

## Nexus Between Inward Remittances and Income Inequality in Thailand

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### Abstract

*The study investigated the nexus between income inequality indices in time series dominating financial flows in Thailand from 1990 to 2018, using OLS, FMOLS, and DOLS as estimation methods to ensure the results' robustness. In earlier 1998, it seemed that the external trade of Thailand experienced a vast deficiency in foreign capital, and it needs a sufficient amount of external finance to promote economic growth, which helps to enhance employment opportunities, increase equal distribution of per capita income, and eliminate poverty. In this regard, the remittance inflows played an unneglectable role in reducing income inequality instead of foreign development assistance. Our empirical findings revealed Thai economy does not hold the Kuznets form of relationship between income inequality and GDP per capita. Moreover, the study showed that there is an inverse relationship between inward remittance inflows and income inequality. However, the study confirmed a positive but insignificant contribution of foreign aid to income distribution. The government should strengthen receipts channels and incentivize investing in human capital as a policy implication.*

**Keywords:** Income inequality, Inward remittance, Foreign aid, Human development, GDP per capita, Thailand, EKC

**JEL Classification:** D63, F24, F35, O15, E01, O53, B41

### 1. Introduction

Even though help has been exploited by both recipients and donors, the role of foreign aid in developing nations is to facilitate economic progress and poverty reduction. Bourguignon, Levin and Rosenblatt (2008); Bjørnskov (2009); Calderon, Layton and Nielson (2009) have emphasized the important role played by foreign aid to overcome income inequality in developing countries. But unfortunately, sometimes the results are reversed. Inflows of remittances, on the

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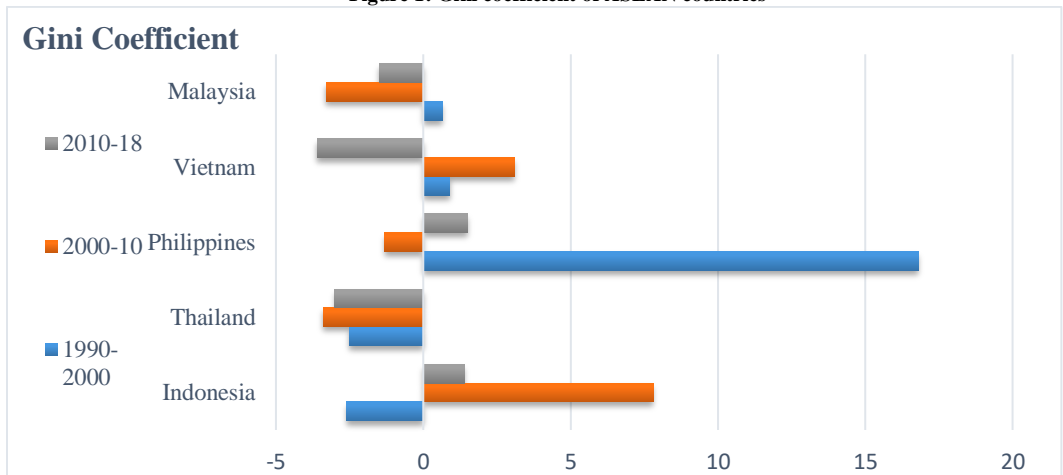
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other hand, portray a healthier side of the recipient country, especially during times of crisis, because they provide chances for developing countries (International Monetary Fund, 2007). Since rising inequality across the developed and developing nations has attracted much attention from the public policymakers. In this context, one of the Sustainable development goals (SDGs) is the eradication of Poverty by achieving economic growth. However, this comes at the cost of serious income disparity globally. Despite poverty reduction, economic growth in developing countries augmented the income disparity intensely because of disproportionate growth (Unternaehrer, 2013). Until the 1990s, Asian countries (Korea, Hong Kong, Singapore, and the Chinese province of Taiwan) had achieved continuous growth, erased huge poverty, and secured fair distribution of income (Jain-Chandra et al., 2016). However, post-1990 many Asian countries have witnessed rising high-income inequality with a break from their own previous equitable growth experience, particularly in the ASEAN region.

The issues of income inequality in these economies were considered the two sides of a flipping coin for decades. Somehow for the proper functioning of the economy, the disparity is considered effective for the market economy but at the same time, it can harness the growth (Berg and Ostry, 2011). Although financial development and external inflows are interlinked due to different institutional reforms, regional, and political aspects, economic growth is not all the time linked

Figure 1: Gini coefficient of ASEAN countries



Source: WDI, author's own estimates

to Income equality.

By considering the Gini coefficient of ASEAN countries, Philippine's inequality index increased by 16.8 index points from 1990 to 2000, followed by

Vietnam and Malaysia. Indonesia reduced income inequality by 2.6 index points. Thailand remained the second-highest among the ASEAN countries which reduced income inequality by 2.5 points in the same time period. Between 2000 to 2010, the results are reversed. Thailand was one of the best-performing countries in the region which maintained its position between 2010 to 2018 (See Figure 1). The reason for such performance might be many socioeconomic characteristics and preferences toward effective welfare policies in Thailand. But one of the noticeable factors was the emigration of Thai unskilled and skilled workers flows toward other countries.

Thailand's economic policies switched to export-oriented enterprises, and significant industrialization was aided by foreign financial infusions. Some major features of a transitional Thai economy from domestic to export-oriented industries. Small and medium firms, as well as the transformation of farming to non-farming businesses, all contributed to the improvement of macroeconomic economic indicators. Due to a rise in Thai exports to international economies after 1996, overall trade increased. Exports boosted trade activity, which subsequently fell with a slight deficit in 2005 and 2012. The quick expansion of the industrialization process raised export volume, lowered external load and improved trade balance. In addition, Thailand's reliance on foreign development aid has decreased, and international remittance inflows have helped Thailand overcome its current account deficit. Due to a considerable reduction in external margination, inbound remittance and net foreign assistance aid as a percentage of GDP decreased in 1992 but began to steadily increase after 2000. During the financial crisis of 2008, there was a significant surge in remittances (see Fig.2). The economic theories and empirical studies argue that the increase in remittance inflow increase per capita is helpful in the reduction of income disparity between poor and rich class families (Barham and Boucher, 1998; and Oberai et al.,1989). Moreover, the economists and policymakers establish a link between the allocation of foreign aid and income inequality for the development of capital deficiency and in the use of productive activities in the economy (Afsar, 1998). So that the aid inflows could be added to the growth in the long run for employment generation and consequently it helps to reduce income inequality.

