

Globalization and Inequality – A Pathway Through Education

P K V Kishan (Indian Institute of Management, Ahmedabad)

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P K V Kishan

Economics Area Indian Institute of Management, Ahmedabad <u>pkvkishan@iima.ac.in</u>

ABSTRACT

This study investigates the interrelationships between globalization, educational outcomes and economic inequality. Econometric models using appropriate panel data techniques are estimated for a sample high and low-income countries over the period 1990-2013. First, we examine the relationship between globalization and educational outcomes, and secondly, the effect of globalization on economic inequality through the channel of education. On average, the results display a positive association between globalization and educational outcomes. Among various elements of globalization, economic globalization bears a positive relationship with schooling outcomes, and the rest of the two dimensions, social and political, have a positive but statistically insignificant effect on education. Apropos country classifications, globalization is seen to have a greater effect on educational outcomes of high income countries, particularly through the political dimension of globalization. In case of low income countries, economic globalization is more pivotal than social or political aspects of globalization in improving schooling outcomes. The findings are robust to the choice of a different estimator. Next, when a country's average educational achievements are low, an increase in openness of the country leads to a decrease in economic inequality. However, as the country becomes more globalized and the educational outcomes of the country improve, the restorative effects of globalization on economic inequality are observed to go down. The empirical results are robust to the use of inequality index from separate data sources and the change in time spans of the study.

Keywords: Globalization, Educational outcomes, Economic inequality, Panel data

1. Introduction

Last few decades have witnessed an economic order whereby deregulation, liberalization, and privatization have come about and barriers to international trade and commerce have been dismantled. This has led to opening up of the economies to each other; hence, setting the tone for globalization. Initially, trade and knowledge transfer among nations paved the way for the developing countries to venture on a journey of catching up, in turn securing the well-being of their respective societies through the channel of economic growth and development. However, it is not yet clear from the debates whether the integration of the world economies has brought about benefits for various groups of countries (especially for developing countries), or have they been adversely affected in the wake of globalization (Lall et al., 2008).

The detractors of globalization have questioned the social and natural sustainability of long-term economic expansion and have also pointed out to the costs and unintended consequences in the form of structural inequality (Sen, 2014), deterioration of the environment, spread of new diseases, increasing poverty and alienation (Capra, 2004), etc. Lall et al. (2008) indicate the importance of controlling the rise in inequality to maintain the sustainability of globalization, failing which there would be "clear losers" in relative as well as absolute terms. They attribute the failure in fully capturing the opportunities created by globalization to the inability of the governments in maintaining broad support across the population. So, the question apropos the bearing globalization has on the distributional aspects of welfare is - has globalization endangered entitlement to certain sections of the population by exacerbating inequality or has it enhanced the size of the pie for everyone ensuring that each person is a winner, notwithstanding whose pie has increased and by how much?

Among other things, globalization is argued to have a deep impact on how knowledge is disseminated. This is because information and innovation are said to be two of the main bases of globalization, which in turn are highly knowledge-intensive (Carnoy, Hallak & Caillods, 1999; Carnoy, 2005). Since knowledge is cardinal to globalization, globalization also influences as to how knowledge is transmitted. However, Carnoy and Rhoten (2002) question if there has been any change at the classroom level in countries which have been an integral part of the global economy and involved in this information age. The authors go beyond this limited line of thought and point to a wider scope that includes education choice, accountability, assessment of educational achievements, decentralization, privatization, and overall delivery of schooling.

We start out with an assumption that educational outcomes are a consequence of the educational provision in a country, which then is related to the size of the welfare state in the country. In turn, the welfare state spawns from the nation-state wherein the state takes on the responsibility of the well-being of its citizens by providing for education, healthcare, housing facilities among others, especially to those in financial and social need, and hence aids in nationbuilding. Given that nation building is inexorably linked to how educated and skilled its citizens are, one needs to look at the relationship between the state of education and its outcomes in a country and the size of its welfare state more acutely. Now, Carnoy, Hallak and Caillods (1999) contend that globalization alters the political power of the nation-state and hence of the welfare state within. Carnoy and Rhoten (2002) further question if globalization diminishes the power of a nation-state. In view of increasing global competition, the answer is a 'yes'. The nation-state plants its focus on policies that augment its global standing. At the same time, systems which are meant to keep the existing domestic political economy stable are compromised. The priority of the nation-state shifts towards making the domestic more attractive to foreign investments at the expense of a shift in public spending from patterns that favour the common consumer base to those benefitting the interests of people in upper echelons of business (Carnoy & Rhoten, 2002). Having said that, although there exists an intent to usher economic progress by improving global economic competencies, a nation-state still requires efficient state machinery with well-developed and functional civil society. Such civil society ensures stable political conditions, provides growing markets and the state machinery supplies a steady public investment in human capital (Evans, 1997). This paves the way for a positive association between the extent of openness of a country and the size of its welfare state (Rodrik, 1997).

