




Nexus Between Globalization, Income Inequality and Human Development in Indonesian Economy: Evidence from Application of Partial and Multiple Wavelet Coherence

Muhammad Haseeb¹ · Tulus Suryanto² · Nira Hariyatie Hartani³ · Kittisak Jermsittiparsert^{4,5} 

Accepted: 10 August 2019 / Published online: 29 August 2019
© Springer Nature B.V. 2019

Abstract

This paper aims at understanding the vigorous connection between globalization, income inequality and human development in Indonesian economy. This study employs Morlet's wavelet approach. Precisely, it applies several implements of methods including continuous wavelet power spectrum, wavelet coherence, partial and multiple wavelet coherence through a monthly data series during 1990–2016. The outcomes reveal that connections among variables progress over frequency and time domain. From the frequency domain point of view, the current study discovers noteworthy wavelet coherences and robust leads and lag linkages. From the time-domain sight, the results display robust but not consistent associations among the considered variables. From an economic point sight, the wavelet method displays that globalization enhances the income inequality in Indonesian economy. This study emphasizes the significance of having organized strategies by policymakers to cope up with 2–3 years of occurrence of huge inequality in income distribution in Indonesia. Also, the policymakers should keep a watch on co-movements between globalization, income inequality and human development index. The current study presents a unique finding on association and co-movement between globalization, income equality and human development index in Indonesian economy. These outcomes should be of interest to researchers, policymakers and economists.

Keywords Globalization · Income inequality · Human development · Multiple wavelet coherence · Indonesia

1 Introduction

The modern economic environment substantiates the role of globalization in enhancing creative corporate practices to attain sustainable human development. Globalization is described as the process of reducing the barriers in order to achieve liberalized flow of capital, finance, goods, services, commodities and labour across the globe (Lal 2000;

✉ Kittisak Jermsittiparsert
kittisak.jermsittiparsert@tdtu.edu.vn

Extended author information available on the last page of the article

Bhensdadia and Dana 2004; Bowles 2005; Jermstittiparsert et al. 2013). Globalization aims to accomplish uniform socio-economic and political system throughout the world's economies. In recent decades, socio-economic development of any economy is directly linked with globalization. It is commonly believed that the process of globalization was started with the advent of GATT 1948. Since then, such developing and under developing economies that embraced the process of globalization have achieved remarkable economic growth.

However, if governments rely solely on globalization, income gaps might increase in the society which can affect economy adversely. This can further hinder the objective of proficient human development. In this regard, Dunning (1993) establishes that numerous nations rely greatly on globalization especially through multinational corporations, (MNCs) for the supply of assets, skills, employment and foreign reserves, in order to stimulate business processes and labour inspiration for work. Yet, neither of these potential advantages ought to be underestimated. More imperatively, they ought to be compared at the constant intervals, with the costs incurred from the presence of foreign investments in the country (Chudnovsky and Lopez 1999).

Studies on globalization mostly use trade liberalization, and foreign direct investment (FDI) as measures of globalization to check its impact on the process of countries' development (Feenstra and Hanson 1997; Gaston and Nelson 2002; Mah 2003; Kai and Hamori 2009; Çelik and Basdas 2010; Sbaouelgi 2017; Dechprom and Jermstittiparsert 2018; Zhang 2018; Le and Nguyen 2019). Based on the findings of both empirical and theoretical studies, the Neo-classical-growth theory supports globalization; whereas, Solow-growth-model opposes the ground that globalization increases income inequality. Therefore, income inequality has become the basic concern in both developed and developing economies that is often linked with increasing globalization and ultimately affects the process of sustainable human development. Thus, the above mentioned concern ignites the debate in the literature for the researchers to reinvestigate the link between globalization, income inequality and human development.

The interconnection of globalization, income inequality and human development is crucial in articulating the strategies of sustainable development. Globalization may have a positive part in prompting financial expansion and higher fares, or producing business and externalities while reinforcing technological advancement; however, it may have a negative influence on host countries. This is the situation when globalization remains an enclave operation and misuses common assets with terrible ecological practices. It might also exploit their restrictive advantages by hurting domestic investments and widening the income gaps. Similarly, with the point of view of sustainable human development, Helleiner (2001) suggests that the most imperative influence of globalization is to bring improvement in human welfare and development. On the other hand, if the process of globalization encounters inefficiencies, it might encourage rent-seeking business bureaucracies leading to propagate poverty, corruption resulting in the disruption of the process of equal growth opportunities.

The current study makes a novel support to existing literature with reference to Indonesia in investigating the correlation between globalization, income inequality and human development of the country. Having extensive treasure of natural resources and rising financial growth, Indonesia has been acknowledged as one of the world's renowned twenty economies. It is because the in recent years, the country has given extra importance to strengthening the economy than to improving social conditions (Fatah et al. 2012; Hossain et al. 2018). In this context, attention may be drawn to a common belief that income gap arises as a result of globalization which is a major concern for governments (Wicaksono

et al. 2017; Mazur 2000; Taguchi and Li 2018). As a result, ever since its liberalization, Indonesian economy has recorded widening income gaps and decline in human development (Lindert and Williamson 2003; Onodugo Vincent and Nwoji Stanley 2013; Henry 2014; Marvasti et al. 2014; Sa'idu 2014; Jung 2015; Mustafa 2016; Zhu and Chen 2018). It has also witnessed sharp rise in its global economic activities though income inequality has persisted as a major factor hindering the country's prospect of long-term growth.

Hill (2008), while assessing the trends of globalization and inequality in Indonesia, elaborated how economies turn out to be progressively open to worldwide businesses. There exists the tendency for the domestic firms to gain power, especially in the presence of feeble government authorities that resulted into generating barriers to equal distribution of income. In other words, unbalanced local business power without government's interference is projected to put pressure on non-skilled labour class while skilled labours benefit from the domestic expansion and expansion in the income gaps. Indonesia, since the fall of Soeharto, is an example of such a situation (Hill 2008).

In addition, social development has also exhibited deteriorating trends due to socio-economic and political turmoil, which has led to ineffective policies to disrupt the prospect of human development (Betke 2001; AlAli 2016; Sheykhi 2016; Harvey 2018). Since the social development paradigm depends on people's well-being, but due to prevailing disparities in Indonesian regions, the human development has witnessed a decline below the international standards (Kusharjanto and Kim 2011). In this regard, Akita and Miyata (2018) have also reported that growing educational and occupational discrepancies in Indonesia, pose a severe threat of increasing poverty and increase in inequalities within urban and rural districts of the country up to 2–30%.

Hence, considering the complexity in the present socio-economic disparities in Indonesia, the present study seeks to identify the co-movement between globalization, inequality and human development of the country. The exclusivity of the present study is evident in its being a pioneer in examining the co-movement between globalization, human development and income inequality by applying the rigorous econometric techniques of wavelet coherence and partial & multiple wavelet coherence. The novelty of the current investigation also lies in anticipating how globalization–inequality–human development nexus interrelates across diverse frequencies and time, and whether such lead–lag correlation varies in terms of magnitude, frequencies and time scales. The innovative results obtained from such advanced methodology would be free from biases and strive for greater insights in the association by allowing us to analyse frequency components of globalization, income inequality and human development time series, without losing time information (Aloui and Hkiri 2014).

2 Literature Review

Previous studies have provided strong theoretical support along with empirically tested connotation to investigate the link between globalization, human development and income inequality. A majority of studies in this regard though have supported a negative association between globalization and income inequality leading to improved human development. However, a few studies have stated a positive connection (Borjas and Ramey 1994), but failed to find evidence of the association among the variables (Edwards 1997). This association also varies due to the economic condition of countries and provides inconsistent results for developed and emerging economies. In this regard, a strand of research

believes that a rise in globalization in emerging economies leads to enhancing income gap and affecting human development (Atif et al. 2012).

Such findings eventually lead to ambiguity in reaching a consensus regarding specific links between mentioned variables. In this regard, Neoclassical theory rightly explains that globalization enhances efficiency and encourages growth through upgraded technology transfer and resource distribution. It is revealed that globalization allows an increase in mobilization of deposits and increases the size of foreign investment and exports. Accordingly, exogenous growth theory suggests that globalization encourages technological development and thus brings positive impact on country's development. In similar context, endogenous growth theory also argues that inflow of foreign investment brings positive spill overs in human capital and gross domestic product (Borensztein et al. 1998; Kos-Stanišić 2007). In developing countries, this indication helps in economic advancement, rise in income and employment and a diminution in inequality, resulting in an improved system of human development.

Singh (2012) has linked the financial globalization with human development, stating that proponents of Orthodox theory are established due to the presence of high risk-sharing probabilities in the event of financial liberalization without any loss of human welfare. The higher level of risk-sharing capacities should enable rise in smoothing consumption and growth trends especially in emerging economies. However, witnessing the extensive indications of crises resulting from the era of globalization, the association tends to create conflicts and suggest that financial globalization hinders human development at the micro-economic level through corporate finance, income distribution and corporate governance.

