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The Impacts of External and Internal Uncertainties on Income Inequality in The ASEAN 5 Countries

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ABSTRACT

From a theoretical standpoint, increasing uncertainty causes delays in additional investment and hiring. Thus, income gaps between rich and poorer groups are expected to stretch further in times of uncertainty. Given that the causal relationship between uncertainty and income inequality poses an area of concern. This study utilised the Autoregressive Distributed Lag (ARDL) estimation technique on data ranging from 1961 to 2020 to examine the possible impact of external uncertainty (world uncertainty) and internal uncertainty (within-country uncertainty) on income inequality in the ASEAN 5 countries. The results demonstrate that, in the long run, the income inequality of the ASEAN 5 countries was more sensitive to external uncertainty shocks (world uncertainty) than to internal uncertainty shocks (within-country uncertainty). More specifically, external uncertainty was a significant determinant of income inequality of all ASEAN 5 countries. In contrast, internal uncertainty only mattered for the income inequality levels of Malaysia and Thailand. On the other hand, in the short run, while external uncertainty affected Thailand's income inequality level significantly, internal uncertainty was found to matter for the income inequality level of Malaysia, Singapore and Thailand. Thus, the results reflect that the impact of uncertainties on income inequality on the ASEAN 5 countries was more significant in the long run than in the short run.

JEL Classification: D8; D33; R11
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INTRODUCTION

From the existing literature, factors, such as; the level of economic development attainment, number of earners, trade openness, inflation, inward foreign direct investment (FDI), size of the government budget, and human and land endowment are regularly associated with fluctuations in the income inequality level of a country. (Odedokun and Round, 2001; Bhandari, 2007; Paweenawat and McNown, 2014; Goh and Law, 2019). However, one common incident that could lead to fluctuations in all the abovementioned factors is uncertainty shocks. While neoclassical economics, under the title of uncertainty, usually deals with the environment of risk, post-Keynesian economists refer to so-called fundamental uncertainty (Ferrari-Filho and Conceicao, 2005). The incidence of uncertainty usually appears after major external shocks, such as; the international monetary crisis, Iraq war, Global Financial Crisis, US-China trade tensions, SARS pandemic, or within country shocks (internal), such as; inflation and political instability (International Monetary Fund (IMF), 2021).

From a theoretical standpoint, increasing uncertainty causes delays to additional investment and hiring (Bernanke et al., 1997; Dixit and Pindyck, 1994), households may exercise precautionary reductions in spending (Basu and Bundick, 2017) and increasing financing costs (Pastor and Veronesi, 2013; Gilchrist et al., 2014). In recent years, empirical evidence has suggested that high uncertainty has a detrimental effect on economic growth (Asteriou and Price, 2005; Susjan and Redek, 2008; Bhagat et al., 2013) and slows down Foreign Direct Investment (FDI) inflows (Erramilli and D' Souza; 1995; Lemi and Asefa, 2003; Ajami, 2019). Therefore, high uncertainty will threaten the confidence level of investors and consumers (Dalen et al., 2017), deteriorate the Gross Domestic Product (GDP) of a country (Haddow et al., 2013) and may drive the global economy into a recession (Ahir et al., 2019). Hence, if this situation prolongs, it will harm economic circulation, where consumers may cut their spending, and producers will be forced to reduce their production capacity. Thus, this paper has argued that increases in the incidence of uncertainty are likely to advance the unemployment and income inequality rates.

The income gaps between rich and poorer groups are expected to become larger in times of uncertainty. The consequences of incidences of uncertainty on income inequality depend on the incidence's duration (short- or long-term). While policy uncertainty, in general, can have detrimental economic effects (Friedman 1968; Rodrik 1991; Higgs 1997; Hassett and Metcalf 1999). Short-term concerns, such as the uncertainty created by the United Kingdom's vote in favour of Brexit, would less severely impact a country's economic and political development, as compared to long-term events including; North and South Korean tensions, the global financial crisis, the SARS pandemic, and the COVID-19 pandemic. Therefore, it is fair to believe that uncertainty that distracts the economic ecosystem would negatively impact income inequality. Besides, the argument that uncertainty worsens income inequality is supported by the fact that despite the economic despair caused by the COVID-19 pandemic, in 2020, billionaires saw their fortunes rise by 27%. Globally the number of millionaires also expanded by five million people (Credit Suisse, 2021). At the same time, the COVID-19 pandemic has also pushed approximately 75 to 80 million people into extreme poverty (ADB, 2021). Sadly, despite the relatively large amount of empirical literature related to uncertainty, there has been a lack of empirical studies focusing on how uncertainty affects an economy's income distribution. Therefore, an examination of the impact of uncertainty on income inequality is urgently required.

ASEAN 5 (Indonesia, Malaysia, the Philippines, Singapore and Thailand) are part of The Association of Southeast Asian Nations (ASEAN), established on 8 August 1967. Though ASEAN is currently hosting nearly 700 million inhabitants and is the fifth-largest economy globally with a gross domestic product of USD 3 trillion recorded in 2018 (Septiari, 2019) in the world, but remains vulnerable to uncertainty. More specifically, according to the report published by the OECD (2020), besides the COVID-19 pandemic, other uncertainties and challenges faced by the individual countries of the ASEAN 5 group include: a) inefficiency in tax administration and infrastructure spending (Indonesia), b) difficulties in starting a business and strengthening tax mobilisation (Malaysia), c) infrastructure implementation delays (Philippines), d) facilitating an enabling environment for the growing fintech services field (Thailand), e) addressing participation barriers in lifelong learning programmes (Singapore). Given that the causal relationship between uncertainty and income inequality poses an area of concern, and policymakers were very keen to identify the impact of external uncertainty (world uncertainty) on the sample country (Fawaz et al., 2012; Vespignani, 2017).

Adopting the Autoregressive Distributed Lag (ARDL) cointegration bounds testing technique to examine the effect of both external uncertainty shocks (world uncertainty) and internal uncertainty shocks (within-country uncertainty) on the income inequality of the ASEAN 5 countries would contribute to the growing body of literature and policy debates on the economic impact of uncertainties.

The remainder of this paper is structured as follows. The following section provides a background to the study, followed by a review of previous related literature. Section 3 outlines the methodology and data used in this study. Section 4 reports and discusses the empirical results, and Section 5 offers both policy implications and concluding remarks.

Income inequality in the ASEAN 5

The Gini index is a measurement of income distribution across the nation. A Gini index of zero expresses perfect equality, whereas a Gini index of 100 expresses maximal inequality. Therefore, the higher the Gini index, the greater the income distribution disparities, which reflects that the high-income group are receiving more percentage of the total income than the lower-income group of the population. As displayed in Figure 1, in general, the Gini index recorded in the region has fluctuated over time since the 1960s. For Malaysia, the Gini index recorded for 1970 was 45.8, but the index worsened to 46.3 in 1977. Although the Gini index was gradually reduced to reach the minimum level its 39.3 in 2019, the index worsened to 41.1 in 2020. In Indonesia, the Gini index recorded in the year 1965 was 41.6. Though Indonesia's Gini index recorded its minimum point at 41.2 in 1987, it worsened to 46.8 since 2015. In the case of the Philippines, the Gini index was recorded initially at 43.2 in 1962. However, the index gradually increased to 43.4 in 1968 and fluctuated between the 41.0 to 43.0 level until 2018. In Singapore, the recorded Gini index was 36.6 in 1973, but the index recorded worsened to 39.3 in 2008. The latest Gini index in Singapore was at 37.5 for the year 2020. Lastly, the Gini index of Thailand was initially recorded at 41.2 in the year 1962, but the index was found to gradually increased and subsequently reached its peak at 44.6 in the year 1992. The latest Gini index recorded by Thailand in the year 2019 was at 39.1. Therefore, from the recent trends of the Gini indexes registered in the five ASEAN countries under study, it can be summarised that: a) The Gini indexes recorded by the ASEAN 5 countries remain significant. b) From Figure 1, an increasing trend in income inequality was detected for the ASEAN 5 countries from 2017.

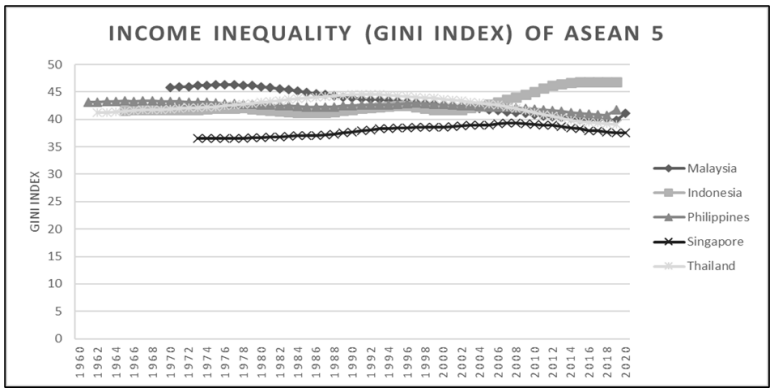


Figure 1 Income Inequality (Gini Index) of the ASEAN 5 countries

External Uncertainty (World Uncertainty)

The IMF has constructed the World Uncertainty Index (WUI) to capture the uncertain events (both economic and political) of 143 countries with a population of at least 2 million. The index was constructed by text-mining country reports from the Economist Intelligence Unit (EIU) on a quarterly basis (IMF, 2021). As shown in Figure 2, global uncertainty has increased significantly since the Asian Financial Crisis (1997-1998). Among the crucial incidences that occurred after 1999 were the outbreaks of SARS in 2001, the Global Financial Crisis (2008-2009), the Sovereign Debt Crisis in Europe (2012). From Figure 2, the all-time high aggregate index was recorded after 2019, mainly due to the COVID-19 pandemic.

