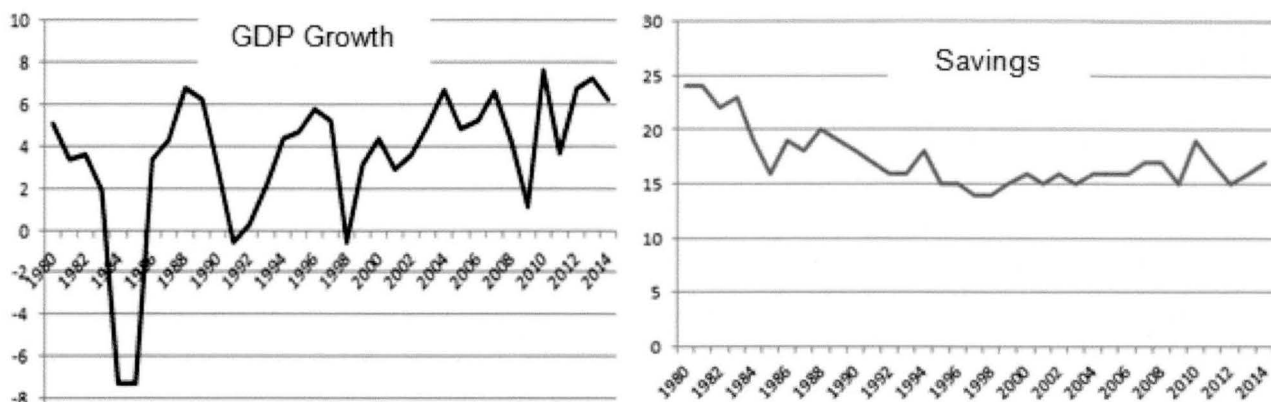


Figure 2. Philippines -GDP Growth and Savings

has slowed dramatically from 25% of GDP in 1980 to 15% of GDP in 1984 and to 17% in 2014.

Figure 3 shows both GDP growth and domestic savings for Singapore, the economic growth has experienced dramatic declining in the years 1985 (-0.6%), 1999 (-2.2%), 2002 (-0.8%) and 2010 (-0.4%). By contrast, the domestic savings has also declined during the early 2000s, it reached (-8% of GDP) in 2009.

Figure 4 shows the volatility of Thai economic growth over

the years, for instance, the economic growth and domestic savings grew and reached their highest level in 1988 and 1990 respectively. Between 1997 and 1999, the economic growth was negative at -10.3% compared to 9% in 1996, while the domestic savings was not affected in the same year.

Brunei was among the ASEAN countries that had experienced slowing both the domestic savings and economic growth in the early 1980s. For instance, Figure 5