Hekschler–Ohlin–Samuelson model establishes that developed countries export skill intensive product in which they have relative benefit, but the developing countries mainly export labour intensive product in which they have reasonable advantage. Thus, this enhances demand for lower skill labour and reduces inequality in developing countries. This enlarges the potential of human welfare by increasing domestic income and purchasing power with improved quality of life. However, many economists have conflicting views about neoclassical vision suggesting that globalization supports a change to more refined economic growth accompanied by a flow in outsourcing, transfer of technology and increase in FDI. It enhances the growth in the demand for high skilled labour (they are generally higher paid, more experience, trained, have more responsibility) and increase the income gap (Feenstra and Hanson 1996, 1997; Gaston and Nelson 2002; Wood 2002; Zhu and Trefler 2005; Dreher and Gaston 2008). The increased income gap affects economic performance and thus reduces human development (Stiglitz 2016; Wicaksono et al. 2017).

2.1 Empirical Studies

Singh (2012) studied the role of financial globalization in influencing human development of emerging economies and emphasized the connection between globalization and human development. This study establishes that financial globalization improves development and growth process but considering poverty as averse to human development, it concludes that financial globalization can play no role in improving human development. Similarly, Akhter (2004) studying the link between globalization and human development argues that economic freedom and corruption mediate the relationship of economic globalization with human development. The study utilized the structural cross section for the period of 1998 using a pool of seventy-five countries. The results of the study establish that economic globalization has significant positive relationship with human development among

the countries. The findings further reported that economic freedom positively mediates the association between economic globalization and human development. Furthermore, the level of corruption tends to negatively mediate the effect of globalization on human welfares.

Sabi (2007) also studied the role of globalization on human, gender development and income equality for a cross-section of 155 economies. The study utilized ten diverse dimensions of globalization to analyse their effect on the Life expectancy, Gini per capita, knowledge and living standard of people with countries. The outcomes of the study establish that globalization tends to show positive effect on high-income economies, whereas, the results failed to find any significant relationship between globalization and human/gender development and income equality in developing, low income and low middle income economies. In addition, Blau (1999) examined the effect of income on cognitive, social and emotional development of children. The author establishes that family income plays a vital role in influencing child's health and mental development. Distributing the type of income, the findings suggest that the effect of current income on cognitive, social and emotional development is low as compared to effect of permanent income, which tends to exert high effects on overall child development.

On the other hand, for a panel of developed, developing and miracle countries, Çelik and Basdas (2010) identified the impact of globalization on income distribution measured by GINI coefficient of the countries. The study utilized Panel regression and FMOLS (fully modified ordinary least square) estimation to analyse the data from the period of 1995 to 2007 in three different categories of economies which are developed, developing and miracle countries. The results of the study proposed that globalization tends to increase income gap in developed and developing countries, whereas in miracle countries it declines income inequality. Likewise, Zhong et al. (2007) also analysed the impact of globalization and change in income inequality in US economy. The results from panel data of US from the period of 1980 to 1990 show that globalization has increased income inequality in United States of America. For China, Wan (2007) investigate the relationship between globalization and income inequality at provincial level. The study utilizes Shapley value decomposition approach and found that globalization encourages income inequality in China.

Basu and Guariglia (2007) also investigate the association among human capital inequality, FDI and economic growth by using panel data of 119 developing countries for the period of 1970–1999. The results of the study prove that FDI has a positive and significant impact on human inequality and economic growth in developing economies. Likewise, Kai and Hamori (2009) empirically analyse the relationship between income inequalities, globalization and financial deepening by using panel data of 29 Sub-Saharan African countries for the period of 1980–2002.¹ The authors establish that globalization has positive significant impact on income inequality of Sub-Saharan African countries. Their results recommend that government needs to focus on additional considerations for the poor i.e. establishment of safety nets and accessible financial services to the poor.

Bjørnstad and Skjerpen (2006) have examined the linkages between globalization and income inequality in the Norwegian economy. The study utilized data from the period of 1972 to 1997 and found that foreign direct investment increases unemployment which in result increases income inequality and affect human development. Similarly, Atif et al. (2012) examined the causal effect of globalization on income inequality by using time

¹ Foreign direct investment and trade (export and import) to the GDP ratio is used as a proxy of globalization.

series data of 68 developing countries and found that an increase in income inequality is a cause of globalization in developing countries. Likewise, Samy and Daudelin (2013) also explored the association between globalization and inequality by incorporating economic growth using time series data for period of 1991–2000. Their results indicated that “Inverted-U” relationship is found in 1991 and a “Straight-U” relationship found in the year 2000 significantly.

Reporting the negative association between globalization and income inequality, Tsai (1995) concluded that FDI declines income inequality in China, India, Korea, Malaysia, Singapore, and Thailand. Similarly, Lee (2010) also explores the impact of globalization on income inequality of 11 Asian countries by using time series data of 1960–2003. The results from Panel regression and Granger causality show significant impact of globalization on income inequality. The outcomes of the study further explain that globalization helps more in reducing the income inequality so it can be concluded that globalization stands beneficial to falling income inequality in long run with Kuznets curve effect. Similarly, Francois and Nelson (2003) investigate the relationship between globalization and income inequality in case of the United States. Their results document that trade (as a proxy of globalization) helps to reduce wage inequality (as a proxy of inequality).

Likewise, Çelik and Basdas (2010) identify the impact of globalization with foreign direct investment (as a proxy of globalization) on income distribution. They employed panel regression and FMOLS (fully modified ordinary least square) over the period of 1995–2007 in China, India, Korea, Malaysia, Singapore, and Thailand. The results expose that globalization progresses in developing and developed nations to reduce income inequality. They recommend that social and economic infrastructure in these countries help to assist income distribution. Bergh and Nilsson (2011) identify the effect of globalization and trade liberalization on world income inequality by using time series data of around 80 countries from 1970 to 2005. The results of GMM technique confirm that social globalization is linked with world income inequality. Moreover, Edwards (2001) considers the association between trade as a proxy of globalization and income inequality over the period of 1970–1980. The results confirm the presence of insignificant relationship between globalization and income inequality. Similar findings are reported in the study of Schultz (1998).

Hence, based on the above literature, we can comprehend that the association among globalization, income inequality and human development is extremely vital for country’s social and economic development. However, despite the excessive emphasis on connection between globalization, income inequality and human development in the prevailing literature, the empirical investigations in Indonesian context is absent, thus failing to find any established association among these crucial variables. Among the few Indonesian studies, Hill (2008) investigated the relationship between globalization and income inequality of Indonesia between the period of 1975 and 2004. The results of the study conclude that there exists no significant influence of globalization in enhancing Indonesian inequality. On the other hand, Amiti and Davis (2012) also analyse the relationship between trade openness, which is often viewed as a fine measure of globalization, and wage system of the country. The results of the study find that liberalization in trade is significant to influence Indonesian wage systems. In particular, the findings establish that cuts in output tariffs enhance mean wages paid by exporters, but reduce the mean wage paid by non-exporters of the country.

Kis-Katos and Sparrow (2015) investigate the association of trade openness and poverty levels in 259 Indonesian regions. Utilizing the data from the period of 1993 to 2002, the authors report that increase in trade liberalization decline the poverty levels by enhancing the income of the deprived segment of the population. Linking human development

with labour's mobility, Tirtosudarmo (2009) find out that labour movement in Indonesia is often encouraged by the government as it enhances the chances of attaining cheap labours from rural to urban areas and help the notion of human development in terms of raising individual and social endeavours to expand human capacities. However, the authors also highlighted that increasing trend of Indonesian labour movement is often resulted into augmented conflicts among locals and migrant, thereby demands increased state intervention in terms of rigorous policies.

Similarly, analysing the link between trade openness, human development, foreign direct investments and economic growth during 1980–2005, Fatah, et al., (2012) found that that life expectancy, FDI, openness is significant to influence Indonesian economy. In other words, the study find out that increase in trade openness, FDI and human development enhances Indonesian economic growth. Similarly, linking globalization and tourism with economic and social enhancements, establish that increase in globalization and tourism can expand the levels of trade, food processing, hotel and restaurant, income levels and foreign investments of the Indonesian economy. The study concludes that tourism enhances positive effects of globalization and brings improvements in domestic production, employment levels, household incomes, that underlie the potential to generate additional demand for products in the local market and ultimately improve social and economic welfare of the country.

The overview of previous literature has presented mixed findings on the association between globalization, income inequality and human development, thereby increasing the ambiguity on specific impact of these variables. Moreover, there also does not exist any empirical investigation in Indonesia to study the severity of Indonesian income gaps, and its linkages with low human development and lack of co-movement analysis. Eventually, such an investigation to find out whether the co-movement between the globalization, income inequality and human development compliments or contrasts each other, thus study would add value to the existing literature by identifying the link among the globalization–income inequality and human development in time frequency domain.

3 Methodology

3.1 Data

The present study employs the annual observations of globalization index which is collected from KOF index and is represented by GLO. The income inequality data is collected from Lahoti et al. (2016) and denoted by INEQ; while, human development index is collected from United Nation Human Development Reports and symbolized by HDI for the time period 1990–2017.

