Impact of Globalization on Income Inequality in Selected Asian Countries

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Abstract

The primary objective of this study is to investigate the relationship between globalization and income inequality in selected Asian economies i.e. Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Singapore, South Korea and Thailand. The specific objectives of this study are to analyze the relationship between trade globalization, financial globalization and technological globalization on income inequality. For attaining these objectives this study used panel data for selected Asian countries from 1980 to 2014 for trade and technological globalization model and from 1990 to 2014 for financial globalization model. The study used pooled OLS and instrumental variable least square technique for estimation. Results show that trade and technological globalization in the selected Asian economies significantly contributes to reduce income inequality while financial globalization increase income inequality. Education has inverse impact on income inequality while foreign direct investment has positive relationship with income inequality. Therefore, the study suggest that government should promote education, invest in research and development activities, establish efficient financial system, reduce trade restrictions and provide subsidies that help to increase the volume of trade.

Keywords: Trade, Financial, Technological Globalization, Income Inequality, Panel Data, Asia

JEL: C23, F62, O53

1. Introduction

Globalization has made the globe more equal. As the communication around the world become cheaper and transportation gets faster, developing countries have a chance to reduce the gap with the rich countries. But story is opposite in many developing countries which experiences an extremely high level of income inequality (World Economic and Social Survey 2013). The relationship between globalization and income inequality is a subject of considerable controversy in economic literature. On one hand globalization is considered to promote economic growth and social welfare of the society, where developing countries have a chance to reduce the gap with the world economy, while on the other; globalization is blamed for increasing income inequality and environmental degradation. Globalization is considered to be a multidimensional phenomenon, which include different aspects of political, social, cultural and economic sphere but the major concern of economists and policy makers is economic globalization and its impact on the income of the people (Ogunyomi et al., 2007). Economic globalization is a process of rapid increase in the liberalization of international trade, investment, finance, and technological changes among countries (Torres, 2001). The impact of globalization is not evenly distributed among all segments of the society, especially the effect of globalization on employment and income. It is widely accepted that increase in globalization is associated with rising income inequality in the world. A combined income of 500 richest individuals in the world are greater than 2.5 billion poor people (Watkins et al., 2005). Therefore, understanding the nature of, and linkages between income inequality and globalization is crucial.

Globalization has been perceived by both anti-globalist commentators and pro-globalist commentators. The anti-globalist commentators (Stiglitz, 2003) argued that globalization has adverse effects on particularly poor economies due to the increase in within or between countries income inequality and there is a need for government intervention to control the adverse effect of globalization on income. While the pro-globalist commentators (Roud and Whalley, 2004; Bhagwati, 2004) argued that increase in income inequality due to globalization is a reasonable price to pay for the benefits of world integration and generally it leads to reduce poverty and creating employment. Therefore, there are challenges that whether globalization lead towards rising income inequality or dampening income inequality.

The world merchandise trade increased 7 percent per year on average attaining a peak of US$ 18 trillion in 2011 during the last 30 year. During this period, developing countries especially Asian economies have seemed to play an increasing role in world trade (World Trade Report 2013). In this globalized world, when exports benefit a bigger share of population in a country, it cause a reduction in country's income inequality otherwise increasing exports cause income inequality to rise. The impact of financial globalization is associated with higher economic growth. Financial globalization cause reduction in income inequality because of an increasing access of finance. But this depend upon the quality of institutions in the economies. When countries have poor quality of institutions, the advantages of financial integration are mostly accrued by rich, who have better access to the opportunities. In case of good institutions the benefits of financial integration are distributed among all segments of the society equally (Lee, 2014). Technological globalization also plays an important role in the development of the economies and effects the distribution of income, particularly for developing countries (Liu and Lawell, 2015).

There are relatively limited studies on the impact of globalization on income inequality in advanced and developing economies. The literature on globalization (as international trade) and income inequality is divided into two strands. The first strand advocates that due to the increase in trade globalization there is a rise in income inequality (Silva and Leichenko, 2004; Rudra, 2004; Felbermayr, 2005; Beckfield, 2006; Ali and Isse, 2007; Meschi and Vivarelli, 2007; Aradhyula et al., 2007; Lu and Cai, 2011; Bensidoun et al., 2011; Cassette et al., 2012; Demir et al., 2012; Rodriguez-Pose, 2012; Munir et al., 2013; Hepenstrick and Tarasov, 2015). The second group advocates that due to the increase in trade globalization there is a decline in income inequality (Chakrabarti, 2000; Silva, 2007; Babones and Zhang, 2008; Tian et al., 2008; Georgantopoulos and Tsamis, 2011). Existing literature take international trade as globalization and measure its impact on income inequality, while only few studies take other aspects of globalization combined with international trade. However, there exist limited work for financial globalization and technological globalization and their effect on income inequality. The present study aims at filling this gap by adding both financial and technological globalization combine with trade globalization and measure its impact on income inequality.

The objective of the study is to analyze the impact of globalization on income inequality in selected Asian economies. The study has following specific objectives: to analyze the relationship between trade globalization and income inequality, to analyze the relationship

between financial globalization and income inequality, to analyze the relationship between technological globalization and income inequality. This study will provide useful guidelines to the policy makers and government to make effective policies in relation to globalization and income inequality that lead towards economic growth and reducing income inequality. The existing literature focused mostly on the one aspect of globalization (i.e. international trade) but this study contributes to the existing literature by examining three different aspects of globalization (i.e. trade globalization, financial globalization and technological globalization) through which income inequality is affecting Asian economies.

The structure of the paper is as follow: Section 2 of this study provides literature on trade, financial and technological globalization and their relationship with income inequality. Model, methodology and data are discussed in section 3. The empirical results of trade, financial and technological globalization on income inequality are analyzed in section 4. Conclusions and policy recommendations are discussed in section 5.

2. Literature Review

Theoretically and empirically globalization play an important role in the development of the countries. There are several dimensions on the relationship between globalization and income inequality that has been investigated by researchers.