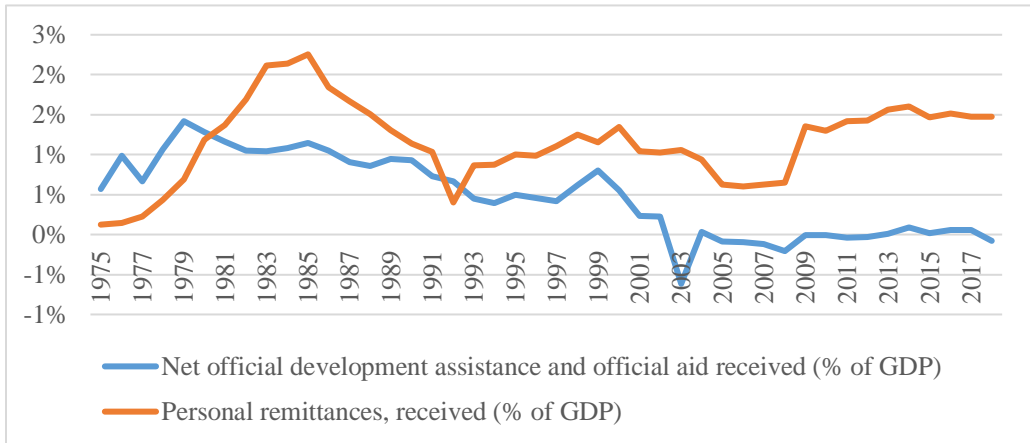
Thailand became an important migrant-receiving as well as a significant migrant-sending country in the region<sup>5</sup>. This is because, the Thai government emphasized its labor-management policy to promote Thai laborers working abroad

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<sup>5</sup> After implication of 11th National, Economic and Social Development Plan NESDP incorporated (2012-16) Later the NESD 12th plan revised in 2017 with a major change to target more enhancement in international regulatory and institutional linkages.

with the help of a new recruitment system of “overseas Thai workers” through public-private licensed companies (Pholphirul, 2012). This dramatically changed the pattern of the Thai emigration structure.

**Figure 2: Trend of Net official development assistance and official aid received, personal remittances received 1975 to 2018**



Data source: WDI, (2019).

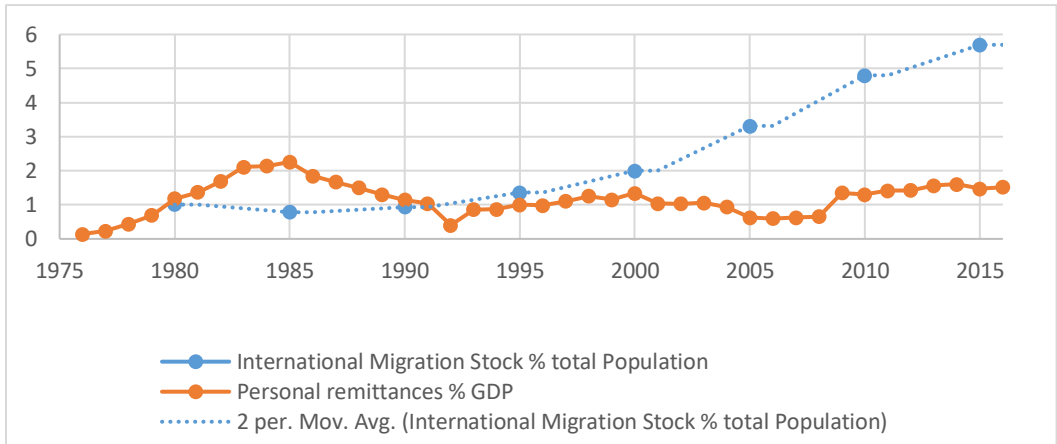
The migrants abroad and employment opportunity supports the living standard of their family members and a major reduction in income poverty in Thailand. More than 2800 million (USD) remittances were received by Thailand through a formal channel from the top four origin countries (UN Migration report, 2019) excluding informal channels, which are estimated more than 10,000 million (USD). It is also seen that migrant family members acquire capital in an emergency which might increase informal remittances.

The international migration stock percentage of the total population is rapidly increasing over time and the trend of net remittance % of GDP is also increasing but it decreases over the migrant’s age (see Fig.3). Even though the number of “Thai emigrants” fell from 1985 to 1990, the financial advantages in terms of inbound remittances grew by an average of 6% each year (Piriya Pholphirul, 2012). This inverse-increasing pattern in immigrants and labor remittances indicates that some of the migrants are earning better wages overseas, or it might be a combination of variables that explains the rising tendency in remittance flows to Thailand. First there might be better data collection. Second, there might be sophisticated income expansions overseas, and lesser costs and remittances are supported by larger industry networks. Third, advances in money transmission and banking technologies encourage transfers over financial channels.

Nevertheless, inward remittance plays a crucial role in reducing income inequality. The evidence from Indonesia also indicated that remittances were largely utilized to purchase land or make modifications to homes (Hugo, 1995).

The objective of this study is to analyze the nexus between remittance inflows, foreign development aid and income inequality in Thailand. The study is expected to contribute to existing literature and highlight the importance of remittance and foreign assistance aid to overcome the major issues of the income distribution. The rest of the paper is organized as follows: section 2 is a review of existing theoretical and empirical literature, section 3 is an empirical framework and detailed description of the methodology used to investigate the relationship between the proposed variables, and section 4 is the results and discussion, and section 5 is the conclusion and policy recommendations.

Figure 3: Trend of Migration Stock and Net Remittances 1975-2015 in Thailand



Data source: United Nations Population Division, Trends in Total Migrant Stock: 2012 Revision.

## 2. Literature Review

Several studies have explained the importance of inward remittances to eradicate the income gap among households of the origin country. Because international migration is often seen as a contributor to the household's basic nutrition under various government policies in developing countries. In many studies focusing on the effects of remittances, the impact on the overall well-being of households is overlooked. Studies such as (Barham and Boucher 1998; Afsar 1998 and Oberai et al 1989) have demonstrated that remittances account for a considerable percentage of a household's income and, in some cases, they can even assure the survival of a household. Other studies have raised frequent questions in the economic development literature about whether “remittances” subsidize a

subsequent equalization of per capita income among households in the origin country. Besides these few scholars claim that remittances earned by migrants likely to reduce income inequality in their origin country (Guest 1998; Taylor and Wyatt 1996; and Oberai et al 1989), while (Barham and Boucher 1998) argued that it is the remittances that caused an increase in income inequality among households. However, there is controversy among different modes of economic behavior. To address these issues, the empirical evidence remained inconclusive. It is more likely to depend on the economic situations of migrants' homes to which they belong, as well as the forms of migration over different periods in history (Taylor, 1999; Russell, 1992; Stark, Taylor and Yitzhaki, 1988). Furthermore, one of the primary and immediate effects of remittances is a rise in per capita income, which precisely comes from remittances received and the nature of money spent. The conclusion is drawn from several studies available on remittance use and income inequality have been amazingly consistent: First, the remittances used to satisfy the consumption needs of individual households and second the priority for investment need often did not usually high (Massey and Parrado, 1994 and Oberai and Singh, 1983).