The Globalization KOF index is a composite index reflecting the components of economic, social and political globalization. The Gini coefficients index reflects the wealth distribution indicating the gap in the income level of countries' individuals. Similarly, human development index comprises of measures of health, knowledge and living standards. It comprises of life expectancy index along with GNI index and educational aspects of adult literacy and school enrolments rates. The health domain shows that greater life expectancy is an indicator of enriched nutrition, medicinal attention with clean environment. Similarly, the educational and income aspects are associated with individual's capacity to enhance

their knowledge, living conditions and contribute emphatically to the social systems to improve their quality of life and purchasing power.

The annual data for this study was transformed into quarterly frequency using the quadratic match-sum method. This process also performs amendments for seasonal deviations as the data was also transformed from low to high frequency by dropping the point-to-point data deviation. This adopted methodology has been successful in capturing the required larger frequency of data without undermining the real essence of studied variables and is consistent with the earlier studies such as Sharif et al. (2019), Shahbaz et al. (2018), Sbia et al. (2014) and Cheng et al. (2012). Finally, the data has been converted into logarithmic difference series for obtaining the return series and ensure its stationarity.

3.2 The Wavelet Methodology

Regardless of established advantages, the examination of variables in the frequency domain is considerably insufficient in the economic empirical literature (Aloui and Hkiri 2014). The principal execution of the wavelet approach performed in the domain of macro-economic was initiated by Ramsey and Zhang (1996) by analyzing the co-movement of stock price indices with a few macroeconomic factors. In Pakistan, Afshan et al. (2018) analyzed the co-movement between stock prices and exchange rates for the period of 1997–2016 by utilizing wavelet analysis. Likewise, Ben-Salha et al. (2018) also performed wavelet-based investigation to analyze the co-movement between energy utilization in Unites States and reported that the utilization of energy sources exhibits significant interactive linkages with the U.S. output.

Many studies have found out that wavelet methodology is efficient in grabbing the true essence of co-movements by considering the relevance of frequency in identifying the extent and magnitude of the effect along with the essential time information (Shahbaz et al. 2015). Hence, it is believed that within the time-domain approach, there exists the tendency of seizing interesting effects that might otherwise exist at different frequencies. The wavelet method is introduced as an effective tool to capture such ambiguous link among the variables (Tiwari et al. 2015a). The detailed methodology of wavelet coherence, partial and multiple wavelet coherence has been adopted from the current studies (Ng and Chan 2012; Aloui et al. 2018; Hkiri et al. 2018; Wu and Wu 2019).

The resulting wavelet coherence squared has been derived from previous studies (Ng and Chan 2012; Wu and Wu 2019) that provide the wavelet power of time series x_1 understood by two independent time series x_2 and x_3 at a given frequency domain. The Monte Carlo methods are employed to estimate the significance level of MWC. The significance tests are derived from a huge set of surrogate data having same AR (1) coefficients as the input datasets. The Cone of Influence (COI) represented by lighter shade splitting the high-power region from the rest is the region of wavelet spectrum with important edge effects (Torrence and Compo 1998). The values outside the COI ascertain the significance level of each scale of Wavelet Coherence.

Finally, phase difference is extremely helpful in describing phase association among two distinct time series. A phase difference of zero demonstrates that the time arrangement moves together (practically equivalent to positive covariance) at the definite rate. In the case that $\varphi_{x,y} \in [0, \pi/2]$, at that point the two variables move in-phase, and the variable y driving x . Oppositely, in the case $\varphi_{x,y} \in [-\pi/2, 0]$ then x is leading. We have an out-phase connection (practically equivalent to negative covariance) if we have a phase difference of π or, $-\pi$ meaning $\varphi_{x,y} \in [-\pi/2, \pi] \cup [-\pi, \pi/2]$. In the case of $\varphi_{x,y} \in [\pi/2, \pi]$, at that point x is

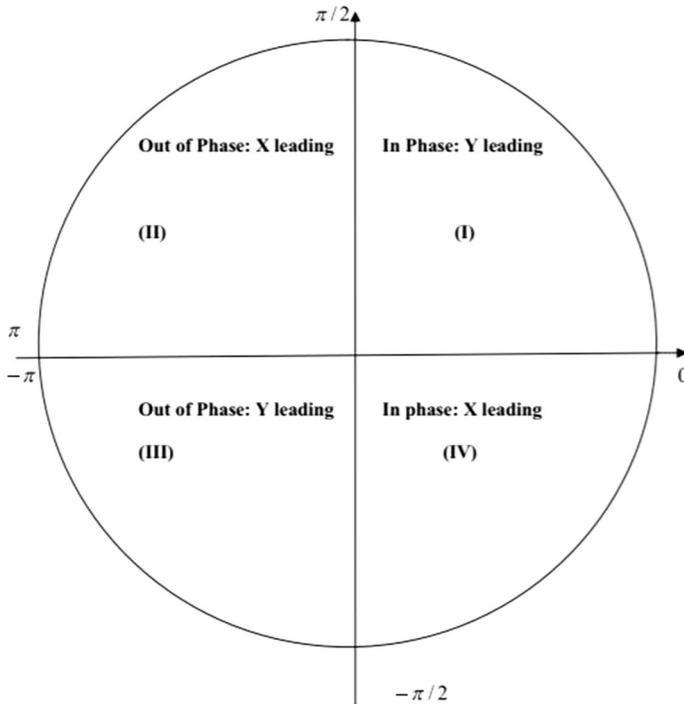


Fig. 1 Different conditions of two variables

Table 1 Results of descriptive statistics. Source: Authors Estimation

	Mean	Minimum	Maximum	SD	Jarque–Bera	Correlation
GLO	57.467	43.641	67.181	6.213	11.310***	–
HDI	0.619	0.527	0.692	0.052	11.039***	0.937***
INEQ	0.475	0.374	0.556	0.054	12.391***	0.952***

***Represents the values are significant at 1%

driving. The time series y is driving if $\varphi_{x,y} \in [-\pi, -\pi/2]$. Figure 1 shows the four different conditions of two variables supposing that if each quadrant lies in 45 degrees, the variable Y will always be leading.

4 Data Analysis

4.1 Descriptive Statistics

As acknowledged earlier, the main focus of this study is to examine the connection between globalization, income inequality and human development. Table 1 provides the results of descriptive statistics analysis of globalization, income inequality and human development

index. The average values for all the considered variables are positive. Globalization index has a mean value of (57.4677) which varies from 43.641 to 67.181. Human development index has an average value of (0.619) which fluctuates from 0.527 to 0.692 and finally, income inequality has a mean value of (0.475) which differs from 0.374 to 0.556. Furthermore, the outcomes of the Jarque–Bera test are significant at the 1% level, which shows that globalization, human development index and income inequality are not normally distributed in the case of Indonesia. Moreover, the coefficient of correlation is also positive and strong for the variables. The maximum correlation is found between globalization and income inequality the coefficient value of 0.952. The correlation between human development index and globalization is also positive and high with the coefficient value of 0.937. The p values of correlation coefficients are highly significant as those values are statistically significant at the 1% level.

Before applying statistical analysis, the series of considered variables have been converted into natural logarithms. The reason behind transforming natural series into logarithms is due to the assumption that results are more efficient in returns rather than actual value (Tiwari et al. 2015a, b).

4.2 Empirical Results and Interpretations

4.2.1 Results of Continuous Wavelet Transform (CWT)

In order to understand the results of CWT, first we need to understand the x-axis and y-axis which is presented in Fig. 2. The x-axis is explained in the time domain which starts from 1990 to 2017 whereas, the y-axis explains the frequency/period domain in quarters which explains (0–4 quarter period for short-run, 4–8 quarter period for medium run, 8–16 quarter period for long run and 16–32 quarter period for very long run).

The results of continuous wavelet transform for GLO, INEQ and HDI for Indonesia is shown in Fig. 1. As we can see that in case of GLO, we found a quite noticeable variance in short, medium, long and very long period. For short-run period, we also found a visible cluster in year 1991–1992, 1997–1998, 2001–2002 and 2013–2016. However, a clear variance can be seen during 1997–1999 and 2012–2014 in medium run period. Additionally, a significant variance is observed during 1993–2001 in the long run period. While, a small but clear variance is detected during 1999–2002 in the very long run period.

For the case of HDI in Indonesia, the results confirm that strong clusters are detected during 1996–1997, 2001–2002, 2007–2008 and 2012–2013 in short-run period. In the medium-run period, we found a large cluster during 1995–1997. Whereas, we found a huge cluster during 1994–2002 in the long-run period. On the other hand, for the case of INEQ, we found three comparable clusters in the short-run period during 1999–2000, 2002–2006 and 2013–2014. Moreover, in the medium and long run period, we found a large single cluster during the time period of 2002–2006. In the very long-run period, we again found a one noticeable cluster during the time period of 1997–2004.