2.1. Literature on trade globalization and income inequality:

The literature on trade globalization and its relationship with income inequality is a matter of controversies among researcher. On one hand trade globalization increase income inequality while on the other it reduce income inequality. Therefore, the literature on trade globalization is further divided into two sub section. The first sub section discuss a positive impact of trade on income inequality whereas the other sub section discuss a negative literature on the relationship between trade and income inequality.

2.1.1. The positive impact of trade globalization on income inequality

Silva and Leichenko (2004) examined the impact of foreign trade on income inequality in different states of U.S. The study used Panel data from 1972 to 1994 by using OLS for estimation. The results of the study suggested that expensive imports and cheaper exports worsening the condition of income inequality in different states of United Nations. They

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concluded that the level of inequality across and within U.S. states increased during the time period from 1992 to 1994. Rudra (2004) investigated the relationship between government social expenditures, openness, and income distribution among more developed and less developed countries. Panel data consists of thirty-five less developed and eleven OECD economies from 1972 to 1996 were used by utilizing fixed effect and two stage least square estimation methods. Results showed that trade worsened inequality only in LDC and social spending reduce inequality only in OECD nations but spending on education also reduced inequality in LDC. Study concluded that social expenditure condition and trade for developed economies are much better than the less developed economies. Felbermayr (2005) revisited the association between economies openness and per capita income. Study used panel data and the time dimension comprised of five-year average. The first period used was 1960 to 1964 and the last period was 1995 to 1999 for 93 countries by utilizing system-GMM approach. Study found a positive trade-income relationship and found no evidence that trade reduces income inequality. Thus he concluded that poor and rich economies have different impact on free trade.

Beckfield (2006) investigated the relationship between national income inequality and regional integration. Unbalanced panel data for 12 European countries from 1973 to 1997 were used. Study employed generalized least squares, fixed and random effects methodologies. Results showed that in all the three estimation techniques economic integration positively related with gini coefficient. The study concluded that the increase in regional economic integration among European countries raise income inequality. Ali and Isse (2007) investigated the effect of foreign aid and trade openness on income distribution. Study used panel data for 150 countries from 1975 to 2000. The study used simultaneous equations system and utilized the methodology of three-stage least squares. Results indicated that there exist positive and significant association between international trade and GDP per worker while government spending and foreign direct investment negatively affect income. They concluded that trade and foreign aid are solid determinants of gdp per capita and international trade appears complementary to economic performance. Meschi and Vivarelli (2007) analyzed the association between international trade and within-country income inequality. Panel data from 1980 to 1999 for 65 developing countries were used by utilizing Least Square Dummy Variable Estimation technique. Study found that the trade openness with the industrialized economies worsen the distribution of income, whereas the same flow towards developing economies equalize the distribution of income.

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Aradhyula et al. (2007) analyzed the impact of openness of trade on per capita income, and income inequality. Study used balanced and unbalanced panel data for 60 developing and developed economies from 1985 to 1994 by using two-stage least square for estimation. Results found that trade increases income for balanced panel. For unbalance panel trade increases income inequality only in developing economies. Study concluded that although trade increases inequality but its magnitude is less in developed countries. Lu and Cai (2011) examined the relationship among trade openness, factor endowment and individual income distribution. Study used panel data of twenty four provinces of China from 1997 to 2005 by using random and fixed effect technique for estimation. They found that the distribution of income is equal in the land and capital intensive provinces while the distribution of income is less equal in human capital and labor-intensive provinces. They concluded that, overall trade openness contributes to increase income inequality in china. Bensidoun et al. (2011) reassessed the relationship between income distribution and international trade by taking each country specific trade pattern. The study utilized the sample of 41 countries for the years 1970, 1980 and 1990 by using fairly general model and different robustness test. The results of the study showed that changes in the nature of trade has a significant impact on income distribution and its magnitude depend upon the national income level of the country. The study concluded that international trade significantly contributes to increase income inequalities in developing economies.

Demir et al. (2012) examined the association between trade structure, sectoral employment and income inequality in the developing economies. Unbalanced panel data of fifty five developing countries from 1981 to 2005 were utilized by employing IV-GMM and two-stages least square (2SLS) for estimation. Results of the study showed that trade structure and employment are significantly positive suggesting that rise in the share of manufactures exports and industrial employment increase income inequality. The study concluded that different trade structure significantly increase income inequality. Cassette et al. (2012) distinguished short run and long run impact of international trade in goods and in services on income inequalities. The study used annual panel data set for 10 advanced countries over 26 years from 1980 to 2005 through the use of panel cointegration, error correction mechanism and dynamic ordinary least square estimation. The results of the study found that trade of services has only short run impact while trade of goods have both short and long run effect on income inequalities. The study concluded that overall international trade cause an increase in income inequality. Rodriguez-Pose (2012)

investigated the association between trade openness and within country inequality. The study used unbalanced panel data for 28 countries from 1975 to 2005 by utilizing the methodology of both static (OLS) and dynamic (GMM) panel data analysis. Results found that rise in international openness has a positive impact on regional inequalities. However the study concluded that in middle and low income economies, changes in trade agreement have more effect on income inequality than the high income countries.

Munir et al. (2013) investigated the association between trade openness and income inequality for Pakistan. They used Cointegration Approach and vector error correction mechanism for the period 1972 to 2008. Results found that trade, remittances, interest rate and urbanization increases inequalities while FDI reduced it. They concluded that after liberalization, income inequality rise in the economy of Pakistan. Hepenstrick and Tarasov (2015) investigated how variations in trade openness contribute to cross-country income differences. The study calibrated the model for the year 2003 for 86 countries by using OLS and the Poisson pseudo maximum likelihood (PPML) for estimation. The study found that if the countries are full symmetric there would be no inequality due to trade openness. But for the counterfactual world where the countries are differ in endowment, population size and variable trade cost then income inequality would increase due to trade.