It was also seen that migrant members used to acquire capital in a situation of emergencies or market failure. This may be the reason that the number of remittances obtained through internal migration was insufficient to allow households to use the money productively. According to the results (Hugo, 1995), remittances were largely utilized to purchase land or make houses rather than investing in Children's education in Indonesia.

The early study by Meesook (1979) addressed the issues of income distribution in terms of income inequality and economic growth. The empirical evidence showed that economic growth decreased regional disparities, particularly in agriculture sector development. A significant decline was also seen in poverty levels between 1963 and 1976 in all regions of Thailand. Consequently, he did not find any evidence of a trade-off between equity and economic growth.

However, none of the studies investigated the relationship between remittance and income inequality except a few studies (Israngkura, 2003; Ikemoto and Uehara, 2000; Krongkaew, Tinakorn, and Supachalasai, 1992 Krongkaew, 1985) in which the authors used different measures of income inequality to estimate existing disparities through household cross-sectional data. Their findings suggested that the Thailand Gini index has increased over time.

The evidence from the regression-based research study about the distribution of income by Fofack and Zeufack (1999) found income inequality decreased with increases in mean education ownership of the home, inward

remittances, and attentiveness average income in earlier 1996. The problem associated with such analysis was concerned with the size of construction through a pseudo panel that it is inappropriate to provide unbiased estimators (see Verbeek and Nijman, 1992, 1993 and Deaton, 1985).

Motonishi (2006) observed the factors associated with income inequality in Thailand over the period from 1975 to 1998. The study followed the empirical form of Deaton and Paxson (1994). The findings revealed no evidence of the Kuznets hypothesis between inequality and economic growth. It is also seen that the household average age has an insignificant impact on income inequality. It is concluded that the Thai households had not experienced considerable aging before 1998.

On the other hand, many households did not report their interest and insurance expenditures because of their inaccessibility to financial services. The issues associated with his study were identified by (Klasen, Lechtenfeld, and Povel, 2011). Since the household income is used to represent income inequality, regression estimation did not control for several earners and non-contributors. Male education left a vague image of the household headed by female participants.

The panel study by Kurita and Kurosaki (2011) for the Philippines and Thailand examined the association between economic growth, poverty, and inequality in consumption expenditure among households covering the period of 1988 to 2004. The findings revealed that expenditure inequality decreases economic growth and the difference in poverty ratio had found between Thailand and the Philippines.

Despite the remarkable growth performances of Thailand from 1980 to 2000, the income inequality had hardly improved because the Gini coefficient was 0.484 in 2013. This was not different from than earlier observed coefficient in 1988, which was equal to 0.487. Consequently, over the last two decades, Thailand's level of economic growth and income inequality still lagged comparatively with the levels in developed OECD nations (Balakrishnan, Steinberg, and Syed, 2013).

The studies by (Kilenthong, 2016 and Pootrakul, 2013) linked the decreasing trend in income inequality indices to the Kuznets shape (inverted-U shape curve) that traced disparity indicators with the economic development. Kuznets's hypothesis stated that at an initial stage of economic development, income inequality increases and starts declining as the economy reaches its desired level of development.

Jain Chandra et al., (2016) investigated the main determinants such as the drivers and policies to combat income inequality in the context of Asian countries. The study used the data derived from national household surveys at a country-specific level. The empirical findings revealed that country-specific policies to combat income inequality could have a substantial impact on reversing the rising trend of income inequality. However, the inequality in economic opportunities could raise the level of inequality as the empirical evidence shows positive and significant relation with the Gini coefficient. Access to basic and skilled-based education, health, and access to financial intermediaries also helps to combat income inequality.

Aslan et al., (2017) investigate the linkages between income inequality, economic growth and gender inequality in financial inclusion using the micro-dataset covered by 146,000 individuals in over 140 countries. The study captured the income inequality channels through the following two aspects. First, is the intensity of financial inclusion at the country-specific at an individual level. Second is the access to individual financial services using scores at countries level under the EKC framework to document a “Kuznets”-curve in financial inclusion. The empirical finding revealed that the measure of inequality in financial access is negatively and significantly related to income inequality. Furthermore, economic growth is the second contributing factor that helps to reduce income inequality through financial channels in these countries. In this regard, the study (Vanitcharearnthum, 2017) contrasted the estimation of income distribution with a new methodology on top income share and tax returns using the 2004 to 2009 socio-economic survey. The finding indicated that the income distribution worsened during 2009.

Kingnetr et al, (2019) decomposed income inequality across household characteristics, their income sources, and industrial subgroups. The findings revealed that the income source is the highest contributing factor that causes income inequality to reduce. The second highest contribution to reducing income inequality from industries subgroup is heterogeneous and followed by manufacturing, agriculture, wholesale and retail trade and real estate sector. The impact of household wealth on total income disparity, ranging from household characteristics to household wealth. The study further elaborates that inequality in credit accessibility and financial assets is a highly contributing factor to income inequality than education.

However, the World Bank (2019), also reported that the level of income inequality in Thailand is comparable to peers and not sufficient as compared to



other Asian countries which became an issue of national priority. Income inequality can harm the whole process of development in two major ways. First, unequal economic opportunity causes the wastage of the productive potential of an economy. Second, it also results in a reduction in institutional development that leads to a risk-taking environment for new investment and innovation.

Maneejuk and Yamaka (2019) investigated the association between inequality in income and economic growth, credit to the private sector and inflation in the context of Thailand. The study followed the EKC framework, using the time series data from Q1-1993: to Q4-2015. The study followed the simultaneous kink econometrics models. The empirical findings do not support the Kuznets hypothesis for Thailand in the proposed period. However, the study determines an alternative way to diminish income inequality through controlling inflation and leveraging the credit facility to the private sector. From the above literature, there is no study found that investigates the impact of inward remittance on income inequality in Thailand except few studies that used cross-section analysis, using socioeconomic factors of income inequality. The literature review discussed confirms that the nexus between inward remittance and income inequality in the case of Thailand has not been subjected to empirical analysis. This study will fill this research gap while performing econometric analysis. The research questions are: what is the nexus between inward remittance and income inequality? What is the nexus between GDP and inward remittances?