In summarising the results of continuous wavelet transform of globalization, human development index and income inequality for Indonesia, we can see there is a similar pattern for GLO–HDI during 1997–2000 in short, medium and long run period. Also, there is a similar pattern observed for the case of GLO–INEQ during 2013–2014 for short-run period. Besides, we can also see a related pattern for the case of GLO–INEQ during 1999–2000 for very long-run period and for the case of HDI–INEQ during 1998–1998

Fig. 2 The continuous wavelet power spectrum of GLO, HDI and INEQ. *Note:* The continuous wavelet power spectrum shown is for GLO (top), HDI (top) and INEQ (bottom). The thick black contour indicates the 5% significance level against red noise and the cone of influence where edge effects might distort the picture are shown outside of the black line. The color code for power ranges from blue (low) to red (high). The Y-axis measures frequencies (period) and X-axis the time period. (Color figure online)

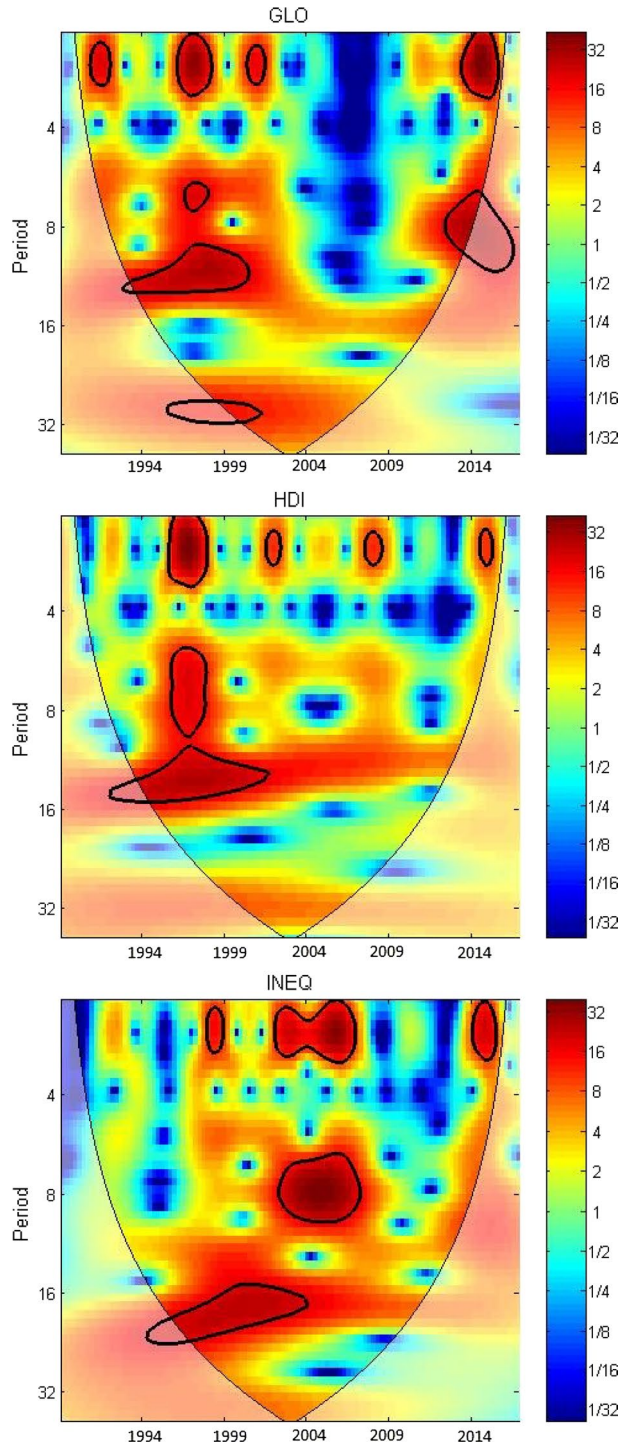
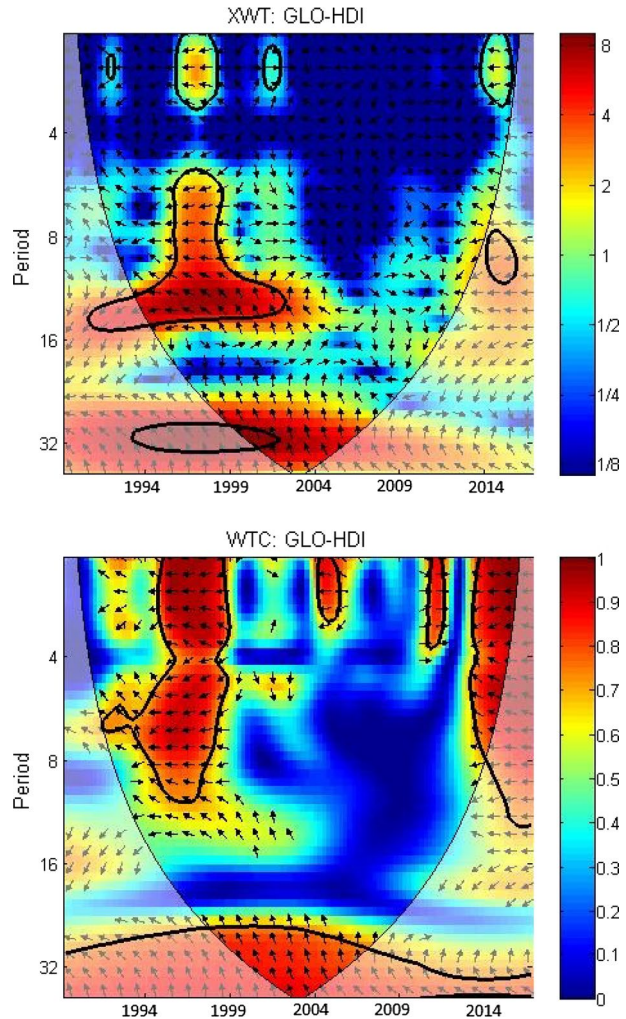


Fig. 3 The cross-wavelet and wavelet coherency of GLO–HDI. *Note:* The thick black contour indicates the 5% significance level against red noise and the cone of influence where edge effects might distort the picture are shown outside of the black line. The color code for power ranges from blue (low) to red (high). The Y-axis measures frequencies (period) and X-axis the time period. The phase difference between the two series is indicated by arrows. Arrows pointing to the right indicate that the variables are in phase. To the right and up, the GLO is leading. To the right down, GLO is leading again. To the left and up, GLO is leading again. To the left and down, GLO is lagging. In phase indicate that the variables have cyclic effect on each other; and out of phase or anti-phase shows that variables have anti-cyclic effect on each other. (Color figure online)

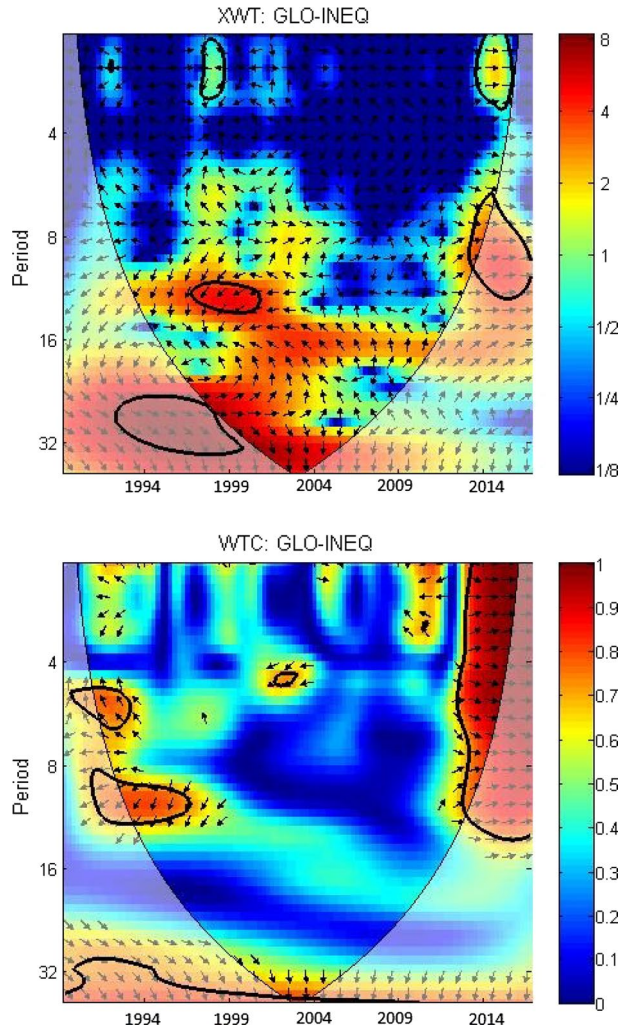


in short-run period. The results of CWT confirm that there are enough similar patterns observed between globalization, human development index and income inequality.

4.2.2 Results of Wavelet Coherence (WTC)

The outcomes of wavelet coherence are presented in Fig. 3. The WCT detects the sectors where the two-time series co-move in time and frequency domain. The outcomes of Fig. 3 offer the remarkable outcomes. The results of wavelet coherence for GLO–HDI shows that in the period of 0–4 months cycle during 1995–1998, the arrows are left side upward explaining that the GLO and HDI are out-phase and presentation anti-cyclic effect in which GLO leading (globalization has a negative causal effect of human development index). Additionally, during 2012–2014, the arrows are left side downward indicating that both variables are again out-phase and having anti-cyclic effect in which HDI leading (human development index has a negative causal influence over globalization in short-run period).