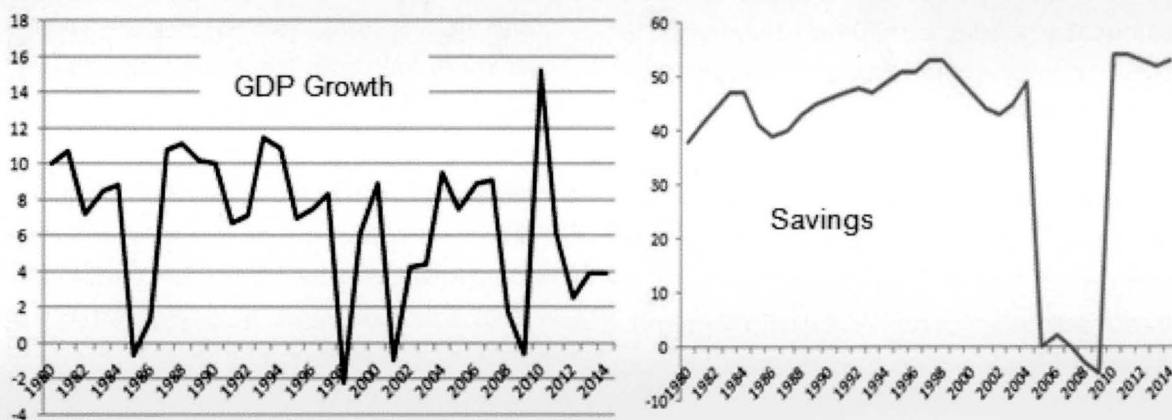


Figure 3. Singapore- GDP Growth and Savings

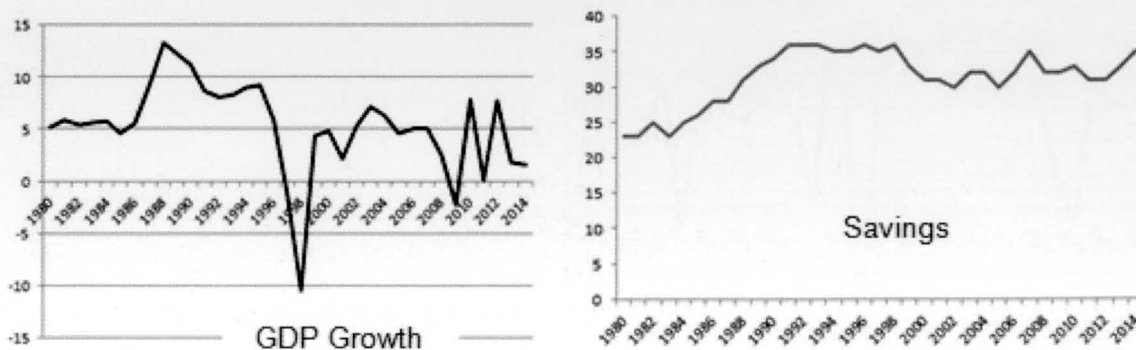


Figure 4. Thailand- GDP Growth and Savings

shows that over the years from 1980 and 1983, the economic growth and domestic savings declined from -6.2 and 37% of GDP to -20% and 30% of GDP respectively. The economic growth and domestic savings for Cambodia has negatively declined during the 1997-98 Asian financial crisis. As shown in Figure 6, however, the GDP growth reached 0% in 2009, while the domestic savings showed negative growth of -5% and -4% during

1994 and 1997.

Figure 7 shows the decline of Indonesia's economic growth during the 1997-98 Asian financial crisis, it decreased dramatically from 5.1% in 1996 to -13% in 1999. By contrast, the domestic savings increased from 17% of GDP to 27% of GDP for the same period.

It is also seen from Figure 8 that the GDP growth of Lao PDR has increased from 2% to 9% in 1980 and 1983