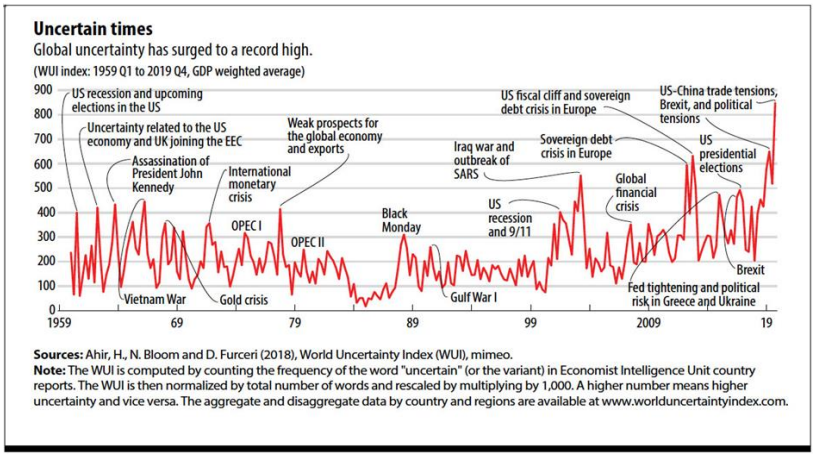


Figure 2 External Uncertainty (World Uncertainty)

Internal (Within-Country) Uncertainty of the ASEAN 5

Compared to external uncertainty (world uncertainty), internal uncertainty shocks (within-country uncertainty) were mainly due to domestic incidences, such as; coups, ethnic tensions, revolutions, or natural disasters like earthquakes, tsunamis, and floods. As displayed in Figure 3, the two highest spikes experienced by Malaysia, in 1962 and 1976, was the uncertainty associated with the formation of Malaysia and the demise of the second Malaysian prime minister (Tun Abdul Razak). For Indonesia, the high uncertainty attained in 2001 was due to the declaration of a state of emergency by the Indonesian President, Abdurrahman Wahid, to halt impeachment proceedings against him (Aglionby, 2001). In the case of the Philippines, the high uncertainty level attained in the year 2004 was due to the terrorist attacks by the Abu Sayyaf Group that killed 116 people (Sun Star, 2004). In the case of Singapore, the highest spike of uncertainty was recorded in 1965, the year Singapore's separated from Malaysia to become an independent republic on the 9th of August. Lastly, for Thailand, the highest spike was attained in 2006 was due to the military coup that ousted their former prime minister Thaksin Shinawatra from power (HRW, 2007)

On the other hand, from the existing literature, Iriana and Sjoholm (2002) concluded that the uncertainty surrounding Indonesia was mainly due to political considerations, such as the president's health status and his successor and the lack of transparency in government-business links. Lindsey (2018) argued that uncertainty remained significant in Indonesia due to the rent-seeking behaviour among political leaders, protectionism behaviour and political tensions between political leaders. On the other hand, Chow et al. (2017) claimed that Indonesia was exposed to more uncertain macroeconomic conditions stemming from internal political instability, abnormal weather conditions and natural disasters compared to its neighbouring countries. Nambiar (2012), Jaafar (2020), Teoh (2020) and the World Bank (2020) found that the global economic slowdown and political uncertainty were the key factors influencing the level of uncertainty in the Malaysian economy. Similarly, in the Philippines, Agnote (2016), Vera (2017), and Noble (2020) concluded that foreign policy spillovers and uncertainty about the political outlook had affected the uncertainty level of the Philippines significantly. Welsh (2018) and Istiak (2020) indicated that uncertainty in Singapore had arisen from the spillover effects of the trade war between the USA and China and during the general election. Lastly, in the case of Thailand, Dodge (2008), Feigenblatt (2010), Banchongduang (2020), and Mirage (2020) found that the ongoing political instability in the country was the main reason behind the increasing within-country uncertainty of Thailand.

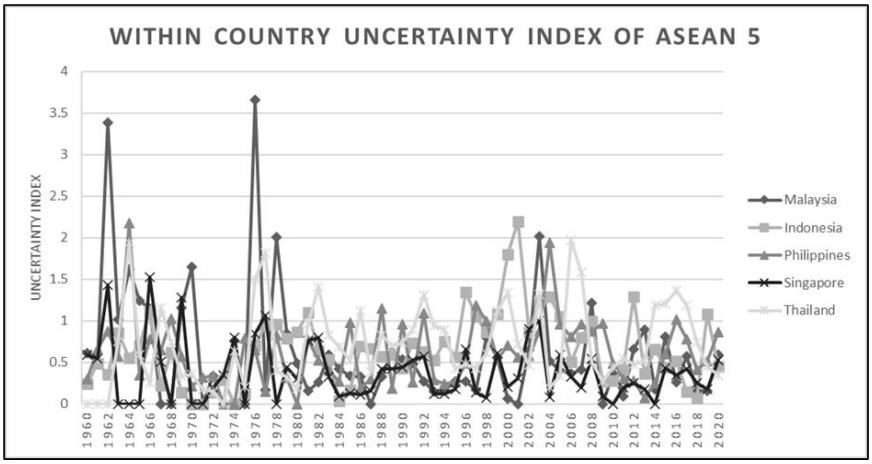


Figure 3 Internal Uncertainty (Within-Country Uncertainty) of the ASEAN 5 countries

LITERATURE REVIEW

The following section presents the theoretical background of this study, followed by relevant empirical evidence.

Theoretical background on the impact of uncertainty on income inequality

Given that many economic decisions are made based on expected outcomes or certainty. Therefore, firms or individuals would wait to invest until the likely future part is more transparent (Dixit and Pindyck, 1994). Hence, uncertainty would decrease investment, slow down the reallocation of resources, and households may increase their saving as a precautionary reaction to uncertainty (Kimball, 1990; Giavazzi and McMahon, 2012). Theoretically, the precautionary might lead to two extreme possibilities: an advancement in Gross Domestic Product (GDP) or a reduction in GDP.

Based on the argument of The Harrod Domar Model developed by Harrod (1939) and Domar (1946), economic growth would be determined by the level of savings and the capital-output ratio. Higher savings is expected to lead to higher investment and a lower capital-output ratio, thus signifying that the investment is comparatively more efficient, and the growth rate will be higher. Thus, the Harrod Domar Model predicts the extra saving due to precautionary measures would lead to economic growth, promote employment opportunity, and thus reduce income inequality. Figure 4 indicates the Harrod Domar Model's predictions on extra saving:

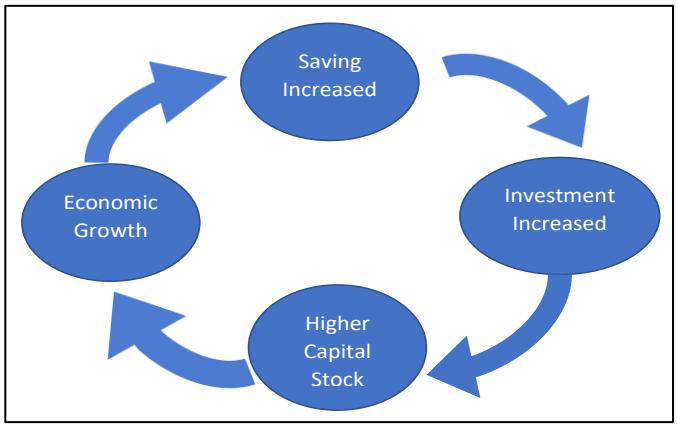


Figure 4 Harrod Domar Model's Predictions on Extra Saving

During the period of uncertainty, individuals will increase their private savings to prepare for the unknown. As highlighted in the Keynesian Paradox of Thrift, if individuals decide to increase their saving rates, it would decrease the total consumption and lower the production output. Thus the rapid rise in national private savings can harm economic activity and damage the overall economic performance. Keynes (1936) argued that the paradox of thrift would be pushing the economy into a prolonged recession, increasing the unemployment rate, and, thus, worsening the country's income inequality. Figure 5 summarise the impact of uncertainty on income inequality.

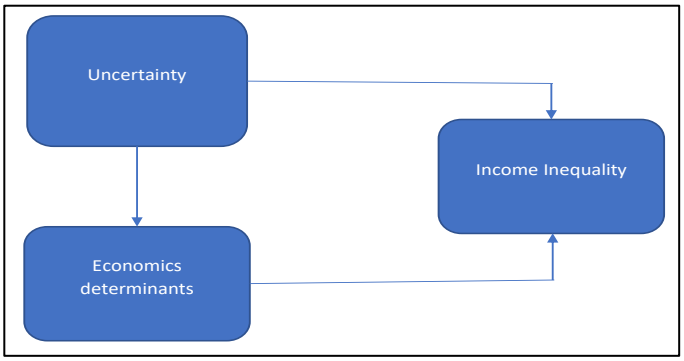


Figure 5 Impact flows of Uncertainty on Income Inequality

In conclusion, from the theoretical point of view, while the Harrod Domar Model expects the economy is better off with uncertainty, the Keynesian Paradox of Thrift is expecting otherwise. Hence, the findings of the study would help to mitigate the confusion between the two theories.

Empirical Evidence

Due to the lack of empirical studies focusing on the impact of uncertainty on income distribution, this section will begin by exploring the impact of uncertainty on economic growth.

Ali (2001) utilised a novel approach to examine the impact of political instability and policy uncertainty on annual data of 119 countries ranging from 1970 – 1995 and concluded that the policy uncertainty variables are found significantly and negatively correlated with economic growth. However, political stability has no significant effect on economic growth. Similarly, Susjan and Redek (2008), using panel data analysis on data of 22 transition economies from 1995 to 2002, confirmed that transition-specific uncertainty harmed economic growth. On the other hand, Mahadevan and Suardi (2010) concluded that uncertainty/ volatility in productivity growth hinders import growth, while export and import volatility impact productivity growth differently. Whereas in Malaysia, Baharumshah and Soon (2014) concluded that inflation uncertainty has a detrimental effect on output growth. Their analysis also reveals that economic uncertainty lowers output growth rate, hence complying with Bernanke's idea. Similarly, Luk et al. (2017) concluded that a rise in the domestic economic policy uncertainty leads to tight financial conditions, lower investment and increased unemployment, hence, dampening the output growth in Hong Kong.

On the other hand, Annicchiarico and Rossi (2015) studied the effects of real uncertainty on long-run growth under different Taylor-type rules. They concluded that there is a non-negligible relationship between real uncertainty and growth. Where Uncertainty due to investment-specific shocks can be highly detrimental for growth, but strict inflation targeting rules neutralise the adverse effects of uncertainty. Abaidoo and Ellis (2016) concluded that uncertainty affects the key economies around the world differently. Where macroeconomic uncertainty associated with the US economy significantly constrains both the industrial productivity and overall GDP growth, weaker impacts were observed with the macroeconomic uncertainty related to the Chinese economy. In addition, Jovanovic and Ma (2020) investigated the impact of uncertainty on growth through the monthly firm-level data ranging from 1973 to 2018 and found that their relationship is highly asymmetric. More specifically, growth response more significantly to uncertainty increases than to its reduction. Besides, Deininger and Squire (1997), Barro (2000), García-Peñalosa and Turnovsky (2006), Mo (2009) and Kliesen (2013) concluded that uncertainty arising from macro-level factors, such as unexpected

changes in oil prices, changes in monetary and fiscal policies is inversely correlated with economic growth and employment rate, thus would significantly impact the income inequality level.

Utilised the panel data analysis techniques on annual data ranging from 1970 to 2007, Fawaz et al. (2012) concluded that income inequality seems to move pro-cyclically in low income developing countries (LIDC) and counter-cyclically in high income developing countries (HIDC). In addition, the uncertainty associated with increasing output volatility was found to exacerbates the income inequality with a higher degree in the HIDC. In contrast, Vespignani (2017) found that in countries where only a tiny share of the population is educated, an increase in trade uncertainty is associated with a significant increase in income inequality. However, trade uncertainty has no significant effect on income inequality in countries with an advanced education system. Fischer et al. (2018) utilised the novel large-scale macro-econometric model to examine the relationship between uncertainty and income distribution. They concluded that national uncertainty shocks are negatively associated with the income inequality level of most states in the US.