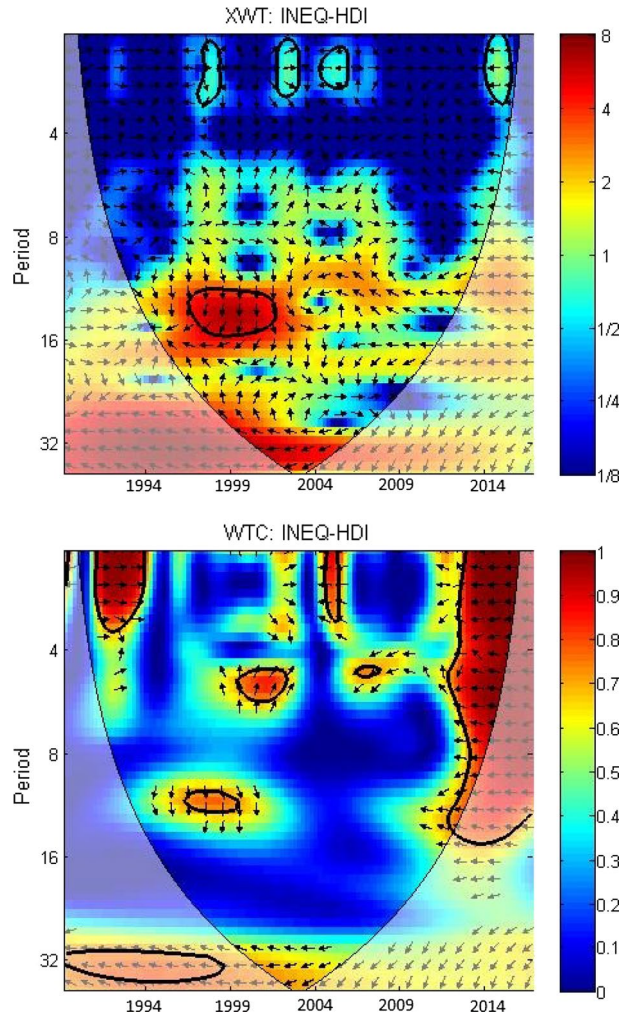
Fig. 4 The cross-wavelet and wavelet coherency of GLO–INEQ. *Note:* The thick black contour indicates the 5% significance level against red noise and the cone of influence where edge effects might distort the picture are shown outside of the black line. The color code for power ranges from blue (low) to red (high). The Y-axis measures frequencies (period) and X-axis the time period. The phase difference between the two series is indicated by arrows. Arrows pointing to the right indicate that the variable are in phase. To the right and up, the GLO is lagging. To the right down, GLO is leading. Arrows pointing to the left indicate that the variables are out of phase. To the left and up, GLO is leading again. To the left and down, GLO is lagging. In phase indicate that the variables have cyclic effect on each other; and out of phase or anti-phase shows that variables have anti-cyclic effect on each other. (Color figure online)



The same results are observed for medium-run time period. In the very long period, during 1997–2008, majority of the arrows are left side upward direction representing that both the variables are out-phase and having anti-cyclic effect in which GLO is leading (globalization has a negative causal influence over human development index in very long-run period for Indonesia). In summarizing, the results confirm that both variables are negative co-movement with each other which means globalization and human development index have a bi-directional causal relationship with each other in the short and medium run time period. The results also confirm a uni-directional causal relationship between globalization and human development index in very long-run period where causality is running from globalization to human development index.

The outcome of wavelet coherence between globalization and income inequality is shown in Fig. 4. The results of wavelet coherence for GLO–INEQ shows that in the 0–4-month cycle during 2012–2016, majority of the arrows are right side down explaining that the GLO and INEQ are in-phase and present a cyclic effect in which GLO leading

Fig. 5 The cross-wavelet and wavelet coherency of INEQ–HDI. *Note:* The thick black contour indicates the 5% significance level against red noise and the cone of influence where edge effects might distort the picture are shown outside of the black line. The color code for power ranges from blue (low) to red (high). The Y-axis measures frequencies (period) and X-axis the time period. The phase difference between the two series is indicated by arrows. Arrows pointing to the right indicate that the variable are in phase. To the right and up, INEQ is leading. To the right and down, INEQ is lagging. Arrows pointing to the left indicate that the variables are out of phase. To the left and up, INEQ is leading again. To the left and down, INEQ is lagging. In phase indicate that the variables have cyclic effect on each other; and out of phase or anti-phase shows that variables have anti-cyclic effect on each other. (Color figure online)



(globalization has a positive causal effect of income inequality). In 4–8- and 8–16-month period, initially two small cluster were seen during 1992–1997 where arrows were first left side upwards and then left side downwards indicating that GLO and INEQ are out-phase having anti-cyclic effect in which both are globalization is leading in medium-run period where as income inequality is leading in long-run period. On the other hand, from 4–8- and 8–16-months period, we also detect a large cluster during 2012–2016 where most of the arrows are right side downward direction which confirming that both variable showing cyclic effect in which globalization is leading (globalization has a positive causal influence on income equality). Generally, the results of wavelet coherence between GLO and INEQ confirm that both variables have a bi-directional causal relationship during the period of 1992–1997 but in recent year like 2012–2016, we found a unidirectional causal relationship between globalization and income inequality in which causality is running from globalization to income inequality in the case of Indonesia.

The outcome of wavelet coherence between income inequality and human development index is shown in Fig. 5. The results of wavelet coherence for INEQ–HDI shows that in the period of 0–4 months cycle during 1992–1994, 2005–2006 and 2012–2016, majority of the arrows are straight right or straight left explaining that the INEQ and HDI have no effect on each other (there is no causal relationship between income inequality and human development index in short-run period). In 4–8 months' period, we saw a small cluster during 1999–2001 where arrows are right side upwards indicating that INEQ and HDI are in-phase having cyclic effect in which HDI is leading in medium-run period (human development index has positive causal influence over income inequality). Similarly, during 2012–2016, we observed a cluster in which few arrows are left side upward indicating that both variables are out-phase having anti-cyclic effect in which INEQ is leading (income inequality having a negative causal influence over human development index in medium-run period). However, we found no causal influence between INEQ and HDI in long and very long-run period for the case of Indonesia.

In general, the result concludes that a negative relationship between income inequality and human development index in the medium run where the income inequality is leading to human development index.

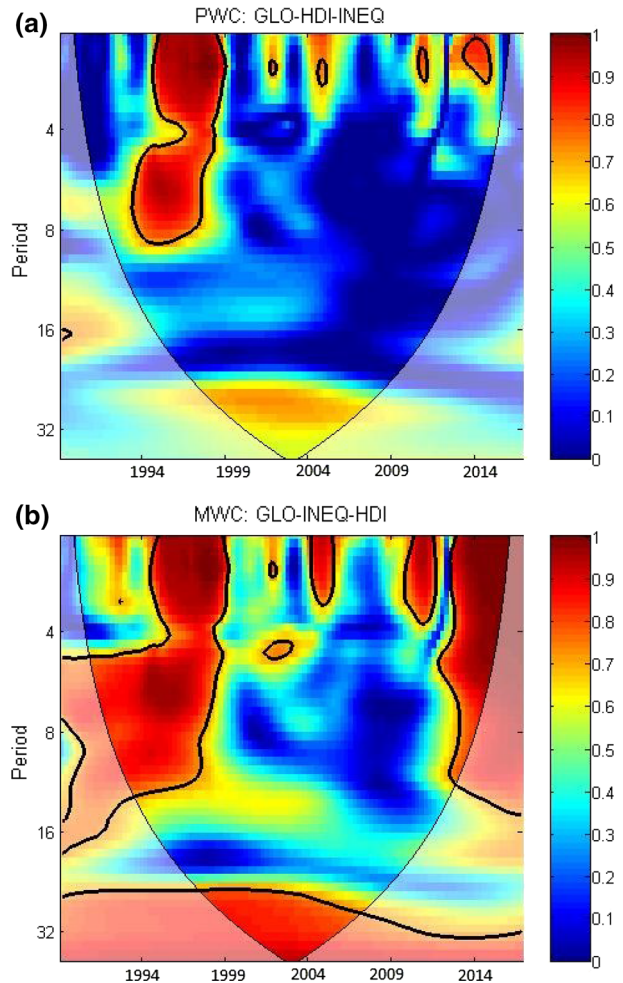
4.2.3 Results of Partial and Multiple Wavelet Coherence

In this sub-section, the results of partial and multiple wavelet coherence are presented (Fig. 6a, b. Figure 6a (PWC) presents the partial wavelet coherence result while Fig. 6b (MWC) explains the multiple wavelet coherence plots between globalization, income inequality and human development index in Indonesia. Figure 6a shows partial wavelet coherence among globalization and human development index after cancelling the income inequality. The correlation is found to be strong and three noticeable red colour significant islands are identified for 0–4 months cycle period (i.e. a short-run horizon) during the sub-period of 1995–2000, 2010–2011 and 2013–2015. But, when considering income inequality in the relationship between globalization and human development index (Fig. 6b), we observe a comparatively different condition.