2.1.2 The negative effect of trade globalization on income inequality

Chakrabarti (2000) explored the impact of intra-national distribution of income and international trade. Study used data of low-income, lower middle-income, higher middle-income and high-income countries with the total of 73 countries for the year 1985. Study employed OLS and IV for estimation. The finding of the study showed that income inequality reduces by greater participation in international trade and growth which offers a channel through which international trade reduce the distribution of income inequality. Silva (2007) examined the impact of export and domestically oriented agricultural trade on income inequality across the developed southern region and the less developed northern regions of Mozambique. The study used cross sectional data from 1996 to 2000 by utilizing ordinary least square. The results of the study found that the domestic oriented agricultural trade has inequality increasing effect in southern Mozambique. Whereas the international orientated crops export has inequality dampening effect in northern Mozambique. Thus the study concluded that income inequality

varies by region and type of trade. Babones and Zhang (2008) analyzed the association between inequality and trade by dividing countries of world into three income categories i.e., Core, Semi-periphery and Periphery. The study used world-systems approach and estimated cross-sectional models at five year intervals: 1980, 1985, 1990, 1995, and 2000. The results for semi peripheral countries showed that trade are related with lower income inequality, while in core and peripheral countries trade are related with higher income inequality. Thus the study concludes that trade affects income inequality according to zone specific ways.

Tian et al. (2008) investigated the impact of economic globalization as FDI and international trade on income inequality in China. Study used annual data from 1979 to 2006 by employing ADF unit-root test and Johansen and Juselius multivariate cointegration approach. Results showed that trade, FDI, and government spending all have a tendency to improve the condition of income distribution. They concluded that income inequality in China are not due to the liberalization of trade, they are caused by other factors. Georgantopoulos and Tsamis (2011) examined the impact of globalization on income distribution in Hungary. Study utilized data from 1990 to 2009 by employing ordinary least square. The results of the study found that the distribution of income improve by increasing trade and foreign capital penetration, while remittance has positive effect. The study concluded that findings follow conventional wisdom that opening up the countries for international trade tends to reduce income inequality and globalization process is beneficial for Hungary.

2.2. The impact of trade and financial globalization on income inequality

Spilimbergo et al. (1997) investigated the association between trade, factor endowments and the distribution of income. Study used panel data for 34 countries from 1965 to 1992. The methodology of Huber correction is used to calculate residuals for fixed effect model and then performed different robustness tests. Results indicated that trade, land and education positively affect income while the impact of financial depth were insignificant. Study concluded that in capital abundant countries trade openness causes reduction in income inequality while in skill abundant countries trade increase income inequality. Heshmati (2003) investigated the association between income inequality and globalization with the help of two indices for globalization. Panel data for 62 countries from 1995 to 2001 were utilized. Ordinary least square technique were used for estimation. Results found that different components of globalization

have different effect on inequality. Technology contributes to reduce income inequality, economic liberalization increase inequality while political engagement have no effect on income inequality. Study concluded that developed countries have more equal distribution of income than the developing economies. Reuveny and Li (2003) investigated the effects of democracy and openness on the distribution of income. Study used pooled data for sixty-nine countries from 1960 to 1996 by using OLS, fixed and random effect techniques for estimation. The study showed that democracy and trade openness reduce income inequality within countries while FDI rise income inequality. Financial capital have no effect on the level of income distribution. Thus the study concluded that due to economic integration income inequality decrease.

Milanovic (2005) investigate the association between openness and income distribution for poor, rich and middle-income economies. The study used cross sectional data for ninety-five countries for the year 1988 and 113 countries for the year 1993 by utilizing simultaneous decile and IV-GMM for estimation. The results of the study found that trade increase inequality while financial depth decrease it. FDI had no effect and democracy improved income inequality. The study thus concluded that the benefits of international trade were mostly acquired by rich and the share of income for poor are lesser in economies that are more integrated. Shahbaz et al. (2007) investigated the association between trade-openness, financial deepening and rural-urban income inequality. They used time series data from 1971 to 2006 for Pakistan by using modified ARDL cointegration along with Johansson technique and ECM. Results of the study found that improvement in financial performance reduce rural-urban income inequality, Openness in foreign capital and trade rise rural-urban inequality and inflation is also linked with high level of rural-urban income gap. Thus the study concluded that financial development improve inequality while trade openness worsened it.

Ogunyomi et al. (2013) examined the impact of economic globalization and growth on income inequality in Nigeria. They used annual time series data from the time period 1986 to 2010. The study employed static linear model and structural simultaneous equation model. The result showed that trade has negative impact on income inequality while financial globalization had significantly positive effect. Thus it was concluded that due to much emphasis on financial globalization, economic globalization tend to increase income inequality and reduce economic growth in the Nigerian economy. Lee (2014) examined the impact of international and financial integration on poverty and income inequality. Study used data from 1976 to 2004 for income

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inequality model and from 1990 to 2004 for poverty model. The study used ordinary least square as methodology. The results of the study showed that there is a conditional association between international trade, income inequality and poverty while financial integration increases poverty and income inequality in general.

2.3. The impact of trade, technology and financial globalization on income inequality

Jaumotte et al. (2008) examined the relationship between trade, technology and financial globalization on income inequality. The study used data of 51 economies, out of which 20 are advanced and 31 are developing and emerging economies and the time period was taken from 1981 to 2003. The study used ordinary least squares with heteroskedasticity-consistent standard errors and instrumental variable least square for estimation. The results found that increased trade tends to reduce income inequality, technological and financial globalization tends to exacerbate it. Thus the study concluded that different modes of globalization have different impact on income inequality. Antonelli and Gehringer (2013) examined the hypothesis that technological changes is a major factor in the reduction of income inequalities. Study utilized the data set of advanced and newly industrialized countries for the time period of 1995 to 2011 by using feasible generalized least square and instrumental variable least square for estimation. Results indicates that technology, trade, GDP per capita, investment and government expenditure contributes to reduce inequality while financial integration increase it. Thus the study confirm the hypothesis of inequality reducing effect of technological changes. Liu and Lawell (2015) examined the impact of innovation measured by technological changes on income inequality in China. Panel data on Chinese provinces over the period 1995 to 2011 were used by employing instrumental variable least square for estimation. Results indicated that there is an inverse U-shaped relationship between innovation and the ratio between urban and rural income. Both industrialization and urbanization contributes to increase income inequality. Study concluded that small amounts of innovation decrease income inequality and large amounts of innovation increase income inequality.