The effects of globalization are sensed throughout the education system, at all levels of education and education policymaking (Carnoy, 2005). There are certain channels which explain this. First, in the matter of financing of education, there is pressure on the government to cut-back on the growth of public funding of education and find other sources of spending to further develop the education systems (Carnoy, Hallak & Caillods, 1999). This is in line with the earlier stated view wherein the size of welfare state diminishes in the wake of globalization. Next, regarding the labour markets, the channel works out a little differently. In its bid to attract greater foreign capital, along with a healthy fiscal climate, the government needs to ensure commensurate skill building and development of its labour force. This entails a greater onus on enhancing the average level of

education in the country. Consequently, payoffs to higher education levels increase as production shifts from labour-intensive towards knowledge-intensive products and processes. This enhances the demand for higher levels of education. As the graduates of the preceding level of education form the body of applicants for the next level, pressure on the whole education system for better quality schooling increases. This produces perverse educational consequences from the standpoint of equity (Carnoy, 2005). Finally, the domestic education system of a country faces direct competition from those situated internationally with regard to increased emphasis on the curriculum of Maths and Sciences, increased accountability in standards and testing, and fastchanging ways of education delivery and instruction. This has a direct impact on education systems and its outcomes in the country.

Next, regarding the link between education and economic inequality, it has been argued that increasing access to education is, on an average, associated with more equitable earnings distribution (O'Neill, 1990; Neal & Johnson, 1996; Lall et al., 2008). Concerning the wage differences between black and white men in the USA, O'Neill (1990) found that improvements in quality of education and increase in access to schooling for successive generations of black households led to enhancements of their educational achievements. This, in turn, contributed to the bridging of the racial earnings gap. Neal and Johnson (1996) also came up with a similar result where controlling for educational attainments eliminates the wage gaps between blacks and whites, and Hispanics and whites. However, once an antecedent factor such as globalization comes into play, the relationship between education and inequality ceases to be straightforward. Globalization rewards the skilled and the educated as they can keep in tune with the latest developments in production technology and innovations. While this happens, the wage premium for higher skilled workers and returns to investment on higher levels of education increase. Concurrently, the demand for low skill activities decreases and in tandem the two effects exacerbate income inequality in both developing and developed economies. It then depends on the supply response of the government to meet the increase in demand for higher education and skilling to nullify this effect. Even if the overall access to education improves and the average attainment levels increase, it may not be necessary for the economy to keep up with the quality and quantity (specifically in the case of higher education) of education demanded.

Inequality in a society is undesirable as it limits the growth potential on account of opportunities existing in the nation not getting tapped. Thence, it becomes essential to study and

understand the linkages between globalization and inequality and the role education plays in strengthening or weakening of this relationship. This is important as education is one of the primary mechanisms by which the global forces affect the lives of populations across the world (Tikly, 2001). Going further, the resulting evidence would potentially enable policymakers to take more informed choices pertaining the benefits of globalization and facilitate them to be shared more equitably. Moreover, understanding the causes of inequality is of the essence to devise policies for its alleviation.

The rest of the paper is organized as follows. Section 2 contains the linkages between globalization and education and between globalization and inequality as contained in literature. In section 3, we cover the data sources and the variables along with the methodology adopted in this paper. Section 4 presents the results, and in the concluding section we summarize the findings, reflect a bit on the limitations of this paper, and suggest the scope for further research.