A strong co-movement is noticed for 0–4 frequency bands during the period of 1996–1999, 2004–2005, 2010–2011 and from 2012 to 2016. The correlation during this period ranges from 0.80 to 1.00. In the medium and long run during the period 1992–1999 and from 2011 to 2015, we identified the presence of two islands for 4–8 and 8–16 months' cycle where the correlation value ranges from 0.90 to 1.00. Moreover, very long-run period (i.e. 16–32 months period) we observed a whole single red island during 1998–2008 where the coefficient of correlation varies from 0.80 to 0.90. Taken collectively, the partial wavelet coherence and multiple wavelet coherence specify a robust effect of income equality when examining the relationship between globalization, human development and income inequality in Indonesia.

Figure 7a shows the partial wavelet coherence among human development and income inequality after cancelling out the globalization index. The correlation finds to be strong and only three noticeable red colour significant islands are identified for 0–4 months' cycle period during the sub-period of 1992–1994, 1997–1999 and 2011–2015. But, when taking globalization index in the relationship between income inequality and human development index (Fig. 7b), we witness a relatively different situation. A very strong co-movement is detected for 0–4-month frequency bands during the period from 1992 to 1994, 1995 to 1999, 2001 to 2006 and from 2010 to 2016. The correlation value throughout this

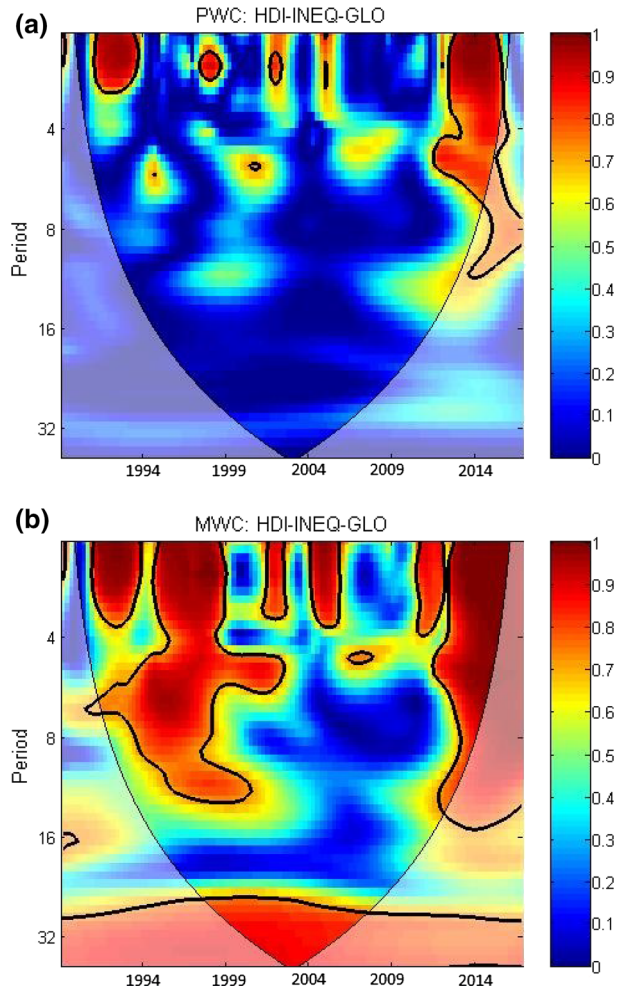
Fig. 6 Results of partial and multiple wavelet coherence between globalization, human development index and income inequality for Indonesia. *Note:* The PWC between the GLO and HDI. The partial wavelet coherencies computed for each pair by cancelling out INEQ. The COI is indicated by the oval black line which delimits the important power regions. Time and frequency (year) are represented on the horizontal and the vertical axis, respectively. The colours in the colours bar measure the degree of the correlation or co-movement between the variables. As indicated, the red colour refers to very strong coherence between the variables. (Color figure online)



period is seen fluctuating from 0.90 to 1.00. In the medium and long run during the period 1992–2002 and from 2012 to 2015, we recognized the existence of two islands for 4–8 and 8–16 months cycle where the correlation value ranges from 0.70 to 1.00. Furthermore, in very long-run period (i.e. 16–32 months period) we detected a whole single red island during 1998–2008 where the value of correlation differs from 0.80 to 0.90. Technically speaking, the partial wavelet coherence and multiple wavelet coherence identify a robust effect of globalization index when examining the relationship between human development index, income inequality and globalization in Indonesia.

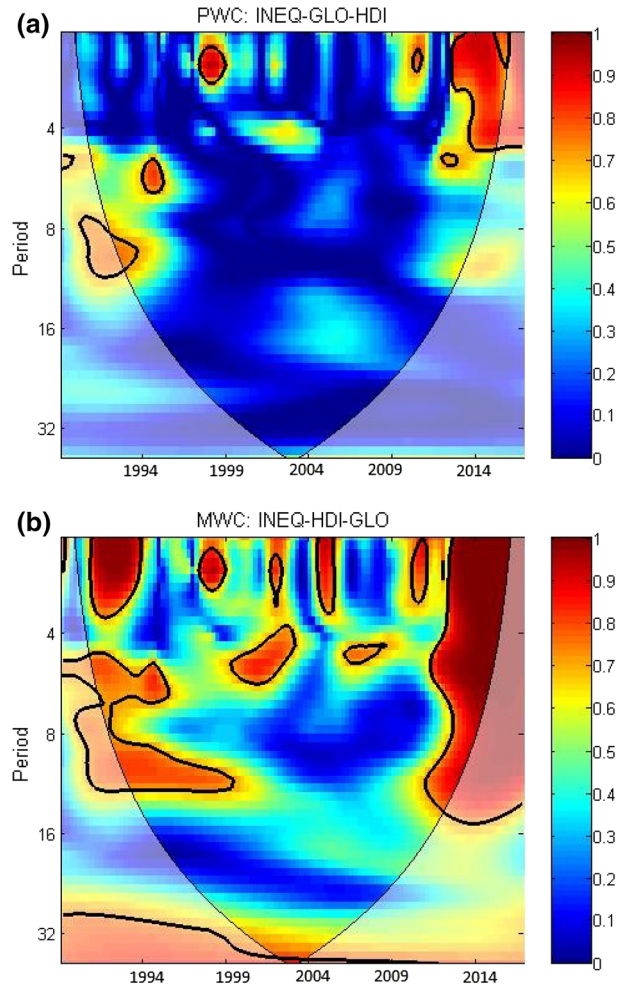
Figure 8a displays the partial wavelet coherence between income inequality and globalization index after cancelling out the human development. The correlation is found to be weak and only two significant islands are identified for 0–4 months cycle period during the sub-period of 1997–1998 and 2012–2015. Also, from 4 to 8 months cycle period we found two small cluster during 1994–1995 and 1996–1997. But, when human development index is brought in the relationship between income inequality and globalization (Fig. 8b), we observe a comparatively different position. A very strong co-movement is detected for 0–4-month

Fig. 7 Results of partial and multiple wavelet coherence between human development index, income inequality and globalization for Indonesia. *Note:* The PWC between the HDI and INEQ. The partial wavelet coherencies computed for each pair by cancelling out GLO. The COI is indicated by the oval black line which delimits the important power regions. Time and frequency (year) are represented on the horizontal and the vertical axis, respectively. The colours in the colours bar measure the degree of the correlation or co-movement between the variables. As indicated, the red colour refers to very strong coherence between the variables. (Color figure online)



frequency bands during the period from 1992 to 1994, 1998 to 1999, 2001 to 2004 and from 2011 to 2016. The correlation value throughout this period is seen fluctuating from 0.90 to 1.00. In the medium run (4–8 month period) during the period 1992–1995, 1999–2004 and from 2011 to 2015. Furthermore, in long-run period (i.e. 8–16 months period) we detected a whole single red island during 1992–2001 and from 2011 to 2015 where the value of correlation differs from 0.80 to 1.00. Technically speaking, the partial wavelet coherence and multiple wavelet coherence identify a robust effect of human development index when examining the relationship between income inequality, globalization and human development index in Indonesia.

Fig. 8 Results of partial and multiple wavelet coherence between income inequality, human development index and globalization for Indonesia. *Note:* The PWC between the INEQ and GLO. The partial wavelet coherencies computed for each pair by cancelling out HDI. The COI is indicated by the oval black line which delimits the important power regions. Time and frequency (year) are represented on the horizontal and the vertical axis, respectively. The colours in the colours bar measure the degree of the correlation or co-movement between the variables. As indicated, the red colour refers to very strong coherence between the variables. (Color figure online)



5 Conclusion and Policy Recommendations

In the current research, we utilized the continuous wavelet transform, wavelet coherence, the multivariate and partial wavelet coherence to investigate the co-movements over time and frequency domain for globalization, income inequality and human development. As discussed previously, the main characteristic of the wavelet approach in the spectral background for the current study was to investigate the co-movements between the globalization and economic variable over time and various frequency bands and explain the leading variables in the lead and lag interactions.