### **3. Empirical Framework**

The general equation for driving income inequality has been massively used as Kuznets' (1955) (U-shaped) relations with growth in income per capita. Following Kuznets (1955) who asserted that income inequality and economic development are related via an inverted-U curve (hereafter referred to as the Kuznets curve). Such type of relationship is examined by a number of empirical studies (List J, and Gallat C, 1999; Dawson, 1997; Jha, 1996; Ram, 1995; Papanek and Kyn, 1986). These studies employed regression of income inequality on per capita income and squared per capita income. However financial inflows, physical, and human capital accumulation in the countries are also important indicators that affect the level of income inequality in different regions or countries (Aslan et, al.; 2017; Massey and Parrado, 1994 and Oberai and Singh, 1983). Thus, our empirical framework initially is based on Kuznets (1955) hypothesis with several structural and policy factors and financial inflows.

$$\text{Income inequality} = f(\text{Financial inflows}, \text{Structural}, \text{Polices})$$

Where income inequality is taken as a proxy of the Gini coefficient<sup>6</sup> estimated by the World Bank. Financial inflows are taken as a set of mainly two kinds of financial inflows Personal remittance received around the globe and net official development assistance. The structural variables are represented as the country characteristics such as a total labor force, log of real income per capita and squared income per capita to represent the Kuznets effects. The policy variable includes the Human development index (HDI) that captures the effect of structural changes; for instance, the quality of human capital consisting of health, education, and income per capita of each household from micro representation to the macro level in the Thai economy. The low level of human capital reduces income inequality among nations. Thus, human capital is the most important tool for reducing income inequality (Aslan et al, 2017). The econometric function of Income inequality transformed into a logarithm and is to be estimated and presented as follows:

$$\ln(IE_t) = \beta_0 + \beta_1 \ln(GDPPC_t) + \beta_2 \ln(GDPPC_t^2) + \beta_3 \ln(HDI_t) + \ln(TLF_t) + \beta_5 \ln(PR_t) + \beta_6(AID_t) + \epsilon_t \quad (1)$$

In above model 1,  $\ln IE_t$  represents the natural log of income inequality measured as the Gini index.  $\ln GDPPC_t$  and  $\ln GDPPC_t^2$ , show the log of income per capita and squared income per capita.  $\ln HDI_t$  and  $\ln TLF_t$  symbolize the log of the Human development index, and log of total labor force. Where  $\ln PR_t$  represents the log of personal remittance received % of GDP,  $AID_t$  symbolizes official foreign assistance Aid % of GDP at time t. and  $\epsilon_t$  is assumed to be a white noise error term.

The data of these variables are collected from World Development Indicator (WDI) databank from 1990 to 2018. The relationship between income inequality and financial inflows along with other controlled variables are interpreted as elasticity in the logarithmic model used in this study.

The systematic procedure of time series analysis to check the existence of a long run relationship begins with confirming the order of integration associated with all variables in question. A set of theoretically consistent and empirically viable variables is selected for estimation.

For the appropriate technique to examine the long run relationship depends on the order of integration of variables, the analysis begins with examining the order of integration, which is presented in the next section.

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<sup>6</sup> There are missing some observation from 1991-92 and 1995 which is inflated using average between  $GINI_{t-1}$  and  $GINI_{t+1}$  for  $GINI_t$  suggested by (Aslan et al., 2017).

### 3.1 Unit Root Test

Since routine empirical procedures fail if any of the variables remain nonstationary at the first difference, it is unavoidable to check whether the variables are stationary or not. This is done through Augmented Dickey-Fuller (ADF) and P-P nonparametric technique with the help of model stated as:

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \sum_{k=1}^n d_k \Delta Y_{tk} + \varepsilon_t \quad (2)$$

$Y_t$  in the above equation is a time series,  $\Delta$  is used as the first difference operator and  $\varepsilon_t$  is a white noise error term. Similarly, Phillips and Perron (1988) proposed an alternative non-parametric and non-augmented DF method of the testing unit root of a time series controlling for serial correlation and modified the  $t$ -ratio of the  $\beta$ s coefficients so that the asymptotic distribution of the test statistic is not affected by serial correlation.

### 3.2 Testing of Co-integration

The equation employed in this technique is presented as a vector autoregression model of order ‘z’ as follows:

$$w_t = \delta + B_t w_{t-1} + \dots + B_a w_{t-z} + \varepsilon_t \quad (3)$$

In the above equation,  $w_t$  is a variable, integrated of order 1 having  $p \times 1$  dimensions. Consequently, the vector autoregression form is presented here as:

$$\Delta w_t = \delta + \Phi w_{t-1} + \sum_{i=1}^{z-1} \Gamma_i \Delta w_{t-1} + \varepsilon_t \quad (4)$$

Where  $\Phi = \sum_{i=1}^z B_i - I$  and  $\Gamma_i = -\sum_{j=i+1}^z B_j$

Trace and maximum Eigen value are the two statistics that are used to confirm the existence or non-existence of long-run relationship in the equation.

### 3.3 Long run Coefficients through FMOLS and DOLS

As it has been already established that, the same level integration of time series variables I (d), the OLS is a sufficient procedure to estimate the long run coefficients. However, OLS is not sufficient in case the issues of endogeneity and the problem of serial correlation in equation (Phillips and Hansen, 1990; Stock and Watson, 1993) originally developed the time series co-integrating techniques FMOLS and DOLS. The advantage of these techniques is superficial to deal even with a small sample size, the issue of endogeneity and serial correlation (Azam, Alam, and Hafeez, 2018; Baloch et al., 2019). These techniques are also preferred over other single co-integrating techniques of the I (1) series for robust empirical results. The major difference between FMOLS and DOLS can be elaborated as

follows. First, the FMOLS contains the non-parametric statistical tools, for controlling endogeneity and autocorrelation. However, the DOLS approach is contained with parametric tools with the leads-lags effect of independent with change operator in equation ( $\Delta X_t$  variables) (Azam et al. 2018; Danish et al. 2019; Kao and Chiang 2000; Narayan and Smyth 2007). Secondly, these methods are supported by Wald tests using asymptotic f- test statistics or Chi-square statistical inferences (Azam et al. 2018). Hence, the estimator driven by these methods is considered fully efficient and unbiased asymptotically.