Additionally, applying the Structural Vector Autoregression (SVAR) on the UK Household data range from 1970 to 2016. Theophilopoulou (2018) concluded that the income inequality of the UK increases in the aftermath of an uncertainty shock. The author also indicated that macroeconomic uncertainty significantly explains the variation of income and consumption inequality in the UK. On the other hand, Chen et al. (2021) investigated the effects of pandemics uncertainty on the income inequality of 141 countries. They concluded that pandemics uncertainty is negatively associated with the income inequality level of the 107 non-OECD countries but positively associated with the 34 OECD countries.

The above empirical findings offer some insightful information on the impact of uncertainty on economic growth and income inequality. Although uncertainty is found to significantly affecting economic growth and income inequality, the results obtained are inconclusive. In addition, although various estimation methods were applied to explore the impact of uncertainty on economic indicators, the majority of the studies were based on panel data analysis or focusing on developed nations. Hence, this study intends to fill the gap in the literature by exploring the impact of uncertainty on income inequality of the ASEAN 5 countries, which consist of both the developing and developed nations. Thus, the analysis would also allow us to see how uncertainty impacts the income inequality level of the developing and developed countries differently.

METHODOLOGY

Based on the background of the study and the theoretical argument, this study applied the autoregressive distributed lag cointegration (ARDL) approach developed by Pesaran et al. (2001) to explore the short-run and the long-run relationship of uncertainty on income inequality of the ASEAN 5 countries. To avoid possible heteroskedasticity between the world uncertainty and within-country uncertainty variable, the estimation of this study will be based on the following two empirical models:

Model 1

$$IE=f(RGDPC, WUC, CPI, UEM, TO) \quad (1)$$

Model 2

$$IE=f(RGDPC, CUC, CPI, UEM, TO) \quad (2)$$

Where *IE* denotes income inequality (Gini index), *R*GDPC is the real GDP per capita (the proxy of economic growth), *WUC* represents the external uncertainty (world uncertainty), *CUC* is the internal uncertainty (within-country uncertainty), *CPI* represents the inflation (proxied by a consumer price index), *EMP* represents the employment rate, whereas, *TO* highlights the trade openness in each of the country.

The ARDL cointegration test models are shown below:

Model 1

$$\Delta IE_t = c + \beta_1 IE_{t-1} + \beta_2 WUC_{t-1} + \beta_3 RGDPC_{t-1} + \beta_4 CPI_{t-1} + \beta_5 EMP_{t-1} + \beta_6 TO_{t-1} + \sum_{i=1}^{p-1} \alpha_{1i} \Delta IE_{t-i} + \sum_{i=1}^{p-1} \alpha_{2i} \Delta WUC_{t-i} + \sum_{i=1}^{p-1} \alpha_{3i} \Delta RGDPC_{t-i} + \sum_{i=1}^{p-1} \alpha_{4i} \Delta CPI_{t-i} + \sum_{i=1}^{p-1} \alpha_{5i} \Delta EMP_{t-i} + \sum_{i=1}^{p-1} \alpha_{6i} \Delta TO_{t-i} + \varepsilon_i \quad (3)$$

Model 2

$$\Delta IE_t = c + \beta_1 IE_{t-1} + \beta_2 CUC_{t-1} + \beta_3 RGDPC_{t-1} + \beta_4 CPI_{t-1} + \beta_5 EMP_{t-1} + \beta_6 TO_{t-1} + \sum_{i=1}^{p-1} \alpha_{1i} \Delta IE_{t-i} + \sum_{i=1}^{p-1} \alpha_{2i} \Delta CUC_{t-i} + \sum_{i=1}^{p-1} \alpha_{3i} \Delta RGDPC_{t-i} + \sum_{i=1}^{p-1} \alpha_{4i} \Delta CPI_{t-i} + \sum_{i=1}^{p-1} \alpha_{5i} \Delta EMP_{t-i} + \sum_{i=1}^{p-1} \alpha_{6i} \Delta TO_{t-i} + \varepsilon_i \quad (4)$$

The optimum lags selection was based on the Akaike Information Criterion (AIC), and the Schwarz Bayesian Criterion (SBC), β_1, β_2, β_3, β_4, β_5 *and* β_6 denotes the long-run parameters to be estimated. While $\sum_{i=1}^{p} \sum_{j}^{k} \alpha_{ji}$ denotes the short-run effects of the independent variables on income inequality (IE).

The ARDL Bounds testing will be implemented through the following sequences. First, all variables would be subjects to the Augmented Dickey-Fuller (ADF), Philips-Perron (PP) and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) unit root test. As indicated by Pesaran et al. (2001), all variables should be stationary at level (*I*(0)) or the first difference (*I*(1)); otherwise, the computed F-statistics would be invalid. Second, the error correction model will be performed to obtain the optimum lags under the ARDL model setups. Third, the ARDL cointegration bounds testing will be undertaken to identify the long-run relationship between income inequality and its explanatory variables. The F-statistics values obtained will be subject to the critical values provided by Narayan (2005), as the sample size was less than 100 observations. Next, the long-run coefficients of the model will be estimated based on the following constraint:

Model 1

$$\varphi WUC = \frac{\beta_2}{1-\beta_1}, \varphi RGDPC = \frac{\beta_3}{1-\beta_1}, \varphi CPI = \frac{\beta_4}{1-\beta_1}, \varphi EMP = \frac{\beta_5}{1-\beta_1}, \varphi TO = \frac{\beta_6}{1-\beta_1} \quad (5)$$

Model 2

$$\varphi CUC = \frac{\beta_2}{1-\beta_1}, \varphi RGDPC = \frac{\beta_3}{1-\beta_1}, \varphi CPI = \frac{\beta_4}{1-\beta_1}, \varphi EMP = \frac{\beta_5}{1-\beta_1}, \varphi TO = \frac{\beta_6}{1-\beta_1} \quad (6)$$

The short-run Error-Correction Model (ECM) will be estimated based on the following criterion:

Model 1

$$ECT_{t-1} = IE_{t-1} - \frac{\beta_2}{1-\beta_1} WUC_{t-1} - \frac{\beta_3}{1-\beta_1} RGDPC_{t-1} - \frac{\beta_4}{1-\beta_1} CPI_{t-1} - \frac{\beta_5}{1-\beta_1} EMP_{t-1} - \frac{\beta_6}{1-\beta_1} TO_{t-1} \quad (7)$$

Model 2

$$ECT_{t-1} = IE_{t-1} - \frac{\beta_2}{1-\beta_1} CUC_{t-1} - \frac{\beta_3}{1-\beta_1} RGDPC_{t-1} - \frac{\beta_4}{1-\beta_1} CPI_{t-1} - \frac{\beta_5}{1-\beta_1} EMP_{t-1} - \frac{\beta_6}{1-\beta_1} TO_{t-1} \quad (8)$$

Besides, the estimation will be subjected to the serial correlation and the CUSUM and CUSUM Squares diagnostic stability tests. The AR Root graphs were also be included in this study to validate the lag structure of the model. Lastly, the world trade uncertainty (*WTU*) variable was also included as the proxy for uncertainty to examine the robustness of the effects of the uncertainty on income inequality in the ASEAN 5 countries.

Data

This study focused on Indonesia, Malaysia, the Philippines, Singapore and Thailand, also known as the ASEAN 5. Due to data availability limitations, this study's analysis focused on annual data, ranging from 1961 to 2020. The Gini index was utilised to reflect the level of income inequality (*IE*) for the sampled countries, and the data were taken from the Standardised World Income Inequality Database (SWIID). The external uncertainty (world uncertainty) (*WUC*) and the internal uncertainty (within-country uncertainty) (*CUC*) were obtained from The International Monetary Fund (IMF)'s World Uncertainty Index (*WUI*) database. The inflation (*CPI*), trade openness (*TO*) (the sum of the exports and imports of goods and services, measured as a share of the gross domestic product) and the real GDP per capita (*RGDPC*) were obtained from the World Development Indicators (WDI). Lastly, the employment rate (*EMP*), which indicates the total number of persons engaged (in millions) in employment, was obtained from the Penn world database. Table 1 presents the descriptive statistics of the datasets.

Table 1 Descriptive Statistics

	Mean	Std. Dev	Min	Max	Observations
Indonesia					
IE	42.95	1.93	41.20	47.20	54
WUC	57731.66	29175.35	11879.56	162594.30	54
CUC	0.66	0.46	0.00	2.20	54
RGDPC	1286.36	1305.52	676.52	4135.20	54
CPI	45.08	50.12	0.3889	154.08	54
EMP	76.70	50.12	32.27	131.17	54
TO	48.82	12.25	23.84	96.19	54
Malaysia					
IE	43.33	2.19	39.9	46.3	50
WUC	56780.13	28127.27	11879.56	162594.30	50
CUC	0.53	0.64	0.00	3.66	50
RGDPC	4507.96	3562.44	357.66	11414.20	50
CPI	69.79	29.14	67.86	121.46	50
EMP	8.32	3.50	3.55	15.12	50
TO	143.01	42.97	73.38	220.41	50
Philippines					
IE	42.55	0.66	40.80	43.40	58
WUC	53032.64	22618.16	11879.56	120155.3	58
CUC	0.62	0.42	0.00	2.18	58
RGDPC	1042.02	897.72	156.70	3252.11	58
CPI	42.36	41.40	1.15	126.48	58
EMP	23.05	9.99	9.03	41.15	58
TO	59.32	18.85	26.62	10825	58
Singapore					
IE	37.94	0.92	36.60	39.30	48
WUC	59131.37	30451.41	11879.56	162594.30	48
CUC	0.36	0.28	0.00	1.06	48
RGDPC	25665.92	20668.30	1685.46	66679.05	48
CPI	81.21	21.55	38.18	114.41	48
EMP	2.07	0.98	0.80	3.76	48
TO	344.79	39.12	245.73	437.33	48
Thailand					
IE	42.51	1.55	39.10	44.60	57
WUC	55667.73	26703.99	11879.56	162594.30	57
CUC	0.77	0.48	0.00	1.97	57
RGDPC	2233.06	2175.17	118.14	7817.01	57
CPI	57.11	35.14	11.28	113.27	57
EMP	27.02	8.71	12.93	38.28	57
TO	80.76	38.09	33.51	140.43	57

Notes: *IE* represents income inequality, *WUC* represents the external uncertainty (world uncertainty), *CUC* is the internal uncertainty (within-country uncertainty), *RGDPC* is the real GDP per capita, *CPI* represents the inflation (proxied by a consumer price index), *EMP* represents the employment rate, whereas, *TO* highlights the trade openness in each of the country.