The foremost contribution of this study is to align with previous researches and emphasize upon the effectiveness of the wavelet approach to investigate relationships among globalization, income inequality and human development index time series for Indonesia. The study also aimed to explain in what way the interconnection among these considered variables are developing over time and through various frequencies. The outcome provides fresh insight of the time and frequency interconnection between the three variables (GLO,

INEQ and HDI) in Indonesia. They disclose that co-movements among these globalization and economic variable have changed and progressed over the frequency and time domains. From the frequency point of view, this study reveals noteworthy wavelet coherences and robust lead–lag relationships. From the time point of view, current study reveals robust but non-homogenous connections among GLO, INEQ and HDI. Moreover, the evidence on the phases explains that these co-movements are not the equal across time-scales and predominantly essential for the short, medium and long terms. This implies that the globalization has a significant relationship with income inequality and human development. Also, the results of wavelet coherence confirm that globalization enhance inequality of income distribution in a short and medium run in Indonesia. Thus, unlike Hill (2008), the current study presents the unique findings in establishing the significant positive association among globalization and income inequality in Indonesia.

This emphasizes the significance of taking organized strategies by the policymakers to deal with the traditional social hindrance in the form of huge inequality of income distribution in Indonesia. The presence of large income gaps is a major source of low human development and consequently results in societal fiasco. Given that less than 4% of Indonesia's population has attained tertiary education, the low level of human development is often accompanied by enhanced income inequality due to the presence of unskilled labour class (Amiti and Cameron 2012). In Indonesian context, the findings imply that the association of globalization with the social variables of human development and income inequality tends to create conflicts. The study also suggests that the presence of globalization hinders human development and enhances income gap at both micro and macro-economic levels by creating skills gap in corporate practices, amplifying income dissemination. This calls for the need of articulating un-biased policies focussed to create social reforms with exclusive focus on domestic policies, labour market institutions, welfare policies, etc. that have the potential to act as a countervailing force to market driven inequality and curtail the negative effect of globalization. Such measures will help to expand mechanical, operational and technical progress that can benefit businesses across the board. Furthermore, the emphasis of the government in rural development with improved infrastructure is obligatory to lessen the wealth gap as it tends to undermine the efforts of poverty alleviation and threatens social cohesion.

References


- Afshan, S., Sharif, A., Loganathan, N., & Jammazi, R. (2018). Time–frequency causality between stock prices and exchange rates: Further evidences from cointegration and wavelet analysis. *Physica A: Statistical Mechanics and Its Applications*, 495, 225–244.
- Akhter, S. H. (2004). Is globalization what it's cracked up to be? Economic freedom, corruption, and human development. *Journal of World Business*, 39(3), 283–295.
- Akita, T., & Miyata, S. (2018). Spatial inequalities in Indonesia, 1996–2010: A hierarchical decomposition analysis. *Social Indicators Research*, 138(3), 829–852.
- AlAli, M. S. (2016). Forecasting-based carry trade using pegged currency: A case of Omani rial. *The Economics and Finance Letters*, 3(2), 21–29.
- Aloui, C., & Hkiri, B. (2014). Co-movements of GCC emerging stock markets: New evidence from wavelet coherence analysis. *Economic Modelling*, 36, 421–431.
- Aloui, C., Hkiri, B., Hammoudeh, S., & Shahbaz, M. (2018). A multiple and partial wavelet analysis of the oil price, inflation, exchange rate, and economic growth nexus in Saudi Arabia. *Emerging Markets Finance and Trade*, 54(4), 935–956.
- Amiti, M., & Cameron, L. (2012). Trade liberalization and the wage skill premium: Evidence from Indonesia. *Journal of International Economics*, 87(2), 277–287.

- Amiti, M., & Davis, D. (2012). Firms, trade, and wages: theory and evidence. *Review of Economic Studies*, 79(1), 1–36.
- Atif, S. M., Srivastav, M., Sauybekova, M., & Arachchige, U. K. (2012). Globalization and income inequality: a panel data analysis of 68 countries. Retrieved from https://www.econstor.eu/bitstream/10419/65664/3/Atif_Globalization_Inequality.pdf.
- Basu, P., & Guariglia, A. (2007). Foreign direct investment, inequality, and growth. *Journal of Macroeconomics*, 29(4), 824–839.
- Ben-Salha, O., Hkiri, B., & Aloui, C. (2018). Sectoral energy consumption by source and output in the US: New evidence from wavelet-based approach. *Energy Economics*, 72, 75–96.
- Bergh, A., & Nilsson, T. (2011). Globalization and absolute poverty—A panel data study. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2363784.
- Betke, F. (2001). *The 'Family-in-Focus' approach: Developing policy-oriented monitoring and analysis of human development in Indonesia* (No. inwopa01/13).
- Bhensdadia, R. R., & Dana, L. P. (2004). Globalisation and rural poverty. *International Journal of Entrepreneurship and Innovation Management*, 4(5), 458–468.
- Bjørnstad, R., & Skjerpen, T. (2006). Trade and inequality in wages and unemployment. *Economic modelling*, 23(1), 20–44.
- Blau, D. M. (1999). The effect of income on child development. *Review of Economics and Statistics*, 81(2), 261–276.
- Borensztein, E., De Gregorio, J., & Lee, J. W. (1998). How does foreign direct investment affect economic growth? 1. *Journal of International Economics*, 45(1), 115–135.
- Borjas, G. J., & Ramey, V. A. (1994). Time-series evidence on the sources of trends in wage inequality. *The American Economic Review*, 84(2), 10–16.
- Bowles, P. (2005). Globalization and neoliberalism: A taxonomy and some implications for anti-globalization. *Canadian Journal of Development Studies*, 26(1), 67–87.
- Çelik, S., & Basdas, U. (2010). How does globalization affect income inequality? A panel data analysis. *International Advances in Economic Research*, 16(4), 358–370.
- Cheng, M., Chung, L., Tam, C. S., Yuen, R., Chan, S., & Yu, I. W. (2012). *Tracking the Hong Kong Economy*. Occasional Paper, 3, 2012.
- Chudnovsky, D., & Lopez, A. (1999). *Globalization and developing countries: Foreign direct investment and growth and sustainable human development*. UN. Retrieved from http://old.tci-network.org/media/asset_publics/resources/000/000/788/original/globalization-chudnovsky.pdf.
- Dechprom, S., & Jermisittiparsert, K. (2018). Foreign aid, foreign direct investment and social progress: A cross countries analysis. *Opcion*, 34(86), 2086–2097.
- Dreher, A., & Gaston, N. (2008). Has globalization increased inequality? *Review of International Economics*, 16(3), 516–536.
- Dunning, J. H. (1993). *Globalisation: The challenge for national economic regimes*. Dublin: Economic and Social Research Institute (ESRI).
- Edwards, S. (1997). Trade policy, growth, and income distribution. *The American Economic Review*, 87(2), 205–210.
- Edwards, L. (2001). Globalisation and the skills bias of occupational employment in South Africa. *South African Journal of Economics*, 69(1), 40–71.
- Fatah, F. A., Othman, N., & Abdullah, S. (2012). Economic growth, political freedom and human development: China, Indonesia and Malaysia. *International Journal of Business and Social Science*, 3(1), 291–299.
- Feenstra, R. C., & Hanson, G. H. (1996). *Globalization, outsourcing, and wage inequality* (No. w5424). Cambridge: National Bureau of Economic Research.
- Feenstra, R. C., & Hanson, G. H. (1997). Foreign direct investment and relative wages: Evidence from Mexico's maquiladoras. *Journal of International Economics*, 42(3–4), 371–393.
- Francois, J. F., & Nelson, D. R. (2003). *Globalization and relative wages: Some theory and evidence*. Nottingham: University of Nottingham.
- Gaston, N., & Nelson, D. (2002). Integration, foreign direct investment and labour markets: Microeconomic perspectives. *The Manchester School*, 70(3), 420–459.
- Harvey, H. (2018). Bilateral J-curve between Philippines and trading partners: Linear and non-linear approach. *Asian Economic and Financial Review*, 8(2), 131–144.
- Helleiner, G. K. (2001). Markets, politics and globalization: Can the global economy be civilized? *Journal of Human Development*, 2(1), 27–46.
- Henry, U. (2014). Globalization and environmental issues: A new framework for security analysis. *Humanities and Social Sciences Letters*, 2(4), 209–216.