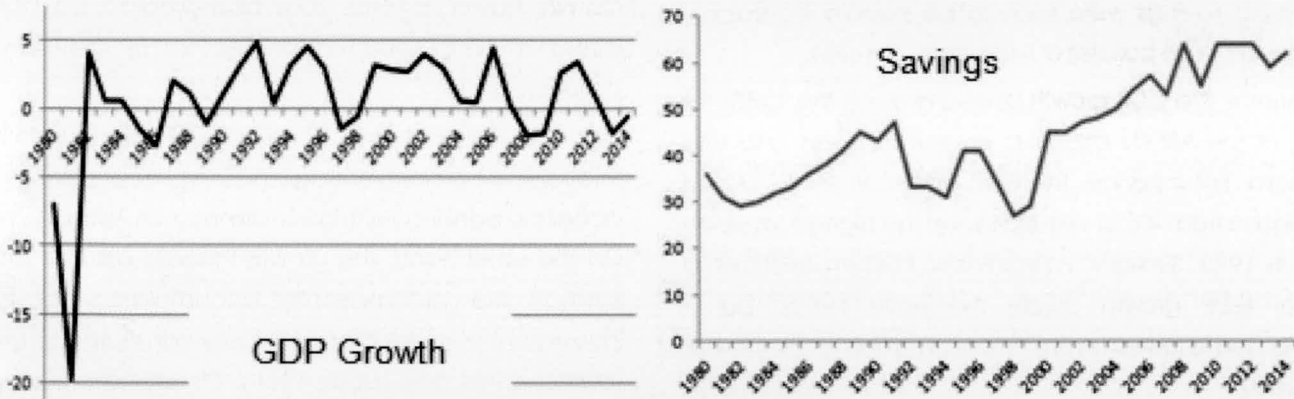


Figure 5. Brunei-GDP Growth and Savings

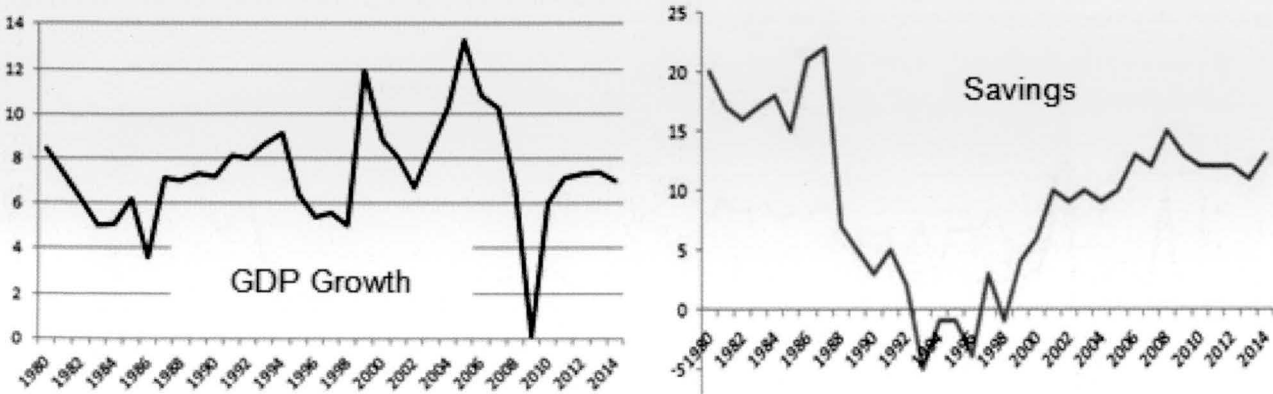


Figure 6. Cambodia-GDP Growth and Savings

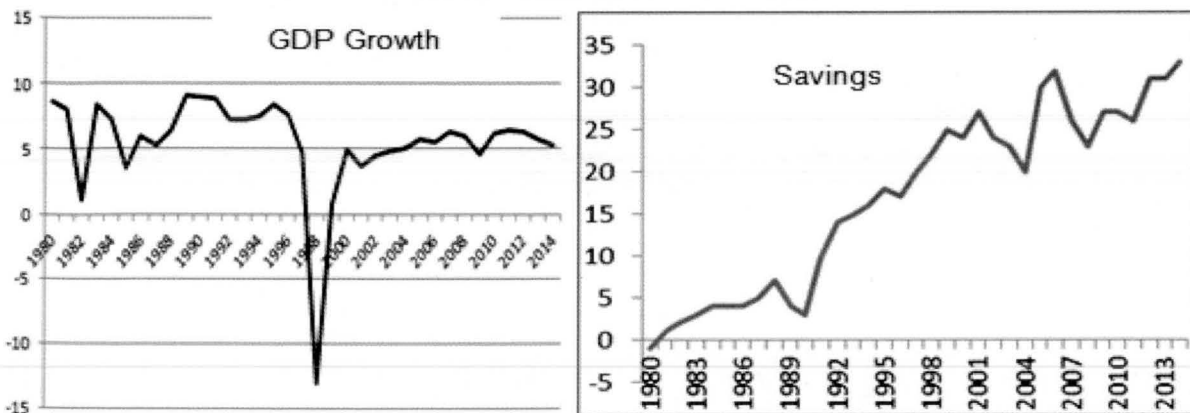


Figure 7. Indonesia -GDP Growth and Savings

respectively. However, Lao PDR experienced a higher economic growth of 14.2% in 1993. Like other the ASEAN members, it was also affected by the Asian financial crisis, where the GDP growth declined from 7% in 1996 to 4% in 1997.