EMPIRICAL RESULTS

Pesaran et al. (2001) indicated that the ARDL model is invalid with variables that are stationary at the second difference - *I*(2). Thus, the ADF, PP, and the KPSS unit root tests were utilised to confirm that no variables are stationary at *I*(2) or integrated at order 2. From the results unfolded in Table 2, all unit root tests utilised (ADF, PP and KPSS) were in agreement that all variables were stationary at level (*I*(0)) or first difference (*I*(1)). Thus, this enabled us to perform the ARDL model estimations as Pesaran et al. (2001) proposed.

Table 2 ADF, PP and KPSS Unit Root Test Results

Variable	Level			First Difference		
	ADF	PP	KPSS	ADF	PP	KPSS
	t-statistics	t-statistics	t-statistics	t-statistics	t-statistics	t-statistics
Indonesia						
IE	-1.6085	-0.9782	0.6332**	-4.0941**	-3.6530**	0.0617
WUC	-3.5414**	-3.5414**	0.6319**	-9.4542***	-16.3021***	0.2410
CUC	-3.9281**	-3.8745**	0.2530	-6.7635***	-22.6077***	0.2835
RGDPC	-2.3314	-2.3992	0.9382***	-6.4958***	-6.4978***	0.2010
CPI	-4.0726**	-3.9493**	0.8742***	-10.3782***	-10.3782***	0.7681***
EMP	0.2017	-0.2592	0.8594***	-4.4158***	-4.3768***	0.4308*
TO	-2.0667	-1.8263	0.3549*	-9.6588***	-11.4912***	0.0757
Malaysia						
IE	-3.0105	-4.1931***	0.9149***	-4.2731***	-4.3386***	0.2580
WUC	-3.3098*	-3.2816*	0.6214**	-8.8943***	-16.4896***	0.1900
CUC	-8.1887***	-8.1887***	0.1939	-5.1917***	-41.5517***	0.2470
RGDPC	-2.7600	-2.7751	0.9152***	-5.6767***	-5.6095***	0.3106
CPI	-1.7136	-1.9441	0.9411***	-5.6737***	-5.6327***	0.1627
EMP	-1.0908	-1.1509	0.9237***	-6.0964***	-6.0583***	0.0413
TO	-1.9021	0.0155	0.5695***	-5.7768***	-5.7391***	0.0450
Philippines						
IE	-1.9194	-0.5642	0.7248**	-3.5523**	-6.0785***	0.3459
WUC	-3.7653**	-3.7671**	0.5515**	-9.8391***	-13.8508***	0.1228
CUC	-6.6610***	-6.7307***	0.1287	-8.3639***	-30.6038***	0.5000**
RGDPC	-2.3085	-3.5253**	0.8953***	-8.2172***	-8.0028***	0.1205
CPI	-2.1881	-2.0711	0.8824***	-5.4238***	-5.4531***	0.1419
EMP	-2.2588	-2.2418	0.9286***	-11.7073***	-14.4107***	0.1101
TO	-1.4902	-2.1231	0.6903**	-7.6890***	-7.6719***	0.2426
Singapore						
IE	0.1706	1.2126	0.6158**	-4.0684**	-3.8332*	0.4488*
WUC	-3.3879*	-3.3252*	0.6492**	-8.7375***	-17.2045***	0.3061
CUC	-6.6078***	-6.6097***	0.2377	-9.2967***	-33.1664***	0.0225
RGDPC	-1.1344	-1.7381	0.8804***	-4.9564***	-5.0488***	0.0517
CPI	-1.3574	-4.3082***	0.8825***	-8.6287***	-7.7481***	0.1458
EMP	-1.9917	-1.8269	0.8687***	-3.3622*	-3.3279*	0.1987
TO	-3.2040*	-3.3155*	0.2455	-7.7409***	-7.6495***	0.2050
Thailand						
IE	-3.2763*	0.2946	0.2833	-1.2841	-3.2365*	0.7029**
WUC	-3.4641*	-3.3787*	0.5808**	-9.595***	-13.3976***	0.2659
CUC	-6.6531***	-5.6868***	0.1335	-8.6573***	-17.0987***	0.3134
RGDPC	-2.3771	-1.8819	0.9000***	-4.6940***	-4.7688***	0.1302
CPI	-0.5499	-0.2356	0.8810***	-4.1790***	-3.8834**	0.2658
EMP	0.4039	-0.3171	0.8977***	-6.1785***	-6.3704***	0.2571
TO	-0.8645	-0.8489	0.8731***	-7.3564***	-7.3571***	0.2430

Notes: *IE* represents income inequality (Gini index), *WUC* represents the external uncertainty (world uncertainty), *CUC* is the internal uncertainty (within-country uncertainty), *RGDPC* is the real GDP per capita, *CPI* represents the inflation (proxied by a consumer price index), *EMP* represents the employment rate, whereas, *TO* highlights the trade openness in each of the country. The coefficients displayed are the t-statistics obtained from the Eviews software package. The null hypothesis of the Augmented Dickey-Fuller test (ADF) and Phillips–Perron (PP) test is that the unit root and the null hypothesis of the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test is stationarity. The constant and trend terms are included in the test equation, and the SIC is utilised for optimal lag order in the ADF test equation. ***, ** and * denote the significance at the 1%, 5% and 10% levels.

The ARDL models of the income inequality-uncertainty nexus were derived from the regression of Equation (3) and (4) through the OLS estimation and the error correction model techniques. Equation (3) intends to investigate the impact of external uncertainty shocks (world uncertainty) on income inequality, whereas, Equation (4) showcase the effects of internal uncertainty shocks (within-country uncertainty) on income inequality of the ASEAN 5. Given that the total observations of Model 1 and Model 2 are well below 100, the underlying variables in Equation (3) and (4) will be cointegrated if the calculated F-statistics are more significant than the upper bound critical value (*I*(1)) provided by Narayan (2005). As reported in Table 3, the

calculated F statistics obtained for Model 1 and Model 2 are more significant than the 10% upper bound critical value (*I*(1)), indicating that income inequality and its determinants in the ASEAN 5 countries were cointegrated in the long run. In addition, the results of the Breusch-Godfrey Serial Correlation LM test presented in Table 3 revealed that the equations under both models are free from serial correlation.

Table 3 Long-Run Cointegration and Serial Correlation LM Test

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Model 1					
ARDL bounds test Pesaran et al. (2001)	7.307197***	8.966823***	5.3279***	3.4527*	4.8150**
Diagnostic checks					
Serial (1) – Lag 2	0.8988	1.1533	1.8654	0.4543	1.9383
	(0.4174)	(0.3301)	(0.1066)	(0.6393)	(0.1628)
Serial (2) – Lag 4	1.2056	1.4785	1.4294	0.6482	1.4308
	(0.1193)	(0.1089)	(1.0781)	(0.6330)	(0.1628)
Model 2					
ARDL bounds test Pesaran et al. (2001)	6.2104***	5.4414***	5.4649***	3.3743*	4.1681**
Diagnostic checks					
Serial (1) – Lag 2	0.5532	0.9717	0.9879	0.2567	1.9464
	(0.5813)	(0.3289)	(0.2531)	(0.7753)	(0.1579)
Serial (2) – Lag 4	1.7918	0.4429	1.7227	0.7210	2.0209
	(0.1471)	(0.6352)	(0.1554)	(0.5851)	(0.1143)
	(K=5, n=50)				
Narayan (2005)	Lower Bound	Upper Bound			
10%	2.2590	3.2640			
5%	2.6700	3.7810			
1%	3.5930	4.9810			

Note: The test statistics of the cointegration tests were compared against the critical values reported n Narayan et al. (2005) for samples of less than 100 observations. Serial (1) and Serial (2) are the Breusch-Godfrey LM test statistics for no serial correction. The numbers in parenthesis indicate the p-values. *, ** and *** denote the significance at the 10%, 5% and 1% levels.

Table 4 presents the results of Model 1 and Model 2 based on the ARDL procedure. Under Model 1, the results show that external uncertainty (world uncertainty) enters the long-run income inequality - uncertainty nexus significantly at a 10% significance level for all ASEAN 5 countries. Additionally, the external uncertainty (world uncertainty) was found to have a higher impact on Indonesia (0.4596) and Singapore (0.4336), suggesting that Indonesia and Singapore were more sensitive to the external uncertainty shocks as compared to countries such as Malaysia, the Philippines and Thailand. The significance of external uncertainty (world uncertainty) on income inequality does not come as a surprise as it was paralleled with the previous studies authored by Friedman (1968), Rodrik (1991), Theophilopoulou (2018) and Chen et al. (2021) that confirmed the detrimental of uncertainty on income distribution. On the other hand, the results obtained from the internal uncertainty (within-country uncertainty)-income inequality nexus (Model 2) highlight that the internal uncertainty only matters for the income inequality level of Malaysia and Thailand but was not a significant determinant for the Philippines, Indonesia and Singapore. The results thus reflect that the income inequality of the ASEAN 5 is more sensitive to the external uncertainty shocks (world uncertainty) than the internal uncertainty shocks (within-country uncertainty – such as political instability).

Additionally, the coefficient obtained for the employment rate variable in Model 1 and Model 2 agreed with the OECD's (2012) finding that a low employment rate drives inequality in labour earnings. The inverse correlation that suggests the increase in the employment rate would reduce the income inequality is in parallel with earlier empirical, such as by Rice and Lozada (1983), Tregenna (2009) and ILO (2013). On the other hand, both inflation and trade openness were found to worsen the income inequality level of the ASEAN 5 countries. From the obtained coefficients, a one per cent increase in the per capita income of Singapore would increase the income inequality by three percentage points. This signifies that the increase of the country's average income would further increase the wealth of the top income or elite group, whereas the lower income group would remain poor. The results were supported by the news that in 2020, the combined net worth of Singapore's 50 richest have risen to Singapore $208 billion, an increase of 25% compared to 2020, while the household income for the low-income families in Singapore fell 69% in 2020 (Forbes, 2021; The Strait Times, 2021). As a result, it is not surprising to find out that inflation would increase the income gap between the rich and the poor further as inflation would increase the wealthy businessman's sales revenue and net income.

In contrast, the poorer group's income would stagnate as most of them are fixed-income earners, as addressed by Nantob (2015) and Muhibbullah and Das (2019). Lastly, mixed results were obtained for the trade openness variable. While trade openness was found to improve the income inequality of Indonesia, it has worsened the income inequality level of the Philippines and Singapore. As an increase in trade openness would create new employment opportunities and economic growth (WTO, 2007; Goh et al., 2019), hence is expecting to have a curative effect on income inequality. However, if the increasing benefits from trade are not distributed evenly, it would worsen the income inequality of the country (Ravillion, 2018; Goh and Law 2019).