2. Review of Literature

2.1 Globalization and Education

Globalization is a complex development that involves the flow of goods, capital, human and other resources, and even institutional design and policies across national boundaries. Globalization is an economic phenomenon but also encompasses several other aspects, some of which include political, technological, cultural and social. Considering its multifaceted nature, globalization has various ramifications/consequences on the provision of education, educational opportunities and educational outcomes in a country. In this section, we look at the literature suggesting a relationship between globalization and education outcomes.

Literature suggests that information and innovation stand as two main bases of globalization and are themselves, knowledge-intensive (Carnoy, 2005). As knowledge is cardinal to globalization, globalization too is bound to have a "*profound impact on the transmission of knowledge*" (p. 3). Education institutions in any country function in the ambit of their internal and external environments. The internal environment constitutes factors within the bounds of the institute such as mission, vision, management style, leadership etc. On the other hand, external factors include globalization, and "*external social, economic and technological environments bound in a complex web of interrelationships*" (Stiglitz, 2002; Moloi, Gravett & Peterson, 2009, p. 282). According to Moloi, Gravett, and Peterson (2009) – "global changes in politics, society

and culture can also have a profound influence on educational policies, practices and institutions" (p. 283). Moreover, as globalization affects employment, it gets intimately linked to one of the foremost objectives of education, i.e. to prepare learners for work.

Globalization is composed of three main dimensions – economic, social, and political, and the same have a considerable impact on education (Wood, 2008). Economic globalization is viewed as a world market/integrated economy system which is typified by increased openness and association among capital and labour operating in 'real time' across various countries around the globe. Next, political globalization is characterized by the changes in political landscape with the emergence of organizations such as European Union and United Nations that exercise political power directly or indirectly. This has brought about diffusion in government policies across nations. Lastly, cultural governance refers to the spread and exchange of ideas and information among people across the world and in many cases their unhindered movements across geographies with the advancements in transportation, and in information and communication technologies (Dreher, 2006; Wood, 2008).

Given the prevalence of these forms of globalization, a major part of the education system has undergone a re-evaluation (Carnoy, Hallak & Caillods, 1999). The global knowledge economy is said to be rewarding those who have superior skills and are more educated. Thus, there is increased pressure on the policymakers, more so in the developing countries, to allocate a greater number of resources towards secondary and tertiary education and skilling their workforce to meet the social demands (Wood, 2008). Therein, a vicious circle gets created, especially in case of many developing countries including the regions of Sub-Saharan Africa. These countries do not have adequate funds for allocation to education, primarily because they have been unsuccessful in integrating their respective economies with the global economy. This, in turn, finds its cause in the inadequacy of the skills of said countries' labour force, thus completing the circle (Nissanke & Thorbeck, 2006). On the 'poor' countries losing out, Spring (2008) comments about researchers who adopt a postcolonial framework to be viewing globalization as – 'an effort to impose particular economic and political agendas on global society that benefit wealthy and rich nations at the expense of the world's poor' (p. 334).

Another lens through which globalization's impact on education is seen is in terms of education reforms. The education reforms, are in turn broadly driven by competition, finance, and equity concerns (Carnoy, Hallak & Caillods, 1999). Competition driven reforms consist of

measures such as privatization and decentralization, improved management of educational resources, an introduction of achievement standards, changes in the curriculum and pedagogy, and improved teacher recruitment and training. They "*aim primarily to improve economic productivity by improving the 'quality of labour' and of educational institutions*" (p. 37). Finance driven reforms are focused towards increasing quality and efficiency in the deliverance of education to optimize public spending. The end objective is an improvement in economic climate and economic growth in the country. Such reforms are made either for ideological reasons or because of limited public resources to invest in the education sector. Finally, equity-driven reforms are primed making education accessible to the poor, women, and those with special needs (Carnoy, Hallak & Caillods, 1999). Impact of globalization on education also varies with the country's level of development. In case of developing countries which are already crippled with limited higher education (Altbach, 2001).

Empirical work in this area of inquiry is limited, especially within the groupings of developed and developing countries (Tikly, 2001). Also, studies on the impact of globalization and its aspects - economic, political, and social - on the holistic aspects of education covering a large set of geographies are limited. Most of the studies have focused on effect of globalization on higher education in the context of a cluster of countries such as Latin America (Sanchez-Paramo & Schady, 2003) and Organization for Economic Co-operation and Development (OECD) or dealt as respective case studies for individual countries such as Uganda, Hong Kong, Mexico (Hanson & Harrison, 1995; Lachler, 1998) etc.