The issue of globalization and its relationship with income inequality has gained much importance in the past few years in both developed and developing countries. Policy makers also remained interested in analyzing the relationship between them. A wide-ranging literature has discussed the impact of globalization as international trade on income inequality in both

developed and developing countries. Few studies also discussed the relationship between financial globalization and income inequality. But there are comparatively limited studies on the impact of technological globalization on income inequality especially for Asian developing countries.

3. Model, Methodology and Data

3.1 Model

In the 19th and early 20th century economists have started to put interest in establishing the link between globalization and income inequality (Lindert and Williamson, 2001). The main theoretical model that explains the relationship between north south trades is the well-known Ricardian framework (1817), but the issue of inequality is missing in the Ricardian framework. The effect of international trade on income inequality is explained by the Heckscher-Ohlin-Samuelson (HOS) framework. Until the 1990s, the main theoretical model to examine the relationship between international trade and income inequality was Hecksher-Ohlin (HO) and Stopler-Samuelson theorem (Milanovic, 2005; and Jaumotte at al., 2008).

In HO model, there are two nations, the North (more developed) and the South (less developed) and two factors of production. The Hecksher-Ohlin model predicts that the countries will exports that goods whose production requires the use of their abundant and cheap factors in the production process and import those goods whose production requires the use of their relatively scarce and expensive factor. According to this, developing countries are expecting to import skilled labor-intensive products and export unskilled labor –intensive products. However, the Stolper- Samuelson theorem (1941), states that the increase in the relative price of a product that is intensively used in the production process will increase the return of that factor, and decrease the return of the other factor. Thus as a result, according to the HOS model, due to the increase in trade openness (which has been rise since the 1980s), unskilled labors in the developing countries are expected to benefit and skilled labor in developed countries are expected to benefit from this openness. In this respect, increasing international trade is expected to increase the income of unskilled labor in developing countries and skilled labor in developed countries, leading to a decline in income inequality in developing countries and rise in income inequality in developed countries.

Empirical studies however have cast doubts on the predictions made by the HOS model, and pointing the existence of evidence that stand against the Stolper-Samuelson theorem (Spilimbergo et al., 1997; Barro, 2000; and Bensidoun et al., 2011). This suggests that there is no clear link between trade and income inequality. According to Barro (2000) rich people in developing countries may benefit more from trade openness than the poor people because they have better advantages of having access to the advance technologies.

Many economists have started to incorporate additional conditions into the standard HOS model to clarify the effect of trade openness on income inequality. Meschi and Vivarelli (2009) relax the assumption of homogenous technology between the countries in the HOS model. They argue that due to the expansion of international trade between countries new technologies may transfer from developed countries to developing countries, which use relatively skill intensive production technique. Demir et al. (2012) argue that in the case of multiple factors of production there is no direct link between HOS model and income inequality. Because HOS model based on the assumption of only two factors of production, in the presence of more than two factors of production, the HOS model would not make any clear cut prediction about the impact of trade openness on income inequality. Xu (2003) modified the HOS model by adding two middle-skills goods in the South, importable and exportable. As international trade is started in South, the two middle-skill goods become traded with the other country, which ensure both the import expansion (inequality-reducing effect) and export expansion (inequality-enhancing effect). Thus the study argue that export expansion effects dominate the import expansion effects that leads to an increase in wage inequality in the South.

Contradiction in the literature arise a question that whether the relationship between inequality and trade globalization be understand better within a Kuznets type framework. According to Kuznets (1955), income inequality rises until a certain income level is reached, after which inequality begins to fall. In other words, trade liberalization probably increases average per capita income but it may cause a much more uneven allocation of gains and losses when distributed among different segments of the society. Dobson and Ranlogan (2009) investigated the openness Kuznets curve for eighteen Latin American economies over the period 1982 to 2000 by utilizing instrumental variable and fixed effect methodology. The result of the study find the presence of openness Kuznets curve and support the Kuznets hypothesis for the link between international trade and income inequality.

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According to Randolph and Lot (1993), income inequality is hypothesized to be a function of linear and quadratic income terms measured in arithmetic form as:

$$INEQ = \alpha_0 + \alpha_1 lnY + \alpha_2 lnY^2 + \mu \qquad (1)$$

Where, $INEQ$ is income inequality, Y is income measured by GDP per capita, Y^2 is square of GDP per capita, and μ is disturbance term.

Barro (2000) include globalization variables into the above equation to check the effect of openness on income inequality as:

$$INEQ = \alpha_0 + \alpha_1 lnY + \alpha_2 lnY^2 + \alpha_3 openness + \mu \qquad (2)$$

The additional variable openness is measure by adding import and export as a percentage of GDP.

3.2. Methodology

3.2.1. Econometric Model

The study has three econometric models which are based on the impact of globalization on income inequality. All three models use income inequality as dependent variable. And a number of explanatory variables are introduced according to the model. The first model is developed to measure the relationship between trade globalization and income inequality. The second econometric model is constructed to assess the relationship between financial globalization and income inequality while the third model aimed to investigate the effect of technological globalization on income inequality. The study used pooled OLS and IVLS estimation techniques as methodology.