From the short-run dynamic coefficients of Model 1 illustrated in section 2 of Table 4, the external uncertainty shocks (world uncertainty) is also found to influence Thailand's short-run income inequality level significantly. However, it does not impact the short-run income inequality level of Indonesia, Malaysia, the Philippines and Singapore. Hence, the findings suggest that Thailand is more vulnerable to external uncertainty shocks (world uncertainty) than neighbouring countries. Therefore, this could be the reason to explain why the Asia financial crisis started in Thailand in 1997 and had the lowest GDP growth rate of 1.73% during the Global Financial Crisis in 2008. On the other end, the short-run coefficients for real per capita income, inflation, and trade openness variable are significant and positively associated with the income inequality of the ASEAN 5 countries. The results obtained are consistent with the findings in the long run, where real per capita income, inflation and trade openness have a detrimental impact on income inequality of the ASEAN 5 countries. Therefore, the results from Model 1 suggests that the impact of per capita income, inflation, and trade openness on income inequality are consistent over time.

On the other hand, under Model 2, the short-run dynamic results indicated in the Table 4 concluded that the internal uncertainty shocks (within-country uncertainty) play an essential role in determining Malaysia, Singapore, and Thailand's short-run income inequality levels. From the obtained coefficients, a one percentage point increase in the internal uncertainty (within-country uncertainty) in Malaysia, Singapore and the Philippines would lead to a 0.0387, 0.0199 and 0.0617 percentage point increase in their income inequality level, respectively. Thus, the results agreed with Fawaz et al. (2012) and Vespignani (2017) that uncertainty would further detriment income inequality. In addition, consistent with the paper’s findings under Model 1, coefficients for real per capita income and inflation among the ASEAN 5 countries that are significant are found to worsen the income inequality. Thus, suggesting that a) the increase in the country's real income benefits the rich more than the low-income group. b) inflation boosted the general price level, generating more income for business owners while the lower-income group's income remained fixed, thus widening the income gap. Lastly, a higher employment rate is found to have a curative impact on the income inequality level of the ASEAN 5 countries. In contrast, trade openness is not a significant determinant of income inequality.

Table 4 ADRL Estimation Results

	Model 1				
	Indonesia	Malaysia	Philippines	Singapore	Thailand
Long-run Coefficients					
Intercept	65.3435***	41.5280***	39.0466***	-5.3114	124.5238
	(0.0001)	(0.001)	(0.0001)	(0.7586)	(0.1445)
ln*WUC*	0.4596*	0.3688*	0.1905**	0.4336*	0.2353*
	(0.0910)	(0.0945)	(0.0499)	(0.0557)	(0.0825)
CUC	-	-	-	-	-
ln*RGDPC*	0.0696	-0.0388	-0.1170	3.1400***	0.7067
	(0.9065)	(0.9456)	(0.4740)	(0.0067)	(0.9189)
ln*CPI*	1.9734***	0.3346***	0.0245***	5.4744	2.8487
	(0.0038)	(0.0053)	(0.0012)	(0.1807)	(0.3766)
EMP	-2.4331*	-2.0609**	-0.2026***	-2.1287**	-1.9833*
	(0.0527)	(0.0253)	(0.0001)	(0.0360)	(0.0878)
ln*TO*	-6.1410***	0.5699	1.3830***	6.3237***	-6.6432
	(0.0001)	(0.3304)	(0.0001)	(0.0033)	(0.3466)
Shot Run Coefficients					
Intercept	0.2500***	-0.0116	0.0479	-0.0307	-0.0526*
	(0.0001)	(0.7668)	(0.1403)	(0.1185)	(0.0778)
ECT(-1)	-0.1118***	-0.0573***	-0.2527***	-	-
	(0.0011)	(0.0001)	(0.0047)	0.0937***	0.0120***
				(0.0001)	(0.0001)
Δ*WUC*	0.0684	0.0413	0.0429	0.0436	0.1299**
	(0.3191)	(0.2774)	(0.4121)	(0.2335)	(0.0103)
Δ*CUC*	-	-	-	-	-
Δ ln*RGDPC*	0.3366**	0.1949	-0.0773	0.3248*	0.1343
	(0.0380)	(0.1253)	(0.6340)	(0.0849)	(0.4859)
Δ ln*CPI*	-0.1430	0.0106	0.0282**	0.9354*	0.5777
	(0.5328)	(0.3844)	(0.0372)	(0.0519)	(0.1781)
Δ *EMP*	-3.5246**	-0.0593	-0.1237***	-0.2307	-
	(0.0219)	(0.4517)	(0.0001)	(0.2657)	0.1022***
					(0.0046)
Δ ln*TO*	-0.1927	-0.1221	0.1820	0.3530*	-0.1137
	(0.3869)	(0.5577)	(0.4105)	(0.0871)	(0.6349)

Notes: *IE* represents income inequality, *WUC* represents the external uncertainty (world uncertainty), *CUC* is the internal uncertainty (within-country uncertainty), *RGDPC* is the real GDP per capita, *CPI* represents the inflation (proxied by a consumer price index), *EMP* represents the employment rate, whereas, *TO* highlights the trade openness in each of the country. The coefficients displayed are the t-statistics obtained from the Eviews software package. A maximum lag length of four was used. The optimal lag structure for the ARDL model was chosen based on the Akaike Information Criterion (AIC). ***, ** and * denote the significance at the 1%, 5% and 10% levels.

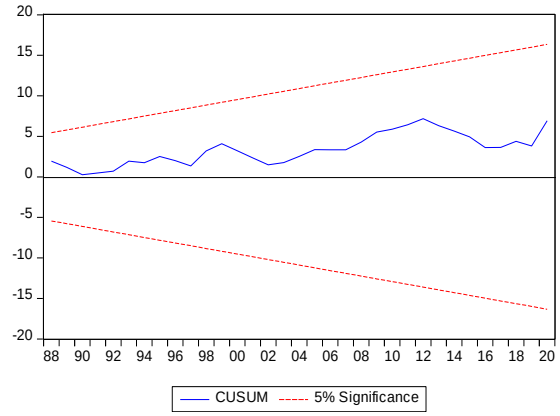
Table 4 Cont.

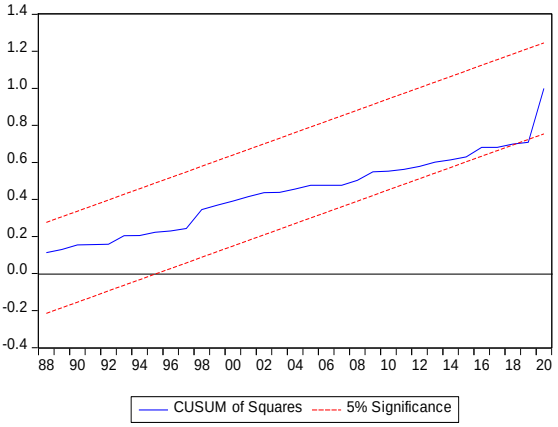
	Model 2				
	Indonesia	Malaysia	Philippines	Singapore	Thailand
Long-run Coefficients					
Intercept	74.2018***	55.2328***	40.5784***	4.0723	6.7415**
	(0.0001)	(0.0001)	(0.0001)	(0.7867)	(0.0282)
ln*WUC*	-	-	-	-	-
CUC	-0.7020	0.1935*	0.1628	0.5017	2.0074*
	(0.1672)	(0.0884)	(0.1308)	(0.3157)	(0.0816)
ln*RGDPC*	-0.5867	-0.9805	-0.0814	3.4012***	5.9242
	(0.2984)	(0.1842)	(0.5547)	(0.0066)	(0.2785)
ln*CPI*	2.8354***	0.1198*	0.0341***	6.7826	4.7508
	(0.0001)	(0.0895)	(0.0001)	(0.1137)	(0.4994)
EMP	-3.3461***	-0.6575	-0.2383***	-1.8525**	-0.8002**
	(0.0082)	(0.2431)	(0.0001)	(0.0464)	(0.0236)
ln*TO*	-5.5067***	0.4879	1.6156***	5.9339***	-1.5827
	(0.0001)	(0.3921)	(0.0001)	(0.0054)	(0.1902)
Shot Run Coefficients					
Intercept	0.2359***	-0.0811*	0.0323	-0.0291	-0.0216
	(0.0001)	(0.0551)	(0.2984)	(0.1239)	(0.3880)
ECT(-1)	-0.1041***	-0.0250**	-0.3112***	-	-
	(0.0006)	(0.0105)	(0.0014)	0.0967***	0.0300***
				(0.0001)	(0.0001)
Δ*WUC*	-	-	-	-	-
Δ*CUC*	0.0401	0.0387**	0.0130	0.0199*	0.0617***
	(0.4902)	(0.0233)	(0.6963)	(0.0545)	(0.0095)
Δ ln*RGDPC*	0.3136*	0.2853**	-0.0523	0.3083*	0.1337
	(0.0502)	(0.0392)	(0.7428)	(0.0834)	(0.3936)
Δ ln*CPI*	-0.0637	0.8098	0.0255**	0.9957**	0.3977
	(0.7850)	(0.2173)	(0.0356)	(0.0319)	(0.2602)
Δ *EMP*	-3.8743**	-0.1608*	-0.1331***	-0.2009	-
	(0.0126)	(0.0690)	(0.0001)	(0.3081)	0.0965***
					(0.0015)
Δ ln*TO*	-0.1091	-0.1677	0.2165	0.3671*	-0.0523
	(0.6079)	(0.5107)	(0.3236)	(0.0813)	(0.7914)

Notes: *IE* represents income inequality, *WUC* represents the external uncertainty (world uncertainty), *CUC* is the internal uncertainty (within-country uncertainty), *RGDPC* is the real GDP per capita, *CPI* represents the inflation (proxied by a consumer price index), *EMP* represents the employment rate, whereas, *TO* highlights the trade openness in each of the country. The coefficients displayed are the t-statistics obtained from the Eviews software package. A maximum lag length of four was used. The optimal lag structure for the ARDL model was chosen based on the Akaike Information Criterion (AIC). ***, ** and * denote the significance at the 1%, 5% and 10% levels.

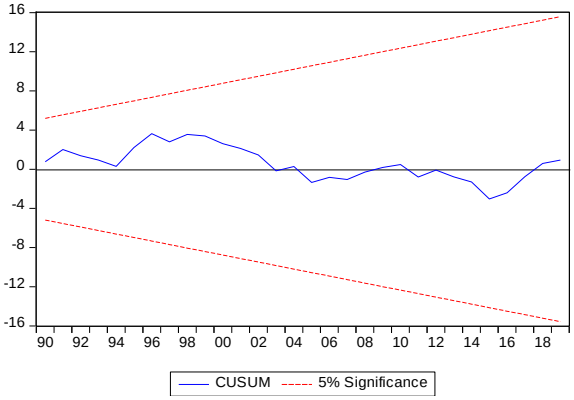
In conclusion, the significant findings of external uncertainty (world uncertainty) and internal uncertainty (within-country uncertainty) on income inequality parallel the Keynesian Paradox of Thrift that uncertainty would distract the economy's ecosystem, thus widening the income gaps. Additionally, real per capita income, trade openness and inflation were found to detriment income inequality. In contrast, a higher employment rate would ease the income gaps between the rich and lower-income groups in the ASEAN 5 countries. Lastly, the diagnostic test results obtained from the Breusch-Godfrey Serial Correlation LM test confirmed that the ECM models were free from serial correlation. Meanwhile, the CUSUM and CUSUM square test diagrams showed that the statistics were within the 5% confidence interval bands. Thus, there was no structural instability in the residuals of the estimations. Besides, the AR root graphs confirmed that the processes were stationary.