2.1.2 Economic Framework

Let's assume, ceteris paribus, education outcomes in a country to be a function of resources allocated to the education sector. In view of this, we take a theoretical look at globalization's effect on the public provision of education through the lens of social spending (welfare state) as specified in the literature (Burbules & Torres, 2000; Tikly, 2001). With regards to the expansion of welfare state, globalization is seen in the purview of the economic openness theory. This, in turn, gives rise to two competing hypotheses - Efficiency hypothesis and Compensation hypothesis. Nyang'oro (2013) places the two in context of globalization theories and those pertaining to spread of education and educational opportunities.

- Efficiency Hypothesis: Under this hypothesis, globalization diminishes the size of the government in terms of lowering of taxes which further leads to lowering of government expenditure. This effectively results in downsizing of the welfare state (Meinhard & Potrafke, 2012). This works out in the following manner – Social spending requires resources that are gained by deficit financing or by taxing businesses. Consequently, taxes on businesses cause an increase in the cost of production, leading to a reduction in profit. Next, the competitiveness of domestic products diminishes as compared to the imports. In addition, step-up in government expenditure increases the interest rate, crowding out private investment, increasing real effective exchange rate (REER) and thereby leading to an increase in inflation, in turn creating an unattractive macroeconomic environment to global investors. The preceding channel creates perverse incentives for the government to augment its spending in the wake of globalization. Moreover, the business groups lobby hard and force the government to reduce taxes on businesses. This pressure on the government is greater in case of developing countries where there is limited capital and collective action on education is difficult (Nyang'oro, 2013). Hence, the education sector is likely to be vulnerable to fiscal constraints.
- **Compensation Hypothesis**: While efficiency hypothesis operates mainly on the supply side of the political market, compensation hypothesis is driven from the demand side. As per compensation hypothesis, there exists a positive relationship between globalization and the size of government on account of higher demand for social stability due to growing internationalization (Rodrik, 1998). As has been argued before, globalization puts certain populations at risk and fluctuations in trade and finance give rise to uncertainty and income volatility (Meinhard & Potrafke, 2012). Hence, the government is expected to act employing social insurance and other compensatory mechanisms. In education, this takes the form of unemployment protection, training, etc. There is also a call from businesses for an educated and skilled workforce to make the market ecosystem more attractive to foreign investments and improve the competitiveness of the economy overall (Nyang'oro, 2013).

Studies based on efficiency versus compensation hypothesis have focused on group of countries such as Latin America (Kaufman & Segura-Ubiergo, 2001; Brown & Hunter, 2004; Avelino et al., 2013), East Asia (Chen, 2007), OECD countries, Nordic countries, developing countries (Rudra & Haggard, 2005), etc. These studies have been inconclusive as to which of

efficiency and compensation hypothesis has had the dominant effect. Kaufman and Segura-Ubiergo (2001) measured globalization as trade openness and capital liberalization and found no statistically significant effect on human capital spending (on both education and health) for both measures of globalization, hinting at the competing hypotheses cancelling each other out. While Brown and Hunter (2004)'s study supported the findings of Kaufman and Segura-Ubiergo (2001), Avelino et al. (2013) observed a positive correlation between trade openness and education and an insignificant relationship between financial openness and education spending. Chen (2007)'s research on eight East Asian countries from 1971 to 2003 could not establish any robust relationship between globalization and education variables. In Rudra and Haggard (2005)'s paper, however, efficiency hypothesis stood as the more dominant effect with a significant negative association between trade and education spending.

In view of the limited empirical evidence on globalization and education, and considering that a consensus on the relationship hasn't been formed at a global level, it is deemed essential to study the effect of globalization on the overall delivery of education to assess globalization's *'true relationship to educational change'* (Carnoy, Hallak & Caillods, 1999, p. 15).