### 3.4 Short-run Analysis (ECM)

It is appropriate at this stage to test the short-run relationship between variables in the Income inequality function. This is done by employing the error correction mechanism (ECM) as equation (5)

$$\begin{aligned} \Delta \ln IE_t = & \Phi_0 + \Phi_1 \sum_{i=1}^p \Delta \ln GDP_{PCt} + \Phi_2 \sum_{i=1}^p \Delta \ln GDP_{PCt-1} + \\ & \Phi_3 \sum_{i=1}^p \Delta \ln PR_t + \Phi_4 \sum_{i=1}^p \Delta \ln PR_{t-1} + \Phi_5 \sum_{i=1}^p \Delta \ln AID_t + \\ & \Phi_6 \sum_{i=1}^p \Delta \ln AID_{t-1} + \Phi_7 \sum_{i=1}^p \Delta \ln HDI_t + \Phi_8 \sum_{i=1}^p \Delta \ln HDI_{t-1} + \\ & \Phi_9 \sum_{i=1}^p \Delta \ln TLF_t + \Phi_{10} \sum_{i=1}^p \Delta \ln TLF_{t-1} + \Phi_{11} EC_{t-1} + \varepsilon_t \end{aligned} \quad (5)$$

$\Delta \ln IE_t$  symbolizes the first difference of the log of income inequality index as the dependent variable in the equation while the variables on the right-hand side of the equation are same as in the long run function except for the two differences. First, the variables as well as their first lags used in first differenced form expressed through  $\Delta$  and second, the first lags of error correction term are included along with the other explanatory variables in the model. Here,  $\Phi_{11}$  is the magnitude of long run model adjustment in response to a short run shock.

### 3.5 Causality Analysis

For checking the causality between variables, Granger (1969) framework is employed. The pairwise direction of causality is another important to test between dependent and independent variables. The granger causality assumes  $X_t$  represents independent variables and  $Y_t$  represents dependent variables over time. Under this framework, the accuracy of  $X_t$  variables to predict  $Y_t$  increases with respect to forecast if there is a true uni-directional relationship detected ( $X$  granger cause  $Y$ ) considering only past values of  $Y_t$  (Foresti, Pasquale 2006). The estimated equation is represented as (6 and 7). It can be either uni-directional or bi-directional with their lag order respectively.

$$\ln Y_t = \gamma_0 + \sum_{i=1}^n \vartheta_i \ln Y_{t-1} + \dots + \vartheta_p \ln Y_{t-p} + \sum_{i=1}^n \rho_i \ln X_{t-1} + \dots + \rho_q \ln X_{t-q} + \varepsilon_t \quad (6)$$

$$\ln X_t = \gamma_0 + \sum_{i=1}^n \vartheta_i \ln X_{t-1} + \dots + \vartheta_p \ln X_{t-p} + \sum_{i=1}^n \rho \ln Y_{t-1} + \dots + \rho_q \ln Y_{t-q} + u_t \quad (7)$$

#### 4. Results and Findings

The findings of ADF and P-P tests are presented in Table 1. This is done through “Augmented Dickey-Fuller (ADF) and P-P unit root test”.

**Table 1: Test of stationarity through ADF and P-P test**

Variables	ADF				P-P			
	Level		First difference		Level		First difference	
	C	C and T	C	C and T	C	C and T	C	C and T
LNIE	-0.801	-2.547	-6.459*	-4.736*	0.112	-3.340	-7.268*	-7.058*
LNGDPPC	-1.233	-3.263	-3.591*	-3.504**	-1.175	-2.612	-3.593*	-3.510**
LNHDI	-2.470	-0.862	-5.467*	-6.506*	-2.838	-0.687	-5.462*	-6.513*
LNTLF	-0.775	-1.777	-5.024*	-5.042*	-0.825	-1.866	-5.017*	-5.041*
LNPR	-2.309	-2.979	-6.550*	-6.467*	-2.336	-3.044	-6.595*	-6.494*
AID	-2.493	-2.878	-7.290*	-7.343*	-2.487	-2.882	-7.290*	-7.399*

Authors’ estimation: Note \* “significant at 1 percent level of significance”. The Ln shows the natural log and IE shows (income inequality), GDPPC (GDP per capita), HDI (Human development index), TLF (Total labor force), PR (Personal remittance received % of GDP), AID (net foreign assistance aid % of GDP)

It is shown that the results allow us to move on to the next step for examining the relationship in model 4 because all variables included in the model are found to be stationary at the first difference. To formally test the co-integration between variables in question, the technique proposed by Johansen and Juselius (1990) is used. The model along with the outcome of Johansen and Juselius's (1990) technique is reported in section 3. The results of the co-integration test are presented in Table 2.

**Table 2: Long run relationship through Johansen and Juselius method**

Null hypothesis	Trace	Critical values	Max Eigen Value	Critical values
None*	74.02	60.06	34.74	30.44
At most one	39.28	40.17	22.30	24.16
At most two	16.98	24.28	9.97	17.80
At most three	7.01	12.32	6.72	11.22
At most four	0.29	4.13	0.29	4.13

Author’s estimation: Note \* “significant at 1 percent level of significance”

As shown in Table 2, the “null hypothesis of no cointegrating vector” is rejected by trace as well as by Eigenvalue statistics. None of the other hypotheses could be rejected implying the existence of one co-integrating vector in the equation. The results confirm a long run relationship between variables modeled in the income inequality equation. It is equally important to analyze the magnitude of variables in the income inequality function and see whether their coefficients have the direction as per theoretical expectations. The estimation of long-run elasticity coefficients is discussed and presented in the next section.

**Table 3: Long run coefficients through OLS**

Variable	Model (1)		Model (2)		Model (3)		Model (5)	
	Coeff	t- stats	Coeff	t- stats	Coeff	t- stats	Coeff	t- stats
C	5.925	1.076	6.056*	3.722	5.229*	3.488	6.217*	3.38
LnGDPPC	-0.149	-0.107	-0.183*	-2.775	-0.253*	-7.437	-	-
LnGDPPC <sup>2</sup>	-0.002	-0.025	-	-	-	-	-	-
LnHDI	-0.267	-1.206	-0.267	-1.234	-	-	-0.783*	-6.274
LnPR	-0.051*	-3.665	-0.052*	-3.750	-0.056*	-4.135	-0.053*	-3.382
AID	-0.033	-0.880	-0.033	-1.067	-0.016	-0.559	-0.036	-1.01
lnTLF	0.015	0.044	0.018	0.060	0.08	0.262	0.128	0.376
Adj R2	0.931		0.934		0.933		0.917	
D.W	2.039		2.038		2.046		1.416	
F-statistic	64.922		81.44		99.20		78.00	
P-value	0.000		0.000		0.000		0.000	

Authors' estimation: Note \* shows "significant at 1 percent level of significance". The Ln shows the natural log and IE shows (income inequality), GDPPC (GDP per capita), HDI (Human development index), TLF (Total labor force), PR (Personal remittance received % of GDP), AID (net foreign assistance aid % of GDP)

The estimated coefficients through the above OLS (ordinary least square) procedure are presented in Table 3. Model 1 is summarized in Table 3 to avoid possible multicollinearity among the independent variables. The estimated model 1 shows that Thailand's economy does not hold the Kuznets hypothesis, as the estimated coefficient of income per capita (LnGDP), and squared income (LnGDP<sup>2</sup>), have failed to detect a significant impact on income inequality from the 1990s to 2018. Our findings are consistent with previous studies (Meneejuk and Yamaka, 2019; Ram, 1997; Tribble, 1996; Ravallion, 1995; Katz and Murphy, 1992). They concluded that the link between income inequality and per capita income reverts to positive at extremely high-income levels and that a quadratic Kuznets curve specification fails to give sufficient flexibility if the sample comprises a mix of industrialized and developing nations. (Meneejuk and Yamaka, 2019) particularly investigated income inequality in the Thai economy and concluded that the Kuznets hypothesis holds only if the sample size is earlier than 1998.