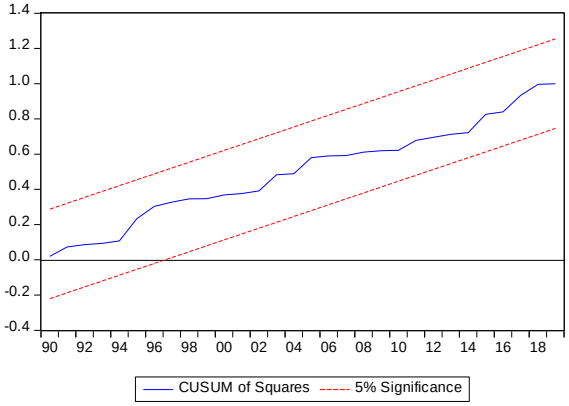
a) Indonesia



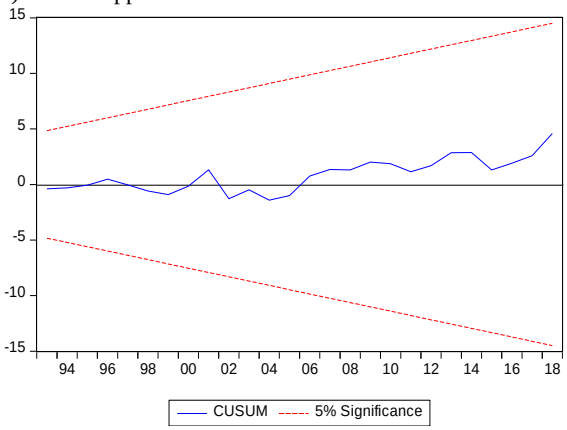


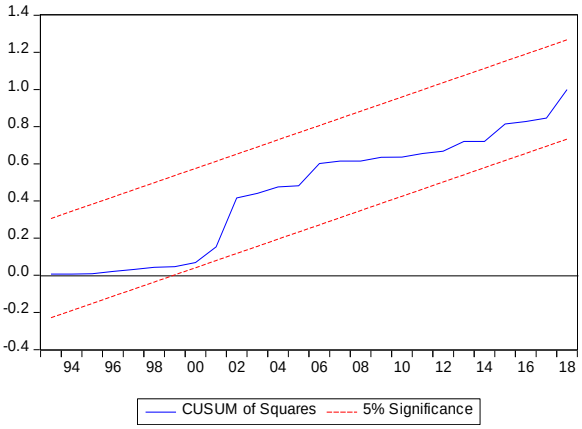
b) Malaysia



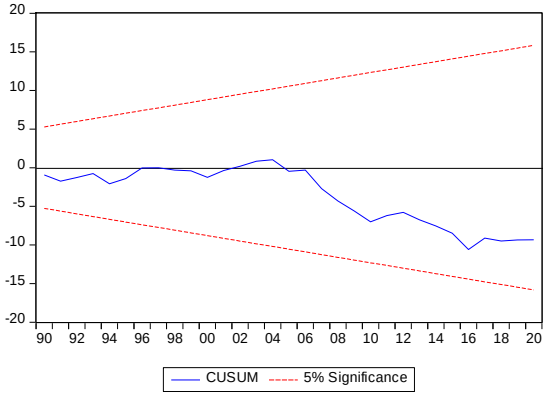


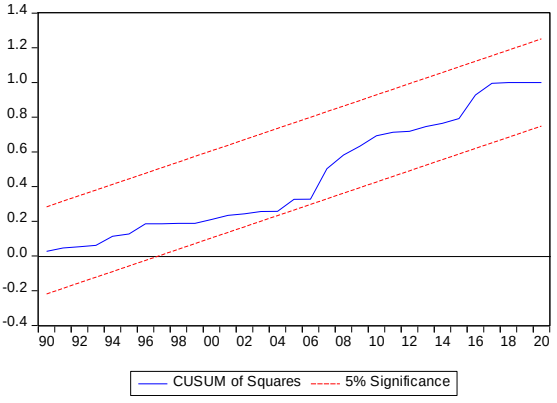
c) The Philippines





d) Singapore





e) Thailand

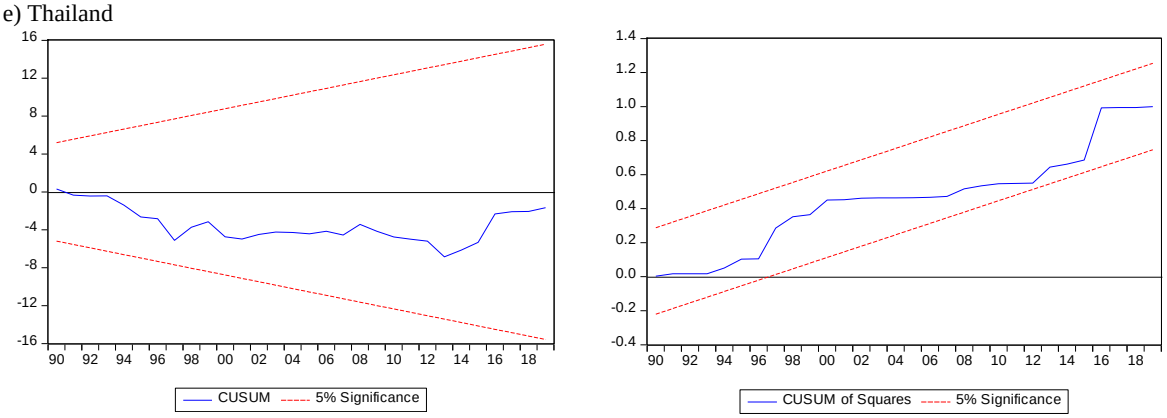
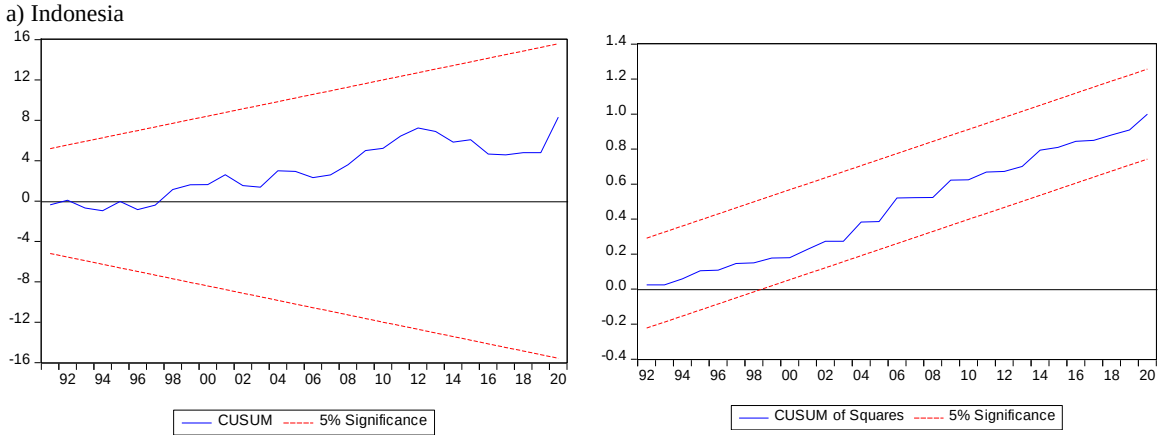
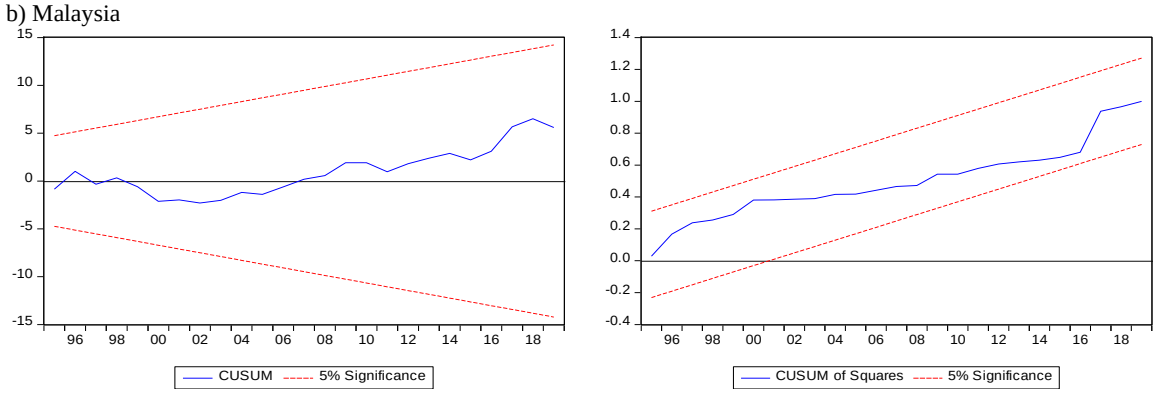