2.2 Globalization and Inequality

The debate surrounding the impact of globalization on income inequality is weighed in favour of economic globalization adversely impacting income inequality. Birdsall (1999) asserts that globalization and market reforms will put populations of developing countries at risk and exacerbate inequality, at least in the short run. In addition to welfare and social concerns on account of income disparities, the drivers of growth are also affected as the opportunities created by globalization may not get fully tapped (Lall et al., 2008). Moreover, widening income disparities might also put the sustainability of globalization itself at risk as its success depends on "*maintaining broad support across the population*" (Jaumotte, Lall, & Papageorgiou, 2013, p. 31). However, Birdsall (1999) also points out that in addition to increasing integration in terms of good and services, globalization also leads to the spread of ideas, information and technology that have huge benefits for the developing countries and that the goal is to tap the potential benefits and limit the countervailing costs.

Dependency theory posits that wealthy states benefit at the expense of the poor and the underdeveloped countries as resources flow from the 'periphery' of the latter to the 'core' of the former. Based on dependency theory and the use of panel design models, Beer and Boswell (2001)

employed a ratio of accumulated stocks of foreign investment and the host nations' GDP as a proxy for dependency. They concluded that relinquish of control by the host developing nations to the multinational companies increase inequality by changing the development patterns of the host nations, in turn influencing changes in domestic income distributions. They also found significant evidence supporting the importance of education for decreasing inequality in most of their models. These findings coincide with Stack (1980) and Prechel (1985), where it is reasoned that large export sectors, which are by-products of dependent patterns of unequal exchange between the industrial countries and the industrializing countries, are positively related to income inequality. Bluestone and Harrison (1988) and Braun (1991) use openness (nation's participation in world trade) as a dimension for globalization to reason that openness is expected to increase inequality in advanced countries and decrease inequality in developing countries. Increase in inequality in advanced economies happens due to 'deindustrialization' wherein high paying unionized and protected industries face competition from the labour force in developing countries and through competition with imports. In developing countries, however, inequality is expected to fall following the rise in employment among low skilled workers in export industries. The findings of Milanovic (2005) suggest otherwise. He finds strong evidence that openness has a disequalizing effect on the income distribution of countries with low average income levels. With the rise in national income, the income gap between the poor, middle class and the wealthy abbreviates.

Wood and Ridao-Cano (1996), Davis (1996) and Kremer and Maskin (2003) make use of specific theoretical ideas to discern how trade affects income distribution. One of them, the Heckscher-Ohlin (HO) model suggests that a given country specializes in the production of commodities which use those resources or factors of production it is majorly endowed with. Consequently, in an open economy set-up, developing countries export goods that are intensive in unskilled labour, whereas, developed countries export goods that are skill-intensive. Hence, in the poor country, trade boom would facilitate an increase in demand for unskilled labour and drive down demand for skilled labour, thus reducing earnings inequality. Analogous forces would add up in the case of the advanced countries to increase income inequality. Wood and Ridao-Cano (1996), however, argue that in the case when the supply of skilled workers depend positively on relative wage, supply responses work to widen the initial gap in skill endowments of the two classes of countries, leading to a divergence in terms of income between developed and developing countries. Their empirical analysis lends support to their hypothesis. A study on inequality and

growth using a panel of countries also supports the preceding hypothesis and finds a negative association between openness and inequality for developed countries and a positive one for developing countries, with the turnaround point at per capita GDP level of \$13,000 (Barro, 2000). In Kapstein and Milanovic (2003), the turnaround point occurs at \$6000. Departing from the standard two-good, two-type Heckscher-Ohlin model, a three-good (differing in capital intensiveness), two-type variant was proposed to explain the increase in inequality in some developing countries after their economies opened up (Davis, 1996). Kremer and Maskin (2003) recognize that opening up of world economies entails globalization of the production process, instead of proliferation of trade in just goods. They model this character of globalization wherein 'a product is designed in one country, manufactured in a second and customer service is provided by a call centre in a third country' (p. 11). They argue that globalization weakly worsens inequality in the poor country albeit with certain reservations.