Another reason may be econometric constraints such as high multicollinearity between two or more regressors. Meanwhile, the estimated model 2, exhibits a significant impact on income per capita while an insignificant impact on Human development, because there is high multicollinearity between LnHDI and LnGDPPC. Afterward, controlling possible multicollinearity between LnHDI and LnGDPPC. The estimated models 3 and 4 exhibit a significant and negative relationship between income per capita and Human development with income inequality. However, the personal remittance received by the residents of Thailand revealed a non-zero impact on income inequality. On the other hand, the empirical evidence shows official development assistance (AID) and total labor force

participation (LnTLF) negative and Positive but insignificant impact on income inequality. Our empirical results are in line with the results obtained from some of the previous studies (Meneejuk and Yamaka, 2019; Kilenthong, 2016; Jain Chandra et al., 2016; Pootrakul, 2013).

**Table 4: Long run coefficients through OLS, FMOLS and DOLS**

Variables	OLS			FMOLS			DOLS		
	Coeff	t- stats	P-value	Coeff	t- stats	P-value	Coeff	t- stats	P-value
C	6.217	3.380	0.003	5.046	2.608	0.016	5.301	1.846	0.081
LNHDI	-0.783	-6.274	0.000	-0.743	-5.663	0.000	-0.792	-3.865	0.001
AID	-0.036	-1.010	0.323	-0.046	-1.192	0.245	-0.051	-0.871	0.394
LNPR	-0.053	-3.382	0.003	-0.056	-3.387	0.003	-0.049	-1.958	0.065
LNTLF	0.128	0.376	0.710	0.356	0.992	0.331	0.351	0.679	0.506
ADJ R2	0.9167			0.9062			0.9013		
D.W	1.416								

Authors' estimation: Note that the variables are in log form and lnGDPPC is excluded. The Ln shows the natural log and IE shows (income inequality), HDI (Human development index), TLF (Total labor force), PR (Personal remittance received % of GDP), and AID (net foreign assistance aid % of GDP).

**Table 5: Long run coefficients through OLS, FMOLS and DOLS**

Variables	OLS			FMOLS			DOLS		
	Coeff	t- stats	P-value	Coeff	t- stats	P-value	Coeff	t- stats	P-value
C	5.229	3.488	0.002	4.964	4.948	0.000	4.010	4.545	0.000
LNGDPPC	-0.253	-7.437	0.000	-0.246	-10.73	0.000	-0.256	-12.546	0.000
AID	-0.016	-0.559	0.582	-0.004	-0.228	0.821	-0.020	-1.157	0.261
LNPR	-0.056	-4.135	0.000	-0.056	-6.108	0.000	-0.043	-5.061	0.000
LNTLF	0.080	0.262	0.796	0.125	0.618	0.543	0.376	2.119	0.048
ADJ R2	0.935			0.931			0.962		
D.W	2.039								

Authors' estimation: Note that the variables are in log form and lnHDI is excluded. The Ln shows natural log and IE shows (income inequality), GDPPC (GDP per capita), TLF (Total labor force), PR (Personal remittance received % of GDP), AID (net foreign assistance aid % of GDP)

In Table 4 and Table 5, the long-run elasticity coefficients through OLS are shown. Human development (HDI) was found to be the most influential factor. The coefficients of income per capita and personal remittance are also found to be statistically significant and negative. The results through FMOLS and DOLS are in line with those got through OLS. The results confirm the negative contribution of human development, income per capita, and personal remittance received by domestic residents, to overall income inequality. The magnitude of other variables is far greater than the standard determinants (income per capita and personal remittance). An insignificant impact on total labor force participation and official development assistance received by Thailand was found in this model.

The results of the short-run analysis are presented in Table 6. The results confirm a short-run relationship in the income inequality of both functions since the coefficient of the error correction term is found to be negative and significant at a one percent level of significance. It shows that around 66 to 100 percent disequilibrium would be settled in the same year after any shock. The short-run

impact of personal remittances is found consistent in both equations. One percent increase in personal remittance by 0.04% reduces the income inequality in the short run. While the rest of the other factors had zero impact on the short run-on income inequality in Thailand.

**Table 6: Error Correction Mechanism (ECM)**

Variables	Model (I)			Model (II)		
	Coeff	t- stats	P-value	Coeff	t- stats	P-value
C	-0.006	-0.549	0.589	-0.011	-2.853	0.009
D(LNHDI)	-0.280	-0.311	0.758	-	-	-
D(LNGDPPC)	-	-	-	0.099	1.203	0.242
D(AID)	-0.017	-0.579	0.569	0.008	0.384	0.705
D(LNPR)	-0.048	-3.285	0.003	-0.045	-4.464	0.000
D(LNTLF)	-0.464	-0.940	0.357	-0.325	-1.033	0.313
ECM (-1)	-0.659	-3.107	0.005	-1.010	-6.504	0.000
Adj R2		0.3210			0.6740	
D.W		1.7380			1.7900	
F-stats		3.5470			12.1610	
Prob(F-stats)		0.0170			0.0000	

Authors' estimation; The Ln shows natural log and IE shows (income inequality), GDPPC (GDP per capita), HDI (Human development index), TLF (Total labor force), PR (Personal remittance received % of GDP), AID (net foreign assistance aid % of GDP)

#### 4.1 Diagnostic Tests

The two equations satisfied the diagnostics tests; such that no autocorrelation was detected by the serial correlation (LM) test. The (BPG), (ARCH) and White tests (with and without cross-product) fail to reject the null hypothesis of residual homoscedasticity. The Jarque-Bera test indicated normally distributed residuals and found insignificant F-statistics while models (I) and (II) are with correct specification using Ramsey RESET test that is confirmed that model is specified. Meanwhile, the structural stability of the estimated model is detected through the plot of the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of the square of recursive residuals (CUSUM<sup>2</sup>). The empirical results of all these diagnostic checks are summarised in Table 7 and Fig.4.