Figure 6 Stability Testing - CUSUM and CUSUM Squares for Model 1

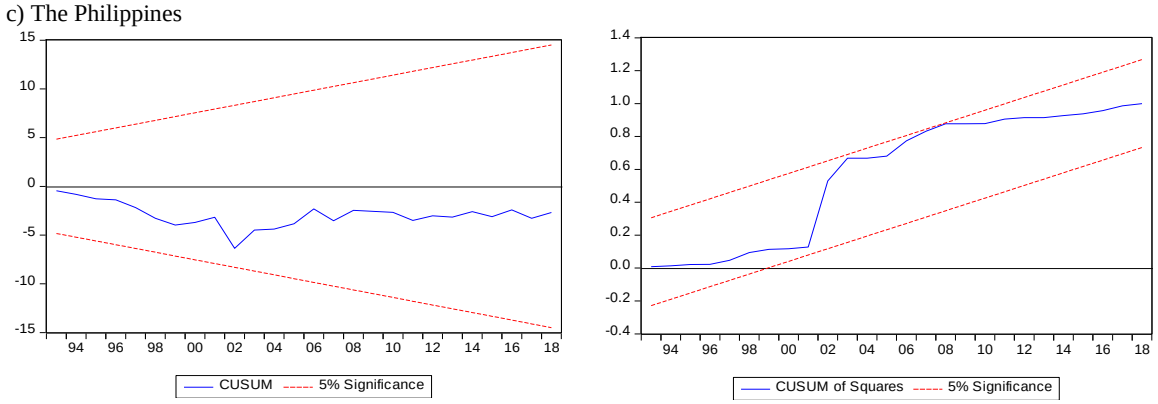
a) Indonesia



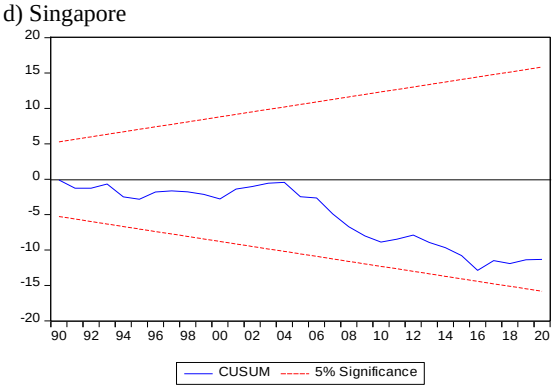
b) Malaysia

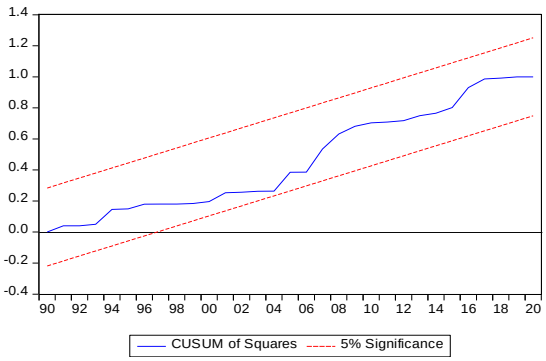


c) The Philippines

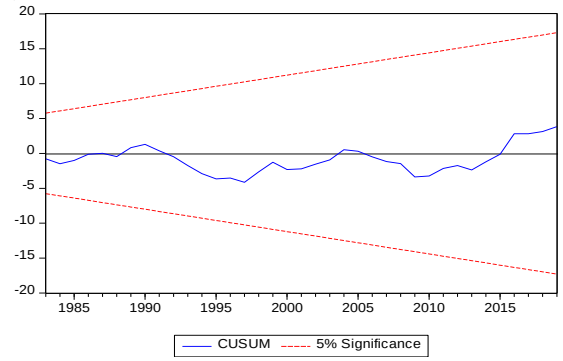


d) Singapore





e) Thailand



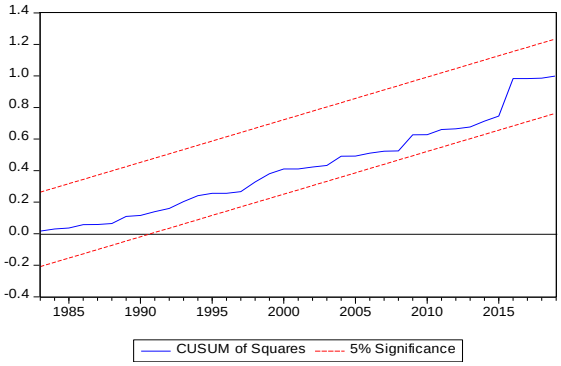
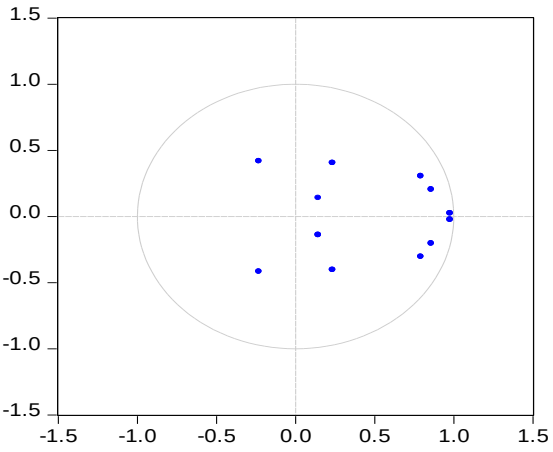


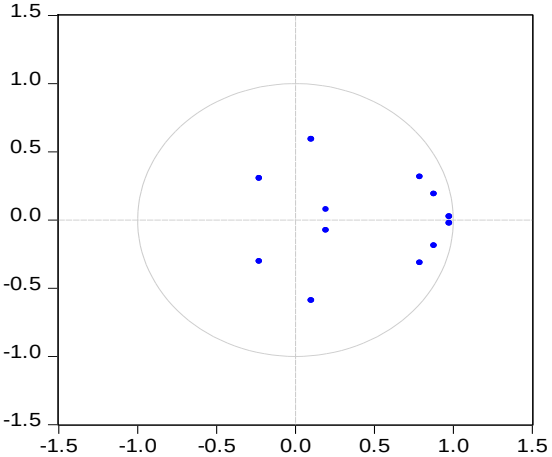
Figure 7 Stability Testing - CUSUM and CUSUM Squares for Model 2