Exploring various dimensions of globalization, Lall et al. (2008) investigate the impact of trade and financial globalization on income inequality using a panel framework and find that trade globalization and financial globalization have offsetting effects. While trade globalization leads to a decrease in inequality, financial globalization (specifically FDI) along with technological progress increases inequality. All the same, greater access to education is said to have an equalizing effect on distribution of income and dissipate the disequalizing effects of FDI once the increased demand for higher education and enhanced skills is met with adequate supply. The analytical principle connecting trade liberalization and inequality is derived from Stolper-Samuelson theorem which implies that in a two-country two-factor framework, increased openness (by the way of tariff reduction) in a low-skilled labour intensive developing country results in an enhancement in wages of the low-skilled workers and a decrease in those of skilled workers, leading to an overall reduction in income inequality (Stolper & Samuelson, 1941 as cited in Lall et al., 2008). This result comes through by the channel of reduction in prices of the importable high skill-intensive product after the tariffs are reduced. Vice-versa would be true for the developed country.

In the Indian context, the hypothesis stands supported as per Kumar and Mishra (2008) who evaluated the impact of 1991 trade liberalization on industry wages using micro-level NSSO data for the years 1980-2000. They found that reduction in tariffs led to a decrease in wage inequality between skilled and unskilled workers. On the contrary, Topalova (2005)'s study on the

causal impact of trade liberalization on poverty and inequality in Indian districts using a differencein-difference estimation design established that trade liberalization led to an increase in inequality, especially in the urban regions.

In Lall et al. (2008), the inequality data is drawn from the World Bank Povcal database by Chen and Ravallion (2004, 2007). However, the authors caution against interpretation of results on account of the analysis using inequality data based on income surveys for some countries and expenditure/consumption surveys for the rest. Moreover, consumption-based inequality indices underestimate inequality, partly because of governments' social security programmes (World Bank, 2006) and partly due to consumption smoothing across time. Some of the other inequality databases include Deininger and Squire (1998) and the World Income Inequality Database (2005).

Most of the differences in the findings from various studies are on account of empirical and methodological differences as well as the choice of control variables. For example, while covering the same period and similar countries, Lundberg and Squire (2003) and Dollar and Kraay (2001) came up with contradictory evidence on the impact of globalization on inequality. Lundberg and Squire (2003) use Sachs-Warner measure as the openness variable and the Gini coefficient as per Deininger and Squire (1998) and find that openness has a mildly negative effect on inequality. In Dollar and Kraay (2001), openness is measured as the ratio of trade to GDP in PPP terms and its effect on income share of bottom quintile is analyzed. The authors observed that openness positively impacts per capita income growth. However, the magnitude and the sign of this effect is same for the mean of income that goes to the poorest quintile as well as for the overall average income level. This renders the relationship between openness and inequality insignificant.

According to Ravallion (2004), these results are to be interpreted with certain caution as the studies depend on fairly noisy data, work with averages, and heterogeneity in country-specific conditions is too great. Also, Milanovic (2005) observes that although there are conclusions that "run nearly the full gamut", there are hardly any empirical findings that show a negative relationship between openness and inequality (Barro, 2000; Dollar & Kraay, 2001; Ravallion, 2001; Lundberg & Squire, 2003). All the same, in summary, specific ways through which trade liberalization is argued to be helpful in alleviating inequalities include – One, generation of new labour-intensive jobs in agriculture and manufacturing, in turn raising the incomes of the poor. Two, making the economies more competitive, thus reducing the disequalizing rent-seeking behaviour. Three, bringing in cheaper imports, thus reducing the real costs of consumption for the

poor, which in fact constitutes the biggest chunk of their income spend (Birdsall, 1999). It can be concluded that the debate surrounding the distributional effects of globalization hardly seems resolved.

2.2.1 Economic Framework

In this study, we intend to ascertain the impact of globalization on inequality in a country through the channel of education. We essentially set out to test the following simple channel.

Globalization \rightarrow Higher returns on higher levels of education \rightarrow Endowment effect – People seeking higher education hail from higher social or economic class \rightarrow Higher returns to those who are already well endowed in terms of social capital and wealth \rightarrow Inequality rises

One of the key factors in the proliferation of trade and globalization is the role of technology. Technological advancements favour those with higher skills and reduce the demand for lower-skilled activities, in process aggravating the skills gap and income distribution in turn (Birdsall et al., 2005). Although greater access to education can alleviate income inequalities, developing countries are marred by resource constraints. Compensation hypothesis, in part, also explains higher returns to higher levels of education in the wake of globalization as described in the previous section. Additionally, in case of developing countries, Wood and Ridao-Cano (1996) argue that supply responses to wage differentials between skilled and unskilled workers would come into force to belie the Heckscher-Ohlin model and further add to the skill premium. Another model in support for increase in returns to higher levels of education was proposed by Stokey (1996).