Figure 8 shows the negative domestic savings of 5.2% of GDP and -3.1% of GDP in 1989 and 1992 respectively. However, since 2001, both the GDP growth and the domestic savings were seen to be steadily increasing, due to response policies of Asian financial crisis.

In general, the GDP growth slowed down in the 1980s for most of the ASEAN countries except Thailand, Lao and Vietnam. For instance, the GDP growth in Thailand had increased from 4% in 1980 to reach the highest levels on 14% in 1989. Similarly, Vietnam also had experienced a higher GDP growth during the early 1980s, but it decreased to lowest level at 3% in 1986 from 5.2% in 1982 (Figure 9).

2. Literature Review

In this section, the theoretical and empirical background

on growth, savings and consumption are discussed. The hypotheses to test the causality relationship between economic growth and saving are developed. Previous studies argued the importance of the GDP growth to the sustainable development and eventually increase domestic savings. Most of the recent theoretical and empirical studies confirm a significant contribution of domestic savings to the GDPG (Romm, 2005;Aghion, Comin, Howitt, & Tecu, 2009 and Oladipo, 2010) while (Sinha & Sinha, 2008 and Abu, 2010) show reverse causality.

Pradeep Agrawal and et al, (2007) found significant relationships among savings, income, dependency and access to banking institutions rate in south Asian countries. On the other hand, the growth theories assume that all savings are automatically accumulated for future investment purpose and eventually transferred to growth (Domar 1946 and Lucas 1988). On the one hand, the consumption theories argue that growth and income leads to both savings and consumption (Carroll and Weil