**Table 7: Diagnostic Tests**

Diagnostic Test	Model (I)		Model (II)	
	F-statistic	P-value	F-statistic	P-value
Serial Correlation (LM Test)	1.162	0.331	0.706	0.505
Heteroskedasticity Test				
Breusch-Pagan-Godfrey	0.902	0.478	1.229	0.325
White (without Cross-Product)	1.420	0.236	1.234	0.323
White (with Cross-Product)	0.505	0.882	0.745	0.700
ARCH	1.119	0.300	0.502	0.485
Ramsey RESET Test	0.710	0.408	0.645	0.525
J-B test Normality	1.504	0.471	0.797	0.671

Author's estimation



## 4.2 Causality Analysis

It is also important to examine the direction of causality between variables in the income inequality function. The causality analysis is presented in section 3.5. The results of the Granger causality test are presented in Table 8. The results show uni-directional causality from income inequality to personal remittance, GDP per capita to income inequality and HDI to income inequality and total labor force to HDI respectively. The study found no bi-directional causality among variables with a year lag.

**Table 8: Granger Causality Test**

Null hypothesis	F-stats	P-value
AID $\nrightarrow$ LnIE	1.812	0.190
LnIE $\nrightarrow$ AID	0.540	0.469
LnPR $\nrightarrow$ LnIE	1.973	0.172
LnIE $\Rightarrow$ LnPR	5.356**	0.029
LNGDPPC $\Rightarrow$ LnIE	24.23*	0.000
LnIE $\nrightarrow$ LNGDPPC	0.024	0.879
LnHDI $\nrightarrow$ LnIE	6.376**	0.018
LnIE $\Rightarrow$ LnHDI	0.002	0.964
LnTLF $\nrightarrow$ LnIE	1.294	0.266
LnIE $\Rightarrow$ LnTLF	3.427***	0.076
LnPR $\nrightarrow$ AID	0.041	0.841
AID $\nrightarrow$ LnPR	0.895	0.353
LNGDPPC $\nrightarrow$ Cause AID	1.590	0.219
AID $\nrightarrow$ LNGDPPC	0.176	0.678
LnHDI $\Rightarrow$ AID	3.819***	0.062
AID $\nrightarrow$ LnHDI	0.022	0.884
LnTLF $\nrightarrow$ AID	2.365	0.137
AID $\nrightarrow$ LnTLF	0.031	0.861
LNGDPPC $\Rightarrow$ LnPR	3.852***	0.061
LnPR $\nrightarrow$ LNGDPPC	0.004	0.951
LnHDI $\nrightarrow$ LnPR	2.753	0.110
LnPR $\nrightarrow$ LnHDI	0.003	0.956
LnTLF $\nrightarrow$ LnPR	0.397	0.534
LnPR $\Rightarrow$ LnTLF	3.946***	0.058
LnHDI $\Rightarrow$ LNGDPPC	2.929***	0.099
LNGDPPC $\nrightarrow$ LnHDI	0.576	0.455
LnTLF $\Rightarrow$ LNGDPPC	2.937	0.099
LNGDPPC $\nrightarrow$ LnTLF	1.546	0.225
LnTLF $\Rightarrow$ LnHDI	5.393**	0.029
LnHDI $\nrightarrow$ LnTLF	1.963	0.174

Author estimation: Note: One lag year is used as per AIC criteria. The ( $\Rightarrow$ ) shows significant causality and ( $\nrightarrow$ ) shows insignificant causality. \*, \*\* and \*\*\* shows 1, 5 and 10% significance level.

## 4.3 Variance Decomposition Analysis

In line with Wong (2010), another way to examine the causal relationship between income inequality and personal remittance is to use the variance decomposition approach. This method estimates the predicted error variance for a time series variable associated with innovations from all independent variables at

different points in time. The results of variance decomposition analysis are presented in Table 9.

As shown in Table 9; the change in income inequality is explained 100 percent by its innovations in the first round however in the second and third rounds the same is dropped faster around 58.45 to 49.67 percent, and the rest of the change is explained by the innovations in GDP per capita, HDI, personal remittance, foreign official assistance AID and total labor force. The explanatory power of personal remittance increased from zero percent in the first round to 6.5 percent in the 2nd round then it started declining smoothly and reached 3.44 percent in the 10th round. At the same time, the change in personal remittances was explained by around 63.9 percent by its innovations in the first round. The explanatory power started declining gradually till the 7th round, and remained around 34.9 percent to 34.4 percent from the 8th to the 10th round.

**Table 9: Variance Decomposition**

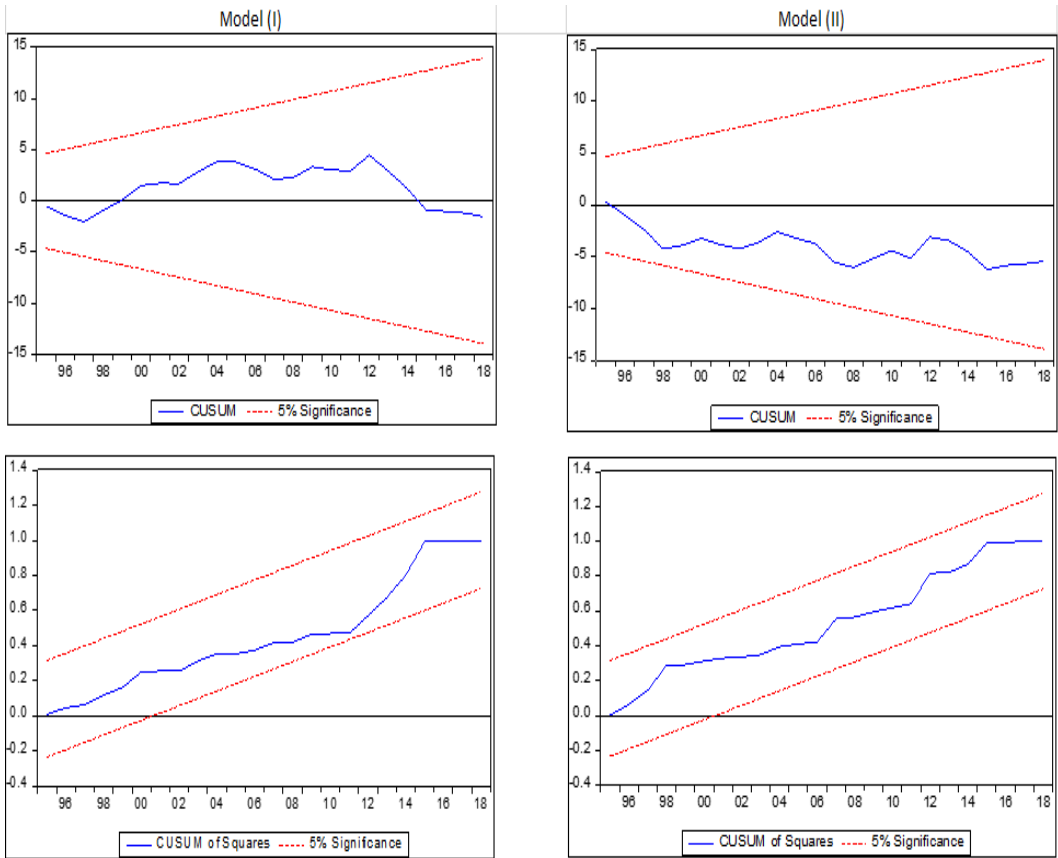
Period	LnIE	LnPR	LnHDI	AID	LnTLF	LnGDPPC
<b>Variance Decomposition of Income Inequality (LnIE)</b>						
1	100	0	0	0	0	0
2	58.45	6.56	4.05	2.81	20.67	7.47
3	49.67	5.47	3.11	10.46	15.25	16.04
4	41.02	4.28	2.85	15.93	11.95	23.97
5	36.07	4.02	3.14	16.42	12.39	27.96
6	33.98	3.8	3.16	16.68	14.03	28.35
7	33.55	3.62	3.01	16.71	15.55	27.55
8	33.16	3.55	2.97	16.5	16.9	26.91
9	32.63	3.48	2.97	16.21	18.21	26.5
10	32.14	3.44	2.96	15.97	19.33	26.16
<b>Variance Decomposition of Personal Remittances (LnPR)</b>						
1	36.08	63.92	0	0	0	0
2	35.98	58.86	4.95	0.01	0.18	0.02
3	34.37	54.66	5.3	3.63	0.62	1.43
4	30.66	47.4	5.86	8.82	0.74	6.53
5	28.04	42.69	5.35	10.35	0.84	12.73
6	25.4	37.72	5.49	12.8	0.8	17.79
7	24.63	35.81	5.41	13.26	0.97	19.92
8	24.68	34.94	5.34	13.76	1.12	20.16
9	24.78	34.78	5.33	13.74	1.33	20.05
10	24.69	34.67	5.35	13.68	1.46	20.15