3.2.1.1. Model for Trade Globalization

The basic estimation equation for trade globalization follows the model of Randolph and Lot (1993) and Barro (2000). The study follows Reuveny and Li (2003), Dobson and Ranlogan (2009) and Munir et al. (2013) for incorporating additional explanatory variables i.e. FDI, education and urban population. Thus, the econometric model for trade globalization is as follows:

$$G_{it} = \alpha_0 + \alpha_1 lnY_{it} + \alpha_2 lnY_{it}^2 + \alpha_3 TO_{it} + \alpha_4 X_{it} + u_{it} \qquad (3)$$

Where, G_{it} is gini index use to measure income inequality, Y_{it} is income measure through GDP per capita, Y_{it}^2 is the square of GDP per capita, TO_{it} is trade openness, and μ_{it} is the error term. X_{it} is a vector of control variables which includes foreign direct investment as a percentage of GDP, education measured through enrollment in primary education and urban population as a percentage of total population.

3.2.1.2. Model for Financial Globalization

Financial globalization is the interconnection of the world's financial institution e.g. banking sector, stock markets etc. Over the past two decades international financial integration has also increased. Developed countries consider to be more financially integrated with the world, but now developing countries have also increased their cross-border asset. It is frequently claimed that the liberalization of global financial markets contributes to rising income inequality. The study follows Jaumotte at el. (2008), Ogunyomi et al. (2013) and Lee (2014) for measuring the effect of financial globalization on income inequality. Therefore, the econometric model for financial globalization is as follows:

$$G_{it} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnY_{it}^2 + \beta_3 FG_{it} + \beta_4 X_{it} + u_{it} \tag{4}$$

Where, G_{it} is gini index use to measure income inequality, Y_{it} is income measure through GDP per capita, Y_{it}^2 is the square of GDP per capita, FG_{it} is financial globalization, and μ_{it} is error term. X_{it} is a vector of control variables which includes foreign direct investment as a percentage of GDP, education measured through enrollment in primary education and urban population as a percentage of total population.

3.2.1.3. Model for Technological Globalization

Technological change effects income inequality through its influence on different factors of production. If technological change increases the demand for skilled worker, than there observe a rise in income inequality, but if technological change increases the demand for unskilled labor this cause a reduction in income inequality. However through knowledge spill over, unskilled labor learn from skilled labor, cause a reduction in income inequality. The estimation equation for technological globalization follows the model of Randolph and Lot (1993). The study follows Jaumotte at el. (2008), Antonelli and Gehringer (2013) for incorporating technological globalization. Thus, the econometric model for technological globalization is as follows:

$$G_{it} = \gamma_0 + \gamma_1 Y_{it} + \gamma_2 Y_{it}^2 + \gamma_3 TG_{it} + \gamma_4 X_{it} + \mu_{it} \tag{5}$$

Where, G_{it} is gini index use to measure income inequality, Y_{it} is income measure through GDP per capita, Y_{it}^2 is the square of GDP per capita, TG_{it} is technological globalization, and μ_{it} is the error term. X_{it} is a vector of control variables which includes foreign direct investment as a percentage of GDP, education measured through enrollment in primary education and urban population as a percentage of total population.

3.2.2. Panel Data Framework

The study used panel data framework for utilizing the effect of globalization on income inequality. Panel data has many advantages over pure time series and pure cross section data due to its control for individual heterogeneity. Panel data provide large number of data points, large degrees of freedom and reduce the problem of collinearity between independent variables, and therefore improve the effectiveness of econometric estimates. The use of panel data provides a means of reducing the magnitude of major econometric problems that often arises in empirical studies, namely, the often heard assertion of omitted variables that correlate with explanatory variables (Hsiao 2014). Panel data can better detect and measured effects that simply cannot be observed in pure cross section and time series data and study the more complicated behavioral models (Gujarati 2005). Due to these advantages the study used panel data.

The study adopted most suitable estimation technique for panel data analysis. There are several possible ways for the estimation of panel data. The first method of estimation is pooled least square which is used in this study because in panel framework one may assume that individual's observations over time are collected from different individuals so there is no serial correlation and error terms are not heteroskedastic. The second estimation technique is fixed effect least square dummy variable in which all variables are pooled together but each cross section has its own intercept term. As the data of the study has the problem of omitted variable biased and endogeneity therefore the use of fixed effect least square is not appropriates. Furthermore, fixed effects estimator may lead a biased results due to measurement error and endogenous changes in explanatory variables. The third estimation technique that can be used with panel data is random effect model. This technique is not appropriate for the study because number of cross sections are less than the number of time series. As a result, neither random effects nor fixed effects

estimation technique is appropriate, a more sophisticated and one of the more advanced method like instrumental variable least square (IVLS) estimation technique is applied.

3.2.3. Instrumental Variable Least Square (IVLS)

The concept of instrumental variables was first introduced by Philip G. Wright (1928). Instrumental variable estimation technique is used when correlation between explanatory variables and error term is suspected. It is typically used to resolve the following problems encountered in POLS i.e. omitted variable biased, measurement error, and endogeneity. In each of these three cases, POLS is not able to provide consistent estimates of parameter. A general solution of these problems are instrumental variable least square estimator, and a general practice of that estimator, often used in the problem of endogeneity, is known as two-stage least squares (2SLS). This technique is used as an extension of the ordinary least square method.

The study uses instrumental variable least square estimation technique as a methodology. As the data used in the study is encountered a problem of omitted variable biased and endogeneity. Therefore the estimation results by POLS delivers biased and inconsistent estimates. Hence the study prefer IVLS estimation technique over POLS.

3.3. Data

The study uses data for the following Asian countries i.e. Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Singapore, South Korea and Thailand from 1980 to 2014 for trade and technological globalization model and from 1990 to 2014 for financial globalization model. Due to the unavailability of data for all Asian countries the study focuses on only eleven countries. The main sources of data are "World Development Indicators", published by the World Bank, "International Financial Statistics Yearbook" published by International Monetary Fund, World Income Inequality Databases (WIID), World Trade Integration and Pakistan Economic Survey. The detailed description of variables and their sources are given in Appendix A.