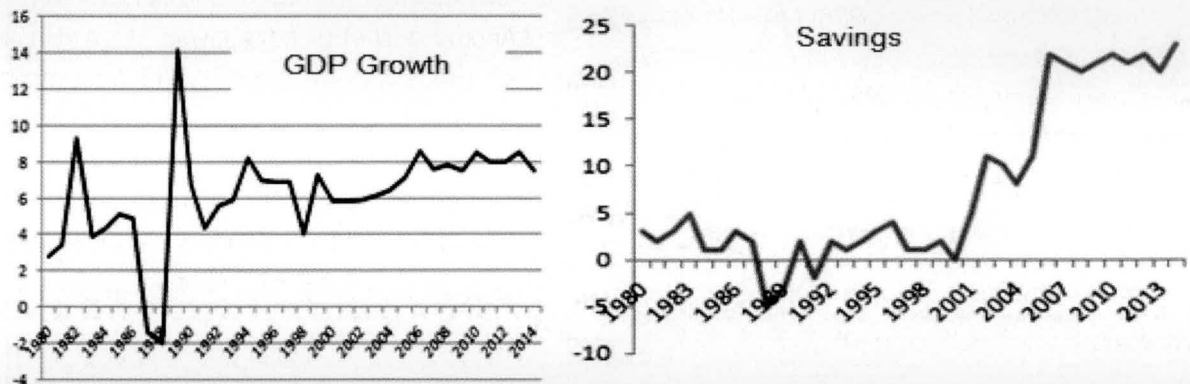


Figure 8. Lao PDR -GDP Growth and Savings

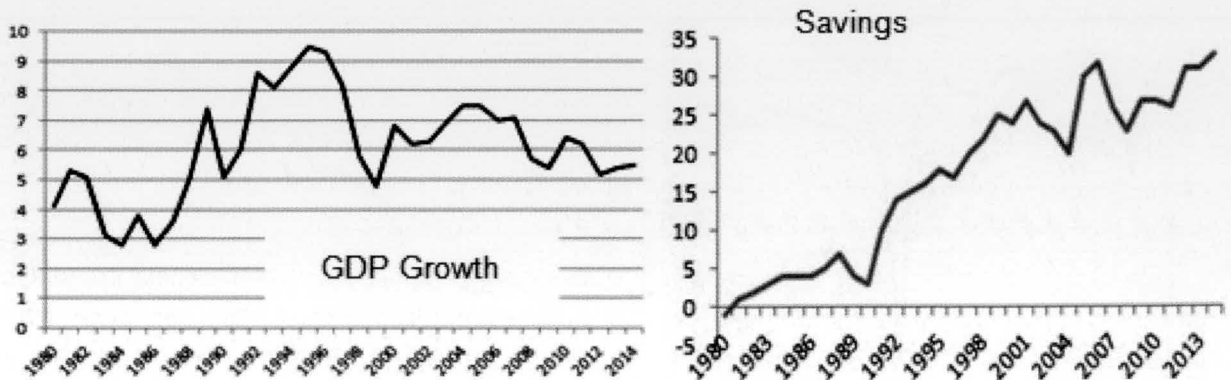


Figure 9. Vietnam -GDP Growth and Savings

1994; Deaton and Paxson, 2000). The following models explain these arguments as suggested by (Harrod, 1939 and Domar, 1946).

$$\frac{dY}{dt} = A \frac{dK}{dt} = A sY \quad (1)$$

The authors assume that the output equals the growth rate of output which is automatically transferred to investment purpose $(dY/dt)/Y$ which equals savings rates.

$$\text{Growth} = dY/dt/Y = S \quad (2)$$

The earlier studies (such as Lewis, 1954; Solow, 1956; Rostow, 1960; Romer, 1986; Lucas, 1988; and Kriekhaus, 2002) explain the relationship between GDP growth and savings behaviors. Lewis (1954) and Rostow (1960) have examined the relation between economic growth and savings. They found that most of the countries achieved a higher growth have already experienced a higher rate of savings. In his growth model, Solow (1956) assumes that the decline in the marginal returns to capital allow substituting between labour and capital, the growth will stop while the economy will experience a higher savings rate.

However, Romer (1986) and Lucas (1988) tested Harrod-Domar hypothesis regarding constant returns to capital. Authors used the endogenous growth models. The authors found that higher investment and savings rates cause a higher GDP growth. This confirms the growth theories in assumption that higher savings rates cause a higher GDP growth even if the economy's output is below the steady state. Kriekhaus (2002) point out that a higher savings emphasizes the higher economic growth.

Ibrahim Alomar (2013) employed a causal and co-integration methods to examine the relationship between economic growth and savings in the GCC countries. The results show that economic growth influences the savings rates. He argues that the GCC countries based on natural resources where GDP growth is high eventually have high savings. Anoruo and Ahmad (2001) used VEC to examine the savings and GDP growth of panel data from African countries. Their results revealed that the GDP growth caused the savings rates.

In the ASEAN context, Baharumshah et al. (2003) examined savings behavior in Asian countries, where they

included Singapore, Malaysia and Thailand in their time series data by adopting VEC model. They found that except for Singapore, the savings had not caused GDP growth. Rudra Pradhan (2009) used a cointegrated panel analysis to test the relationship between foreign direct investment and economic growth in ASEAN-5 countries. The FDI and GDP growth at the panel level are found cointegrated with each other.

Using a Granger Causality Test, Seng Sothan (2014) examined the direction causality between GDPG and domestic savings in Cambodia over the period 1989-2012. The results show no Granger causes were found between savings and GDPG. He concluded that in Cambodia, according to these results, the domestic savings and GDPG tends to be independent of each other. Similarly, Tang and Chus (2009) used a nonparametric methodology to re-asses the savings-growth causality in Malaysia,. Authors point out that in the long run, the domestic savings and economic growth tend to be positive.

This study is built on the recent work done by Alomar (2013) and Anoruo and et al. (2001), who claim that domestic savings has significantly led to the economic growth through investment. Sothan (2014) analyzes the effects of savings on economic growth in Cambodia. The key contribution of this article is to examine the causality relationship between economic growth (GDP) and domestic savings in the ASEAN over the period from 1980-2014.

3. Empirical Models Specification and Data

3.1 Model

One of the aims of this paper is to examine how the economic growth affects the domestic savings in the ASEAN. The authors also tested the causality relation among these countries if we found unit roots between economic growth and savings.