Indonesia Model 1

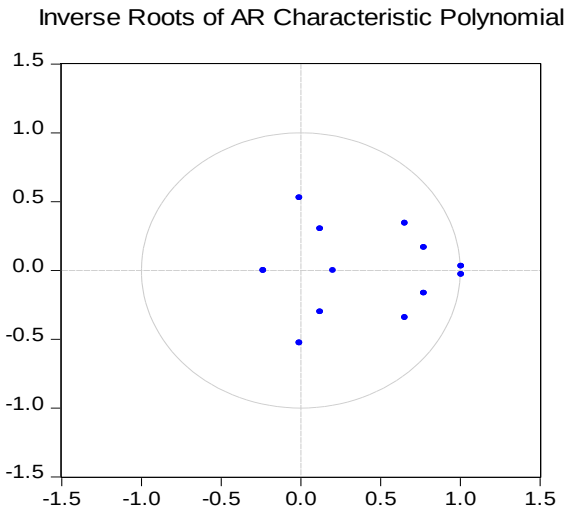


Malaysia Model 1

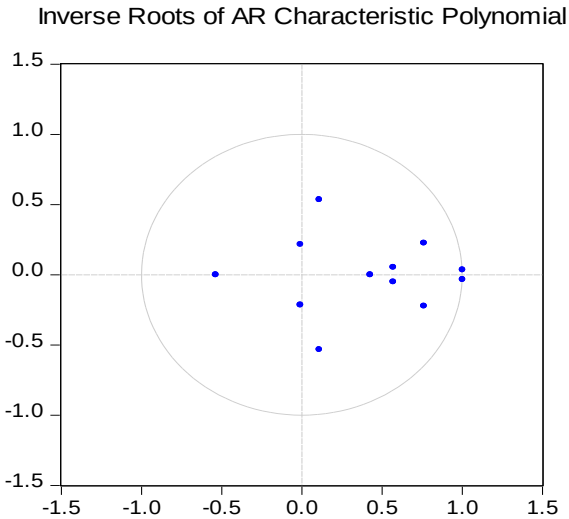
Indonesia Model 2



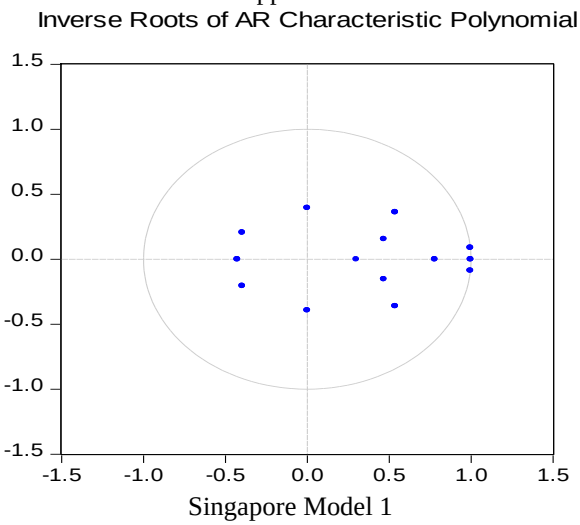
Malaysia Model 2



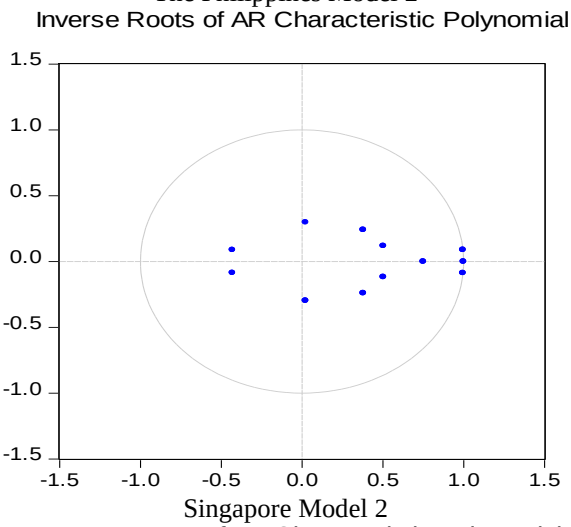
The Philippines Model 1



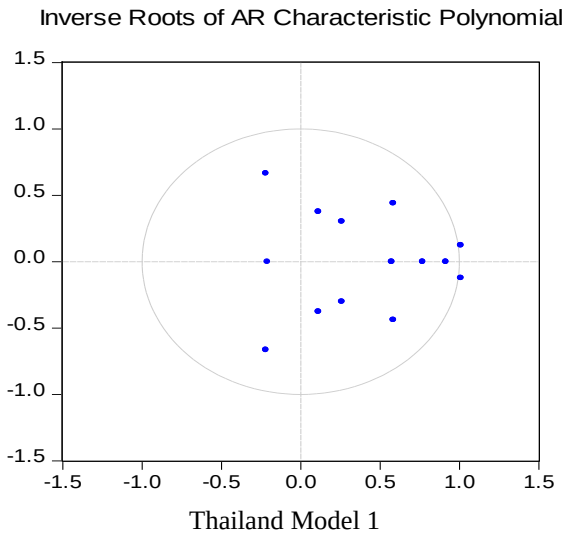
The Philippines Model 2



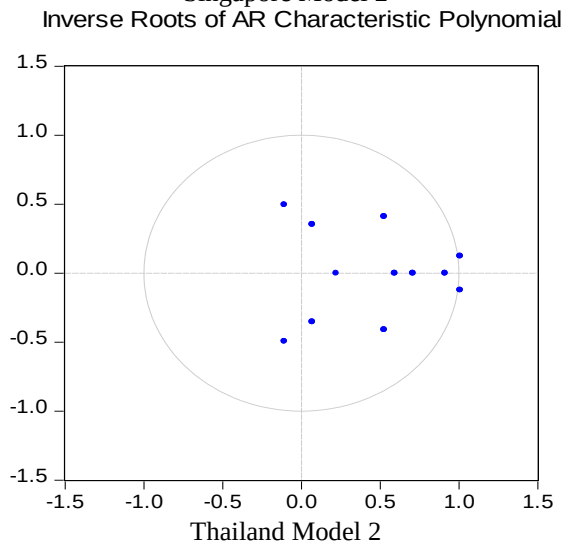
Singapore Model 1



Singapore Model 2



Thailand Model 1



Thailand Model 2

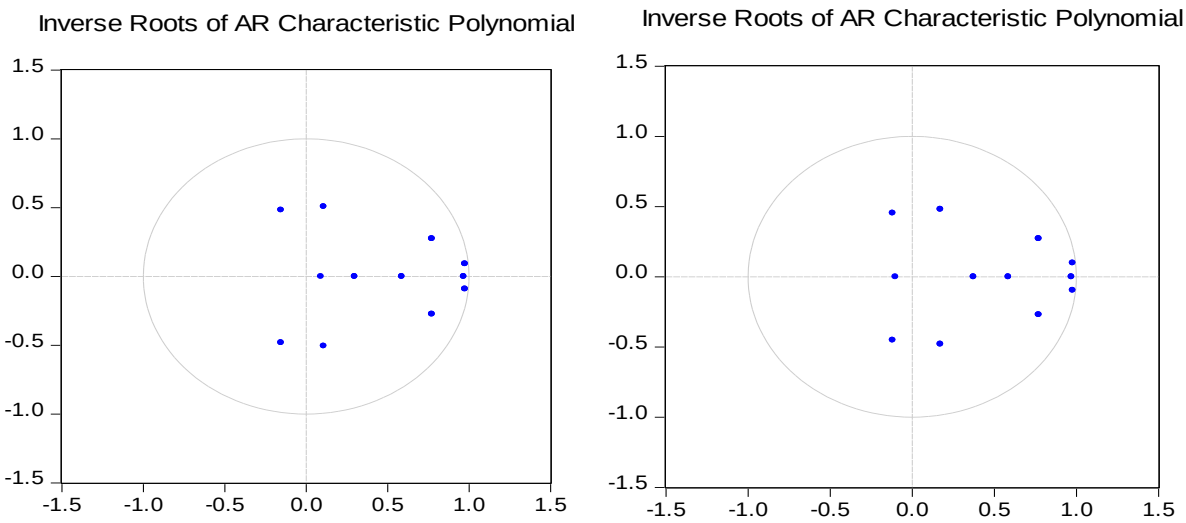


Figure 8 AR Root Graphs

Robustness Check

The estimation procedures were repeated by substituting the uncertainty variable with world trade uncertainty to investigate the robustness of the models presented in section 3. However, due to the limitation of data, the robustness checking was based on data ranging from 1996 to 2019. As illustrated in Tables 5 and 6, the findings of the results confirmed the long-run cointegration of income inequality-uncertainty nexus for all ASEAN 5 countries. Thus, validating the significance of the ARDL models listed in Equations (3) and (4). From Table 6, the uncertainty is found positive and significantly correlated with the income inequality variables. Hence it is in parallel with the paper's main findings that uncertainty detriment income inequality of the ASEAN 5 countries. Additionally, with the per capita income, inflation and trade openness were found to positively impacts income inequality, and the inverse correlation of employment rate with income inequality was obtained. Thus, the robustness checks firmly validate the consistency of the ARDL models utilised in this study.

Table 5 Long-Run Cointegration and Serial Correlation LM Test (Robustness Checks)

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Model 1					
ARDL bounds test Pesaran et al. (2001)	50.3765***	7.1235***	16.5667***	21.4956***	9.4241***
Diagnostic checks					
Serial (1) – Lag 2	4.1797*	1.8831	0.5637	2.5906	1.6377
	(0.0730)	(0.2137)	(0.6409)	(0.1898)	(0.3932)
Serial (2) – Lag 4	3.2019	2.6413	2.2584	7.9627	1.9793
	(0.1430)	(0.1834)	(0.1357)	(0.1147)	(0.1168)
Narayan (2005) (K=5, n=30)	Lower Bound	Upper Bound			
10%	2.4070	3.5170			
5%	2.9100	4.1930			
1%	4.1340	5.7610			

Note: The test statistics of the cointegration tests were compared against the critical values reported n Narayan *et al.* (2005) for samples of less than 100 observations. Serial (1) and Serial (2) are the Breusch-Godfrey LM test statistics for no serial correction. The numbers in parenthesis indicate the p-values. *, ** and *** denote the significance at the 10%, 5% and 1% levels.

Table 6 ADRL Estimation Results -Robustness Checks

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Long-run coefficients					
Intercept	23.7450***	114.6312***	88.1005***	14.7032*	136.9836**
	(0.0001)	(0.0001)	(0.0001)	(0.0673)	(0.0241)
ln*TUC*	0.2916	0.0244**	0.0832*	0.1918**	1.2911*
	(0.1695)	(0.0001)	(0.0532)	(0.0432)	(0.0852)
ln*RGDPC*	4.4413***	0.4084	-0.3869	1.1339**	-0.1525
	(0.0001)	(0.4137)	(0.2815)	(0.0197	(0.9969)
ln*CPI*	-1.6030*	12.8112***	8.2186**	0.0652	2.217
	(0.0853)	(0.0010)	(0.0238)	(0.9683)	(0.1852)
EMP	-0.01941*	-0.0745	-0.1953	-1.1728***	-0.1442
	(0.0996)	(0.3421)	(0.1383)	(0.0033)	(0.6531)
ln*TO*	-0.7433	3.3825**	3.3151***	2.5390***	-0.1976
	(0.2385)	(0.0142)	(0.0042)	(0.0004)	(0.9695)
Short-run coefficients					
Intercept	-0.0707	-0.0493	0.0235	0.0024	-0.0712*
	(0.6834)	(0.4309)	(0.7311)	(0.9634)	(0.0814)
ECT(-1)	-0.1910***	-0.1095*	-0.1587***	-0.1081*	-0.0610***
	(0.0086)	(0.0632)	(0.0059)	(0.0641)	(0.0001)
Δ*TUC*	0.0392*	0.0005	0.0274***	0.0131	0.0165*
	(0.0882)	(0.9477)	(0.0001)	(0.1052)	(0.0707)
Δln*RGDPC*	0.6449	-0.1851	0.3272	0.0376	0.2078
	(0.1079)	(0.3244)	(0.1194)	(0.9189)	(0.1938)
Δ*CPI*	-0.3443	-0.9293	-0.1577	0.6201	0.3056***
	(0.6560)	(0.5855)	(0.8548)	(0.7488)	(0.0051)
EMP	0.0150	-0.0455	-0.0111	-0.1227	-0.0667*
	(0.7580)	(0.6344)	(0.6785)	(0.8388)	(0.0766)
Δ*TO*	-0.3682	-0.6702	-0.3425	0.5559	0.1192
	(0.3983)	(0.1436)	(0.2126)	(0.2070)	(0.6487)

Notes: *IE* represents income inequality, *WUC* represents the external uncertainty (world uncertainty), *CUC* is the internal uncertainty (within-country uncertainty), *RGDPC* is the real GDP per capita, *CPI* represents the inflation (proxied by a consumer price index), *EMP* represents the employment rate, whereas, *TO* highlights the trade openness in each of the country. The coefficients displayed are the T-statistics obtained from the Eviews software package. A maximum lag length of four was used. The optimal lag structure for the ARDL model was chosen based on the Akaike Information Criterion (AIC). ***, ** and * denote the significance at the 1%, 5% and 10% levels).

CONCLUSION

From the theoretical standpoint, a rise in uncertainty will likely impact the economic ecosystem and raise income inequality. Thus, the causal relationship between uncertainty and income inequality poses an area of concern. This study utilised the ARDL estimation techniques developed by Pesaran et al. (2001) to examine the possible impact of external uncertainty (world uncertainty) and internal uncertainty (within-country uncertainty) on income inequality contributes to the growing body of literature and policy debates on the economic impact of uncertainties. From the results obtained, in the long run, the income inequality of the ASEAN 5 countries is found more sensitive to the external uncertainty shocks (world uncertainty) than the internal uncertainty shocks (within-country uncertainty). More specifically, external uncertainty is a significant determinant of income inequality of all ASEAN 5 countries. In contrast, internal uncertainty only mattered for the income inequality levels of Malaysia and Thailand. On the other hand, in the short run, while external uncertainty affected Thailand's income inequality level significantly, internal uncertainty was found to matter for the income inequality level of Malaysia, Singapore and Thailand. Thus, the results reflect that the impact of uncertainties on income inequality on the ASEAN 5 countries was more significant in the long run than in the short run.

In addition, the results also highlight that real per capita income and inflation worsen income inequality. It suggests that the increase in the real income does not reflect the prosperity that was shared evenly but instead makes the rich richer and the lower-income group poorer. For instant, in the year 1996, Singapore real per capita income and Gini index were at US$26233.63 and 38.5, in 2019, while the real per capita income of Singapore has threefold to US$65640.71, its Gini index remains persistent at 37.6 level. Similarly, the inflation variable was found to detriment the income inequality level of the ASEAN 5 countries. Thus, it shows that the price increase would generate more income for wealthy people in business, widening their income gap from the poorer income group, which is mainly the fixed income earner.

On the other hand, a higher employment rate will have a corrective impact on the income inequality level of the ASEAN 5 countries. Thus policymakers should look into the way to increase job opportunities in the country. Lastly, mixed results were obtained from the trade openness variable. More specifically, it was found to improve the income inequality of Indonesia, but it has worsened the income inequality level of the Philippines and Singapore. This signifies that increased trade openness creates new employment opportunities and economic growth (WTO, 2007) and expects to reduce income inequality (Goh et al., 2019). However, it will worsen the income inequality level if the increasing benefits from trade openness are not distributed evenly.

Given that the uncertainty has a detrimental impact on the income inequality level of the ASEAN 5 countries, policymakers should direct the following policy attentions to mitigate the impact of uncertainty. First, all countries to form and maintain a functional incident response team to offer an immediate first response to address the uncertain incidents. As Sherlock (1998) highlighted, during Asian Financial Crisis, the crisis worsened in the ASEAN countries mainly due to a lack of an effective and immediate government policy response to address the crisis. Second, an effective fiscal and monetary policy response to restore confidence and mitigate the impact of uncertainty on income inequality is required. As reported by the Internation Monetary Fund (IMF), in 2020, Malaysia's GDP shrinks by 5.6% due to the COVID-19 pandemic (Nikkei Asia, 2021), while Singapore, the Philippines and Thailand's GDP shrink by more than 6%, respectively. The World Bank (2020) suggested that the crisis would require immediate action to cushion the pandemic's economic consequences. Hence, an effective fiscal and monetary policy response would restore the investor to continue to invest in the country, thus mitigating the impact of the uncertainty and minimising the damages. Third, policymakers should look into promoting sustainable growth. The journey to recover from the uncertainty shocks could be lengthy and challenging. Thus a more robust and cleaner economic foundation may better withstand the pressures from the future uncertainty shocks. Lastly, the Covid pandemic also shows us that innovation and digitalisation are crucial for the survival of any corporation. Thus, policymakers should foster innovation and digitalisation as the conventional way of doing business can no longer withstand the uncertainty shocks.

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