4. Results

4.1. The Impact of Trade Globalization on Income Inequality

The empirical analysis of the study starts with exploring the impact of trade globalization on income inequality in the selected Asian economies. The study used Pooled Least Square (POLS)

and Instrumental Variable Least Square (IVLS) techniques for estimation. The results of POLS in which the dependent variable is income inequality while explanatory variables are log of GDP per capita and its square term, trade, education and foreign direct investment is presented in table 4.1.

The results of pooled least square show that the coefficient of GDP per capita is positive and significant while its square term show negative and significant relationship with income inequality indicates the presence of Kuznets hypothesis. The estimated coefficient of trade and foreign direct investment indicates the existence of significant and positive impact on income inequality. Education has negative and insignificant impact on income inequality. For checking the reliability of the estimation results by POLS the study applied the Ramsey's regression specification error test (RESET) for omitted variables. The results of Ramsey test reject the null hypothesis that there is no omitted variable in the model suggesting that model is not correctly specified. Therefore, POLS would yield biased and inconsistent estimation results that are not reliable. Due to the problem of omitted variable biasedness and endogeneity IVLS estimation technique is applied. The study applied Wu-Hausman test for endogeneity. The result of Wu-Hausman test accepting the null hypothesis that the variables are exogenous. This suggests that IVLS remove the problem of endogeneity and omitted variable biased by instrumenting the variables. Therefore the study preferring the results of IVLS estimation technique over POLS. The instrumental variables used in IVLS estimation technique for removing the problem of endogeneity are log of GDP per capita and its square term, trade, education, foreign direct investment and urban population. The estimation results of IVLS, Ramsey's RESET and Wu-Hasman test are also presented in table 4.1.

The estimation results of IVLS show that the coefficients of GDP per capita and its square value are both significant while GDP per capita shows a positive and its square term shows negative relationship with income inequality. This indicates the existence of Kuznets inverted-U hypothesis means income inequality first increases and after attaining a certain level its starts decreasing. This inverted-U hypothesis is also found by Dobson and Ramlogan (2009) and Reuveny and Li (2003).

The effect of trade openness on income inequality is negative and significant at the 5% level of significance. This indicates that greater participation in international trade significantly

contributes to reduce income inequality. This inverse relationship are in favorable arguments with trade openness. As the study focused on the analysis of the developing countries of Asia which are generally abundant in labor intensive production. So according to the HOS framework (1981) international trade is expected to increase the income of unskilled labor, leading to a decline in income inequality in developing countries. The finding of this study support the HOS framework. The result reveals that income inequality decrease under integration of countries and economies, it is not trade globalization that is responsible for inequality, inequality can be a result of poor infrastructure, week institutions, bad governance and unbalanced taxes and redistribution policies. The inverse and significant effect of trade globalization on income inequality is also found by Chakrabarti (2000), Bhatta (2002), Reuveny and Li (2003), Milanovic (2005), Tian et al. (2008), Jaumotte et al. (2008), Georgantopoulos and Tsamis (2011) and Ogunyomi et al. (2013).

Table 4.1: Impact of trade globalization on income inequality

Dependent Variable: Income Inequality		
Independent Variables	**Pooled Least Square (POLS)**	**Instrumental Variable Least Square (IVLS)**
Constant	-48.43446*** (7.506391)	-11.33286*** (5.722955)
Ln GDP per capita	21.62380*** (1.971578)	12.33538*** (1.525353)
(Ln GDP per capita)^2	-1.363238*** (0.127981)	-0.692101*** (0.100046)
Trade Openness	0.030359*** (0.005869)	-0.015912** (0.007691)
Education	-0.008215 (0.006714)	-0.072276*** (0.020108)
Foreign Direct Investment	0.386453*** (0.119958)	0.228474*** (0.081665)
R-squared	0.560027	0.832712
Ramsey RESET Misspecification Test	18.22 [0.0000]	-------
Wu-Hausman Test	-------	0.633646 [0.4266]

*Note: Standard error is reported in parenthesis "( )". ***, ** and * represents 1%, 5% and 10% significance level respectively. The probability values are in brackets "[ ]".*

Education has inverse and significant impact on income inequality. As more people are educated this will contributes towards reducing the gap between rich and poor in selected Asian economies. But attaining education is expensive for the poor people. In broad-spectrum, the

education spending for poor people decreases because they have more children than the rich, all this confirms a vicious circle. Therefore income inequality persists in the developing countries due to low rate of education. The negative and significant relationship between education and income inequality is also supported by Rudra (2004), Lee (2014), Demir et al. (2012), Cassette et al. (2012), Meschi and Vivarelli (2009) and Jaumotte et al. (2008).

The estimated impact of foreign direct investment on income inequality indicates the existence of positive and significant relationship. This result suggests that FDI mostly benefiting those who are relatively higher skill intensive sector, and increasing the demand for and income of high skilled workers. Therefore FDI contributes toward increasing income inequality in the selected Asian economies. Tian et al. (2008), Reuveny and Li (2003), Cassette et al. (2012) and Jaumotte et al. (2008) also find similar impact of FDI on income inequality.

4.2. The Impact of Financial Globalization on Income Inequality

The study further investigates the relationship between financial globalization and income inequality for selected Asian countries. The results of pooled OLS is reported in table 4.2 in which the dependent variable is Income inequality while the explanatory variables are log of GDP per capita and its square term, financial globalization and education. The results of POLS show that the coefficient of GDP per capita is positive and statistically significant while its square term has negative and significant impact on income inequality. The estimated coefficient of financial globalization and education has positive and significant relationship with income inequality. For checking the problem of misspecification the study applied the Ramsey's regression specification error test (RESET) for omitted variables. The results of Ramsey test reject the null hypothesis that there is no omitted variable in the model suggesting that model is not correctly specified. Therefore, POLS would yield biased and inconsistent estimation results that are not reliable. Due to the problem of omitted variable biasedness and endogeneity IVLS estimation technique is applied. The study applied Wu-Hausman test for endogeneity. The result of Wu-Hausman test accepting the null hypothesis that the variables are exogenous. This suggests that the IVLS remove the problem of endogeneity and omitted variable biased by instrumenting the variables. Therefore the study preferring the results of IVLS estimation technique over POLS.