3.1.1 Unit Root ADF Test

To check the stationary time series, the authors use Augmented Dickey Fuller (Dickey and Fuller, 1981). Thus, they hypothesis that the $\beta = 0$ is tested against the alternative in the following equations.

$$\Delta X = \beta X_{t-1} + \sum_{i=2}^p \eta_i \Delta X_{t-1+i} + \epsilon_t \quad (3)$$

$$\Delta X = \alpha_0 + \beta X_{t-1} + \sum_{i=2}^p \eta_i \Delta X_{t-1+i} + \epsilon_t \quad (4)$$

The following is formulated to test the null hypothesis,

$$\Delta X = \alpha_0 + \beta X_{t-1} + \delta t + \sum_{i=2}^p \eta_i \Delta X_{t-1+i} + \epsilon_t \quad (5)$$

Where:

X = log of the variables series

p = the maximum lag

ϵ = random error.

3.1.2 Johansen Fisher Panel Tests

Johansen (1988) empirical model is used in this paper to estimate the co-integration between economic growth and domestic savings. Co-integration rank and vector indicators are modeled as follows:

$$\lambda \text{trace}(r) = T \sum_{i=r+1}^n \ln(1 - \lambda_i) \quad (6)$$

According to the λ trace equation, we suppose that the co-integration is less than or equal to (r), the alternative hypothesis is $r = 1, 2, 3, \dots$

$$\lambda \text{max}(r, r+1) = -T \ln(1 - \lambda_{r+1}) \quad (7)$$

In λmax equation (5) we intend to test the hypotheses that supposing the co-integration is less than or equal to r, the alternative hypothesis is that $r = r + 1$.

3.1.3 Granger Causality Tests

Engle and Granger (1987) empirical model is used in the last stage to examine the causality relationship between economic growth and domestic savings. VEC model are modeled as follows:

$$d \begin{bmatrix} \log GDP_t \\ \log GDS_t \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix} + \sum_{i=1}^s d \begin{bmatrix} \phi_{11i} & \phi_{12i} \\ \phi_{21i} & \phi_{22i} \end{bmatrix} \begin{bmatrix} \log GDP_{t-i} \\ \log GDS_{t-i} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \end{bmatrix} [Z_t - 1] + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \quad (8)$$

Where:

d = the first difference

s = the optimum lag length

Z = the error correction term

e = white noise error.

3.2 Data

In this paper, the authors investigate the causality relationship between the economic growth and savings in the ASEAN. They excluded Myanmar from the due to unavailability of data. This data set covers the years 1980 to 2014. They have collected data on gross domestic product (GDP), which was used as log of Gross Domestic Product (LogGDP) and total domestic savings used as log of Gross Domestic Savings (LogGDS). The data was extracted from the World Bank and Asian Development Bank, some data on domestic savings were gathered from various sources.

4. Discussions

4.1 Unit Root ADF Results

Table 1, shows the unit roots for the level data for both GDP and GDS. The logGDP and logGDS have a positive significance at 1% for all countries. In the next step, the authors test these variables on the cross section panel to be stationary. In contrast with ADF for D (1) both logGDP and logGDS have been found stationary at 1% only Cambodia accepted the stationary at 5%, this refers that both variables have a co-integration between them.

4.2 Johansen Fisher Panel and Cross Section Results

Table 2 presents the co-integration results between the

Country	ADF levels for (LogGDP and logGDS)		ADF for D (1) (LogGDP and LogSAV)	
	LogGDP	LogGDS	LogGDP	LogGDS
	P-Value			
All the ASEAN	0.9289	0.9031	0.0016	0.0021
Brunei	1.0048	0.8375	0.0000	0.0001
Cambodia	0.9231	0.9993	0.0007	0.0415
Indonesia	0.8923	0.9927	0.0035	0.0009
Lao PDR	0.9104	0.8198	0.0000	0.0014
Malaysia	0.9902	0.9173	0.0019	0.0052
Philippines	0.9061	0.7538	0.0038	0.0042
Singapore	1.0000	0.9284	0.0006	0.0013
Thailand	0.8132	0.8871	0.0034	0.0045
Vietnam	0.9198	0.9923	0.0006	0.0008