- Hill, H. (2008). Globalization, inequality, and local-level dynamics: Indonesia and the Philippines. *Asian Economic Policy Review*, 3(1), 42–61.
- Hkiri, B., Hammoudeh, S., Aloui, C., & Shahbaz, M. (2018). The interconnections between US financial CDS spreads and control variables: New evidence using partial and multivariate wavelet coherences. *International Review of Economics & Finance*, 57, 237–257.
- Hossain, M. S., Kibria, M. G., & Islam, M. S. (2018). Does globalization affect the economic growth of Bangladesh?—An econometric analysis. *Asian Economic and Financial Review*, 8(12), 1384–1393.
- Jermstittiparsert, K., Sriyakul, T., & Rodoosong, S. (2013). Power(lessness) of the state in the globalization era: Empirical proposals on determination of domestic paddy price in Thailand. *Asian Social Science*, 9(17), 218–225.
- Jung, K. (2015). Inequality and unemployment management. *Asian Journal of Economics and Empirical Research*, 2(2), 62–73.
- Kai, H., & Hamori, S. (2009). Globalization, financial depth and inequality in Sub-Saharan Africa. *Economics Bulletin*, 29(3), 2025–2037.
- Kis-Katos, K., & Sparrow, R. (2015). Poverty, labor markets and trade liberalization in Indonesia. *Journal of Development Economics*, 117, 94–106.
- Kos-Stanišić, L. (2007). The process of globalization and ethnic minorities in Latin America. In Etničke manjine i sigurnost u procesima globalizacije.
- Kusharjanto, H., & Kim, D. (2011). Infrastructure and human development: the case of Java, Indonesia. *Journal of the Asia Pacific Economy*, 16(1), 111–124.
- Lahoti, R., Jayadev, A., & Reddy, S. (2016). The global consumption and income project (GCIP): An overview. *Journal of Globalization and Development*, 7(1), 61–108.
- Lal, D. (2000). The challenge of globalization: There is no third way. In I. Vásquez (Ed.), *Global fortune: The stumble and rise of world capitalism* (pp. 29–42). New York: Cato Institute.
- Le, Q. H., & Nguyen, H. N. (2019). The impact of income inequality on economic growth in Vietnam: An empirical analysis. *Asian Economic and Financial Review*, 9(5), 617–629.
- Lee, J. E. (2010). Inequality in the globalizing Asia. *Applied Economics*, 42(23), 2975–2984.
- Lindert, P. H., & Williamson, J. G. (2003). Does globalization make the world more unequal? In P. H. Lindert & J. G. Williamson (Eds.), *Globalization in historical perspective* (pp. 227–276). Chicago: University of Chicago Press.
- Mah, J. S. (2003). A note on globalization and income distribution—The case of Korea, 1975–1995. *Journal of Asian Economics*, 14(1), 157–164.
- Marvasti, M. B., Sadeghi, S. K., & Karbor, R. (2014). New evidence on the link between income inequality and misery index: A nonlinear time series analysis. *International Journal of Sustainable Development & World Policy*, 3(1), 25–30.
- Mazur, J. (2000). Labour's new internationalism. *Foreign Affairs*, 79, 79.
- Mustafa, S. A. (2016). The effective strategies in companies' performance using the partial least squares approach. *International Journal of Economics, Business and Management Studies*, 3(2), 94–101.
- Ng, E. K., & Chan, J. C. (2012). Geophysical applications of partial wavelet coherence and multiple wavelet coherence. *Journal of Atmospheric and Oceanic Technology*, 29(12), 1845–1853.
- Onodugo Vincent, A., & Nwoji Stanley, C. (2013). Widening the breadth of knowledge diffusion among Nigerian employees: The upsides of globalization. *International Journal of Management and Sustainability*, 2(6), 113–126.
- Ramsey, J. B., & Zhang, Z. (1996). The application of wave form dictionaries to stock market index data. In Y. A. Kravtsov & J. B. Kadtko (Eds.), *Predictability of complex dynamical systems* (pp. 189–205). Berlin: Springer.
- Sa'idu, B. M. (2014). Poverty, inequality and millennium development goals' expenditure: A probabilistic linkage. *International Journal of Management and Sustainability*, 3(11), 653–663.
- Sabi, M. (2007). Globalization and human development. In *International conference on globalization and its discontents*, Cortland, The Sage Colleges, USA.
- Samy, Y., & Daudelin, J. (2013). Globalization and inequality: Insights from municipal level data in Brazil. *Indian Growth and Development Review*, 6(1), 128–147.
- Sbaouelgi, J. (2017). Income inequality and economic growth: Application of quantile regression. *Asian Development Policy Review*, 6(1), 1–14.
- Sbia, R., Shahbaz, M., & Hamdi, H. (2014). A contribution of foreign direct investment, clean energy, trade openness, carbon emissions and economic growth to energy demand in UAE. *Economic Modelling*, 36, 191–197.
- Schultz, T. P. (1998). Inequality in the distribution of personal income in the world: changing and why. *Journal of Population Economics*, 11(3): 307–344.

- Shahbaz, M., Lahiani, A., Abosedra, S., & Hammoudeh, S. (2018). The role of globalization in energy consumption: A quantile cointegrating regression approach. *Energy Economics*, *71*, 161–170.
- Shahbaz, M., Tiwari, A. K., & Tahir, M. I. (2015). Analyzing time–frequency relationship between oil price and exchange rate in Pakistan through wavelets. *Journal of Applied Statistics*, *42*(4), 690–704.
- Sharif, A., Afshan, S., & Qureshi, M. A. (2019). Idolization and ramification between globalization and ecological footprint: Evidence from quantile-on-quantile approach. *Environmental Science and Pollution Research*. <https://doi.org/10.1007/s11356-019-04351-7>. (In Press).
- Sheykhi, M. T. (2016). Rural–urban balance as a measure of socio-economic development with special reference to Iran. *Journal of Social Economics Research*, *3*(1), 1–12.
- Singh, A. (2012). Financial globalization and human development. *Journal of Human Development and Capabilities*, *13*(1), 135–151.
- Stiglitz, J. (2016). Globalization and its new discontents. *Project Syndicate*, *5*(8), 2–3.
- Taguchi, H., & Li, J. (2018). Domestic value creation in the involvement in global value chains: The case of Chinese economy. *Asian Development Policy Review*, *6*(3), 155–168.
- Tirtosudarmo, R. (2009). *Mobility and human development in Indonesia*.
- Tiwari, A. K., Bhanja, N., Dar, A. B., & Islam, F. (2015a). Time–frequency relationship between share prices and exchange rates in India: Evidence from continuous wavelets. *Empirical Economics*, *48*(2), 699–714.
- Tiwari, A. K., Dar, A. B., Bhanja, N., Arouri, M., & Teulon, F. (2015b). Stock returns and inflation in Pakistan. *Economic Modelling*, *47*, 23–31.
- Torrence, C., & Compo, G. P. (1998). A practical guide to wavelet analysis. *Bulletin of the American Meteorological Society*, *79*(1), 61–78.
- Torrence, C., & Webster, P. J. (1999). Interdecadal changes in the ENSO–monsoon system. *Journal of Climate*, *12*(8), 2679–2690.
- Troster, V., Shahbaz, M., & Uddin, G. S. (2018). Renewable energy, oil prices, and economic activity: A Granger-causality in quantiles analysis. *Energy Economics*, *70*, 440–452.
- Tsai, P. (1995). Foreign direct investment and income inequality: Further evidence. *World Development*, *23*(3), 469–483.
- Wan, G. (2007). Understanding regional poverty and inequality trends in China: Methodological issues and empirical findings. *Review of Income and Wealth*, *53*(1), 25–34.
- Wicaksono, E., Amir, H., & Nugroho, A. (2017). *The sources of income inequality in Indonesia: A regression-based inequality decomposition* (No. 667). ADBI working paper series.
- Wood, A. (2002). Globalization and wage inequalities: A synthesis of three theories. *Weltwirtschaftliches Archiv*, *138*(1), 54–82.
- Wu, T. P., & Wu, H. C. (2019). A multiple and partial wavelet analysis of the economic policy uncertainty and tourism nexus in BRIC. *Current Issues in Tourism*. <https://doi.org/10.1080/13683500.2019.1566302>.
- Zhang, W. B. (2018). Inequality and education subsidies in general equilibrium growth model for a small open economy. *Asian Journal of Economic Modelling*, *6*(2), 172–190.
- Zhong, X., Nichols Clark, T., & Sassen, S. (2007). Globalization, producer services and income inequality across US metro areas. *International Review of Sociology—Revue Internationale de Sociologie*, *17*(3), 385–391.
- Zhu, C., & Chen, L. (2018). An analysis of the development of China's Commercial banks under the structural reform of the supply side. *Journal of Accounting, Business and Finance Research*, *4*(1), 1–8.
- Zhu, S. C., & Trefler, D. (2005). Trade and inequality in developing countries: A general equilibrium analysis. *Journal of International Economics*, *65*(1), 21–48.

Affiliations

Muhammad Haseeb¹ · Tulus Suryanto² · Nira Hariyatie Hartani³ ·
Kittisak Jermisittiparsert^{4,5} 

Muhammad Haseeb
muhammad.haseeb@taylors.edu.my

Tulus Suryanto
tulus@radenintan.ac.id

Nira Hariyatie Hartani
hariyatie@uum.edu.my

- ¹ Taylors Business School (TBS), Taylors University Lakeside Campus, 1 Jalan Taylors, Subang Jaya, Malaysia
- ² Faculty of Islamic Economics and Business, The State Islamic Institute of Raden Intan Lampung, Bandar Lampung, Indonesia
- ³ School of Postgraduate Studies, Management and Science University (MSU), 40100 Shah Alam, selangor, Malaysia
- ⁴ Department for Management of Science and Technology Development, Ton Duc Thang University, Ho Chi Minh City, Vietnam
- ⁵ Faculty of Social Sciences and Humanities, Ton Duc Thang University, Ho Chi Minh City, Vietnam