The instrumental variables used in IVLS estimation technique for removing the problem of endogeneity are log of GDP per capita and its square term, education, foreign direct investment and urban population. The estimation results of IVLS, Ramsey's RESET and Wu-Hasman test are also presented in table 4.2.

Table 4.2: Impact of financial globalization on income inequality

Dependent Variable: Income Inequality		
Independent Variables	**Pooled Least Square (POLS)**	**Instrumental Variable Least Square (IVLS)**
Constant	-81.54494*** (12.59356)	-46.23378*** (17.11751)
Ln GDP per capita	27.00107*** (3.079436)	18.71668*** (3.972958)
(Ln GDP per capita)^2	-1.531754*** (0.189254)	-1.064713*** (0.255378)
Financial Globalization	0.037169*** (0.005453)	0.042193** (0.018913)
Education	0.015225* (0.008351)	-0.010903 (0.031239)
R-squared	0.451402	0.880822
Ramsey RESET Misspecification Test	11.55 [0.0000]	------
Wu-Hausman Test	------	1.52774 [0.2178]

*Note: Standard error is reported in parenthesis "( )". ***, ** and * represents 1%, 5% and 10% significance level respectively. The probability values are in brackets "[ ]".*

The results of IVLS show that the estimated coefficients of GDP per capita and its square term are also statistically significant in financial globalization model while GDP per capita shows a positive and its square term shows negative relationship with income inequality. This indicates that there exist a Kuznets inverted-U hypothesis in the selected Asian economies means income inequality first increases and after attaining a certain level its starts decreasing. This inverted-U hypothesis is also found by Dobson and Ramlogan (2009) and Reuveny and Li (2003).

The effect of financial globalization on income inequality is positive and statistically significant at 5% level of significance. The result suggest that financial globalization is likely to increase income inequality. Even though financial globalization contributes to reduce income inequality through the increasing access of finance for the poor, but the study analyze the developing Asian countries where the quality of institutions is week, so that the benefit of financial integration may not be equally distributed between the rich and the poor. Mostly international corporations and

high income individuals have access to financial markets, so that the rich people take the advantage of financial globalization to increase their income further. Thus financial globalization lead to financial instability in the selected Asian economies. The significant and positive impact of financial globalization with income inequality is also found by the empirical analysis of Jaumotte et al. (2008), Ogunyomi et al. (2013) and Lee (2014).

Education has inverse and insignificant impact on income inequality in the financial globalization model. Meschi and Vivarelli (2009), Demir at al. (2012) and Lee (2014) also studied the impact of education on income inequality.

4.3. The Impact of Technological Globalization on Income Inequality

The study finally analyze the relationship between technological globalization and income inequality in the selected Asian economies. The estimation results of pooled OLS is presented in table 4.3 in which the dependent variable is income inequality while the explanatory variables are log of GDP per capita and its square, technological globalization, education and foreign direct investment. The results of POLS show that the coefficient of GDP per capita has positive and significant relationship with income inequality while its square term also has significant but negative impact on income inequality. The estimated coefficient of technological globalization and education has negative and significant relationship with income inequality. Foreign direct investment has significant and positive impact on income inequality. For checking the problem of misspecification the study applied the Ramsey's regression specification error test (RESET) for omitted variables. The results of Ramsey test reject the null hypothesis that there is no omitted variable in the model suggesting that model is not correctly specified. Therefore, POLS would yield biased and inconsistent estimation results that are not reliable. Due to the problem of omitted variable biasedness and endogeneity IVLS estimation technique is applied. The study applied Wu-Hausman test for endogeneity. The result of Wu-Hausman test is insignificant accepting the null hypothesis that the variables are exogenous. This suggests that IVLS remove the problem of endogeneity and omitted variable biased by instrumenting the variables. Therefore the study preferring the results of IVLS estimation technique over POLS.

The instrumental variables used in IVLS estimation technique for removing the problem of endogeneity are log of GDP per capita and its square term, technology, education, foreign direct

investment and urban population. The estimation results of IVLS, Ramsey's RESET and Wu-Hasman test are also reported in table 4.3.

Table 4.3: Impact of technological globalization on income inequality

Dependent Variable: Income Inequality		
Independent Variables	Pooled Least Square (POLS)	Instrumental Variable Least Square (IVLS)
Constant	-39.95911*** (7.926956)	-8.293146*** (7.868079)
Ln GDP per capita	17.95872*** (2.207090)	11.21712*** (1.943509)
(Ln GDP per capita)^2	-0.953871*** (0.160006)	-0.623352*** (0.120028)
Technological Globalization	-0.189946*** (0.043527)	-0.034935* (0.018380)
Education	-0.015209** (0.006457)	-0.058286*** (0.019393)
Foreign direct Investment	0.659854*** (0.091628)	0.191326*** (0.056411)
R-squared	0.550219	0.881951
Ramsey RESET Misspecification Test	7.82 [0.0000]	------
Wu-Hausman Test	------	0.541351 [0.4624]

*Note: Standard error is reported in parenthesis "( )". ***, ** and * represents 1%, 5% and 10% significance level respectively. The probability values are in brackets "[ ]".*

The results of IVLS show that the estimated coefficients of GDP per capita has significant and positive relationship with income inequality while its square term has negative and significant effect on income inequality. This indicates that there exist a Kuznets inverted-U hypothesis between gross domestic products per capita and income inequality means income inequality first increases and after attaining a certain level its starts decreasing. This inverted-U hypothesis is also found by Dobson and Ramlogan (2009) and Reuveny and Li (2003).