Table 1. Unit Root ADF Results

Type	Hypothesized No. of CE(s)	Trace test	Prob.	Max-Eigen test	Prob.
GDP and GDS	None	48.05	0.0002	26.08	0.0024
	At Most One	39.18	0.0001	39.18	0.0005

Table 2. Johansen Fisher Panel Co-integration Results

GDP growth and the savings. The cross section panel has significantly accepted the null of co-integration at the 1% level for all panels.

Table 3 illustrates the crosssection for each country, the co-integration between GDP and GDS have significantly been found at level of 1% and 5% for all countries except LAO and Cambodia which did it at 10%. In the literature, the relationship between GDP and savings in the long run tend to be cointegrated. However, it was necessary to test causality between economic growth and savings to give a complete picture of this analysis, so they have used VEC model to know the direction between the panels.

4.3 Granger Causality Results

Table 4 reports the causality relationships between savings and economic growth. The savings lead to the economic growth as found in Brunei, Lao PDR, the Philippines, Singapore and Vietnam. The economic growth led to the savings as found in Indonesia, Malaysia and Thailand, this is due to the fact that these countries have suffered much in the 1997-98 Asian financial crisis. Only Cambodia has had a Bi directional causality; this confirms the previous results of (Sothan, 2014).

Conclusion

This paper examines the causality relationship between

Hypothesized No. of CE(s)	Country	Trace test	Prob.	Max-Eigen test	Prob.
None	BRU	21.0742	0.0000	27.0174	0.0002
	CAMB	14.2517	0.0863	21.7365	0.0618
	INDO	25.6376	0.0001	33.7856	0.0313
	LAO	12.5283	0.0742	21.0192	0.0646
	MALY	22.6347	0.0013	29.6073	0.0415
	PHIL	17.3682	0.0148	26.9318	0.0024
	SING	26.5392	0.0016	31.2574	0.0037
	THAI	24.6573	0.0009	38.8261	0.0041
	VIET	23.6312	0.0217	29.0012	0.0022
	At Most One	BRU	8.3543	0.0158	8.3543
CAMB		12.0213	0.0018	12.0213	0.0018
INDO		11.9302	0.0062	11.9302	0.0261
LAO		8.3671	0.0146	8.3671	0.0146
MALY		9.7836	0.0018	9.7836	0.0018
PHIL		13.0031	0.0092	13.0031	0.0092
SING		9.9216	0.0427	9.9216	0.0327
THAI		8.3785	0.0184	8.3785	0.0184
VIET		10.9378	0.0016	10.9378	0.0216

Table 3. Cross Section Results – Country level

Country	Savings granger causes Economic Growth	Economic Growth causes grangerSavings	Bi directional causality
Brunei	*		
Cambodia			*
Indonesia		*	
Laos	*		
Malaysia		*	
Philippines	*		
Singapore	*		
Thailand		*	
Vietnam	*		

Table 4. Result of Granger Causality Results

economic growth and savings over the period 1980-2014. First, the authors give an overview of the ASEAN economies, this includes the contributions of economic growth in domestic savings. Second, they reviewed various works on economic growth, this include long run growth and savings behavior theories. Third, they have developed Augmented Dickey Fuller (ADF), Johansen Fisher Panel and Granger Causality to test this hypotheses and see whether economic growth in the ASEAN has causal relation with domestic savings. The authors found that significant differences of relationship between economic growth and savings among the ASEAN exist. They also found that the domestic savings caused the economic growth of Singapore, the Philippines, Brunei and Vietnam. Meanwhile, the economic growth caused the domestic savings of Indonesia, Malaysia and Thailand. Further analysis revealed the causality relationship for Cambodia and Lao PDR.

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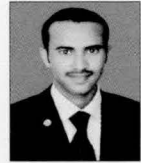
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