Source: Author estimation

#### 4.4. Stability of short run model

The study employs the CUSUM and CUSUM<sup>2</sup> (Cumulative Sum) tests to check the stability of the short-run model. The test uses the cumulative sum of recursive residuals to find out parameter stability. As shown in Fig 4, the cumulative sum of recursive residuals remained inside the 5 percent critical lines thus confirming the non-inexistence of structural instability in the equation.

**Figure 4: Cumulative sum of recursive residuals, plot of cumulative sum of recursive residuals. The straight lines represent critical bounds at 5% significance level”.**



## 5. Conclusion

Over decades, there is consensus that economic growth can improve other socioeconomic indicators of Thailand, especially for decreasing income inequality. The important drivers of income inequality have been recognized in the macroeconomic framework especially foreign financial inflows in Thailand. For this purpose, the current study investigated the nexus between income inequality, inward remittance, and foreign development aid along with structural and policy variables covering the period from 1990-2018. Due to the improvement in trade balances and massive emigration of Thailand, the dependency on foreign development aid has been reduced. The inward remittance inflows are unneglectable in the sense that these significantly improved the current account balances and living standards of the poor households.

The study employed regression analysis to examine the association between income inequalities, remittance inflow, and official development assistance. The augment dicky fuller (ADF), and Phillips–Perron (PP) tests were used to test the “series stationarity”. The results revealed the same order of integration, and all variables were found stationary at the first difference I (1). The study proposed by Johansen and Juselius to test a long-run relationship between income inequality and financial inflows. The empirical evidence revealed the existence of a long-run association between income inequality and explanatory variables. In the next section, we used OLS, FMOL, and DOLS to test robust empirical coefficients and the magnitude of independent variables. The empirical evidence suggests that income per capita, human development, and personal remittance have a negative and significant impact on income disparity in Thailand. We also found that foreign development aid has a negative but insignificant relationship to income inequality. The total labor force participation has a positive but insignificant impact on income inequality over time. The results are robust, and long-run coefficients derived from the OLS approach are consistent with FMOLS and DOLS. The study also found that Thailand's economy does not hold the Kuznets hypothesis in the post-1990 era. Meanwhile, in the short run, ECM for both models was found negative and highly significant. It showed that the short-run disequilibrium is corrected at 0.65% to 100% speed each year. Furthermore, the insignificant impact of foreign aid can be possible because it is not allocated for the development of capital deficiency but rather for the allocation of funds for unproductive activities in the economy. In addition, the trade surplus later in 1997, reduced the dependency on foreign aid, so that the aid inflows could not be added to the growth in the long run for employment generation and consequently did not reduce the income inequality. Apart from this, the existence of a negative and significant relationship between income inequality and personal remittance is due to a direct increase in income per head, and it also positively influenced foreign reserves to reduce the BOP crisis in import bills.

This study's particular contribution is to highlight the financial inflows that are important for income equality. The results imply that there is a need to reshape existing government policies as the reliance of the economy on foreign aid and debt should be diverted. So, reallocation is necessary to reduce income inequality in long run as well as in the short run.

## **5.1 Policy Implications**

A healthy environment of investment either foreign or domestic would help to improve balanced growth in the economy. Controlling corruption will increase the transparency that will work as a bright among investors and individuals to pay

taxes and avoid a trust deficit between public institutions and individual households. Expansion in the tax base, and reducing the indirect tax rate would help to improve the availability of financial resources. The ratio of income tax has been increased but the frequency of tax payment is constant over time, which creates more inconveniences in paying taxes. This needs to be more considered by a government agency (official tax collector).

For such amendments these policies are desired that will ensure and encourage the more stable sources of foreign financial aid, foreign investment as well as remittance for bringing stability and equability to economic opportunities. The choice of remittances and foreign aid to improve economic stability and equity would be better than “The trade but not Aid” argument for self-sufficiency and equitability. Thus, encouraging trade, and opening economic boundaries for foreign investment, encouraging migration with unskilled and semi-skill labor should be adopted as it will improve the economic opportunities for domestic residents.

## **5.2 Limitations of Study**

The study has a few limitations in that it uses macro indicators (aggregate variables), which do not show various micro-challenges faced by regions or groups of individuals in Thailand. Secondly, the study assumes a similar influence of remittance inflows on aggregate income redistribution; therefore, the findings and conclusion are also based on the same assumption. Third, data on foreign assistance aid is not available at the micro-level, so we only used an aggregate set of variable series. However, the study did not consider other socioeconomic factors, such as inequality in education, inequality in economic opportunities by gender, and so on.

## **5.3 Future Research Suggestions**

The study suggests some future research directions to be fulfilled over time. Reinvestigating the nexus between inequalities in income, financial access, education, and economic opportunities by gender should be investigated as these issues are growing and affecting productivity in the economy.

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