The estimated impact of technological globalization on income inequality shows inverse and statistically significant relationship. The result of the study find the evidence of income inequality reducing effect with technological globalization. Technological globalization is a force of creative destruction generally leads to create new jobs and industries. Although this technological globalization increase the demand of high skilled labor but there is a knowledge spillovers among the workers. As knowledge spillovers allow the fewer skills workers to learn from the highly skilled workers, and to increase their productivity. All this cause a decrease in

income inequality because through knowledge rich environment due to technological globalization, the low skilled workers learn and gain from this globalization. Technological globalization magnifies the rates of economic growth and hence increase the income levels employing a reduction in income inequality. Thus technological globalization contributes to reduce income inequality in the selected Asian countries. The result of negative and significant impact of income inequality and technological globalization is also found by Antonelli and Gehringer (2013), Heshmati (2003) and Liu and Lawell (2015).

Result shows that the impact of education on income inequality is negative and significant reducing the gap between rich and poor. As the study analyze the developing countries of Asia, where acquiring education is difficult for poor people, because poor people have more children than the rich. Therefore, the poor remain less educated and have less employment opportunities than the rich, so income inequality persists. Rudra (2004), Lee (2014), Demir et al. (2012), Cassette et al. (2012), Meschi and Vivarelli (2009) and Jaumotte et al. (2008) also found the inverse and significant impact of education and income inequality.

Foreign direct investment and income inequality indicates the existence of positive and significant relationship. This result suggests that FDI contribute towards increasing income inequality and mostly benefiting the high skill workers. The impact of positive and significant relationship between FDI and income inequality is also found by Tian et al. (2008), Reuveny and li (2003), Cassette et al. (2012) and Jaumotte et al. (2008).

5. Conclusion

The goal of this study is to examine the impact of three modes of globalization separately on income inequality. These three mode includes trade globalization, financial globalization and technological globalization. The time period for data analysis is from 1980 to 2014 for trade and technological globalization model and from 1990 to 2014 for financial globalization model. The study includes eleven Asian countries and data collected at an annual frequency. The study has excluded other Asian countries from the analysis due to data limitations.

The study used Hecksher-Ohlin and the Stolper-Samuelson theorem as a theoretical model for the relationship between globalization and income inequality. This study follows the model of Randolph and Lot (1993) and then augment it for incorporating globalization variable into the model (Barro, 2000). The study further incorporates some control variables into the model i.e.,

enrollment in primary education, foreign direct investment and urban population. This study used panel data framework because panel data reduce the magnitude of major econometric problems that arises in pure time series and cross section data. This study used pooled least square and instrumental variable least square estimation technique but prefers the results of IVLS over POLS because in the estimation results by POLS there exist problems of omitted variable biased and endogeneity.

Results indicates that trade significantly contributes to reduce income inequality in the selected Asian economies. This negative impact of trade for developing countries is consistent with the finding of Hecksher-Ohlin and the Stolper-Samuelson theorem. This inverse relationship are in favorable arguments with trade openness. The impact of financial globalization on income inequality suggested that financial integration cause an increase in income inequality. Therefore the benefits of financial globalization is not evenly distributed among the rich and the poor. The estimated impact of technological globalization also significantly contributes in the reduction of income inequality. As globe is integrated with the technology, people with low skills learns through knowledge spill over by the high skills workers and then get employment, therefore inequality in the income declines. In all three models the coefficient of GDP per capita and its square term is significant while GDP per capita has positive and square of GDP per capita has negative sign show the existence of Kuznets hypothesis indicating that income inequality in the selected Asian developing countries first increase and after attaining a certain level it starts decreasing.

The results of control variables show that enrollment in primary education has negative impact on income inequality, as enrollment in the education increases this will contributes to reduce the gap between rich and poor. The estimated impact of foreign direct investment suggests that FDI mostly benefits high skill intensive sector therefore cause an increase in income inequality. Therefore, it is concluded that the trade and technological globalization contributes in the reduction of income inequality while financial globalization indicates the existence of greater income inequality for the selected Asian countries.

In the light of above findings the present study suggest following policy recommendations:

- Government should reduce trade restrictions and provide subsidies that help to increase the volume of trade and reduce income inequality.

- Government should invest in research and development activities to enhance technological globalization and build institutions that trained the low skills workers which contributes in the reduction of income inequality.

- Government should establish the advance, competitive and powerful financial system which lead towards economic growth and decrease income inequality.

- Government take steps to promote education and provide free education at least up to the secondary level to reduce income inequality.

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Appendix A

Variable	Description	Source
G	Gini index used to measure income inequality. For missing values of gini in the data, study applied the technique of interpolation and find missing values.	World Development Indicator (WDI) and World Income Inequality database (WIID).
Y	Income measured by gross domestic product per capita (GDPpc) in US $ at current price.	World Development Indicator (WDI).
Y^2	Square of income measured by the square of gross domestic product per capita (GDPpc) in US $ at current price	World Development Indicator (WDI)
TO	Trade openness calculated as sum of exports and imports as a percentage of GDP.	World development Indicator (WDI) and World Trade Integration.
FG	Financial globalization calculated as a sum of foreign assets and foreign liabilities as a percentage of GDP. Where foreign assets includes: portfolio debt, portfolio equity, foreign direct investment (assets) and reserves excluding gold stocks. And foreign liabilities includes: portfolio debt, portfolio equity and foreign direct investment (liabilities).	World Development Indicator (WDI) and International Financial Statistics (IFS).
TG	Technological globalization proxied by Fixed telephone subscriptions per 100 people.	World Development Indicator (WDI).
X	List of control variables includes: • Foreign direct investment as a percentage of GDP. • Education measured by the enrollment in primary education. • Urban population as percentage of total population.	World Development Indicator, (WDI) and Pakistan Economic Survey.