Next, rise in returns to higher education would consequently lead to increase in demand for university education. This would have ramifications for the entire higher education system for higher quality schooling at lower levels, ensuing perverse educational consequences from the viewpoint of equity (Carnoy, 2005). Increase in demand for higher education puts pressure on the system and increases competition for the limited seats in the system. This entails onus on lower levels of schooling to deliver quality education and hence changes the stakes at primary and secondary levels of education. Also, a call for expansion of supply of university system puts continuous pressure on the entire education system to expand and thus have severe repercussions on the quality of deliverance. There is a contention that in most countries, people from higher social class backgrounds are the ones who get a shot at higher levels of education (Carnoy, 2005). So, an endowment effect is in play. In an already unequal society, those who have higher social, economic and human capital accumulate further higher returns and exacerbate inequality. This happens as only those at a higher socio-economic status can 'get access to "better" schools in regions that are more likely to spend more per pupil for education, particularly in those schools attended by higher socio-economic class pupils. Competition for such higher-payoff education also increases as the payoff to higher education increases, because the stakes get higher' (Carnoy, 2005, p. 9). As a result, schooling becomes layered at the lower levels especially in countries with limited resources. This is a testable hypothesis and although out of scope of the present work, future research can test whether globalization leads to stratification of schooling at lower levels in terms of quality of deliverance.

Burbules and Torres (2000) lay down another channel that relates globalization to inequality through education. Globalization has created a new world order in response to which different nations have gone through different patterns of economic restructuring. Economic restructuring has gone hand in hand with implementation of neoliberal policies, some of which hadn't worked out as intended at that time with profits going down, labour unions fighting to maintain the wages at a high level, and prices remaining controlled at lower levels owing to foreign competition. This had led to many countries facing fiscal crisis as their respective governments failed to match state revenues with social expenditures. Ensuing budget reductions affected the public sector and size of welfare state diminished. Privatization of essential social services such as housing, health, and education increased and thus, '*social salary (public expenditure distributed in the form of social benefits) diminished at the expense of individual salaries*' (Burbules & Torres, 2000, p. 7). Thus, because of such process, large sections of population were left excluded while the limited few were taken care of by the state leaving the society fragmented and unequal.

3. Data, Variables, and Empirical Methodology

From the discussion on literature thus far, nothing can be conclusively said about the associations between globalization, education outcomes, and inequality. Although Heckscher-Ohlin model and Stolper-Samuelson theorem propose a decrease in inequality in developing countries and an overall convergence across the developed and the developing countries in the wake of globalization, dependency theory and modifications thereof suggest otherwise. In

addition, the empirical literature positions itself on either side of the fence. As for the connection between globalization and education, considering that information and knowledge sharing/exchange is integral to globalization, countries which have opened up to the forces of globalization have experienced changes in their education systems in terms of their policies, practices, institutions, etc. Empirically though, there have not been enough studies to have probed the impact of globalization on educational outcomes covering a cross-section of countries. Moreover, to the best of our knowledge, there hasn't been any study to have specifically looked at the impact of globalization on inequality through the channel of education.

Based on the gaps in literature, we approach the empirics with a two-pronged objective. One, to discern the effect of globalization on education outcomes. Two, to understand how globalization relates to income inequality within an economy and more importantly assess the relationship when education is one of the main mediating forces. For this, we have considered a panel of about 120 countries across the world as per data availability for the variables of our interest. Hence, we have attempted to include as many countries as possible in each model for the time-period between 1990 and 2013. In this dataset, the data over the period 1990 – 2005 is spaced every five years (E.g.1990, 1995 . . .) and from 2005 till 2013, data is considered for each year. This constraint of having to work with unequally spaced time panels is because of limited data availability of one of the primary explanatory variables - education outcomes, i.e. mean years of schooling.

Most of the dataset is derived from World Development Indicators (WDI) of The World Bank. This database is a compilation of international sources that are officially recognized and include national, regional and global estimates. The list of variables used in our analysis is presented in table 1 along with their brief descriptions and respective data sources.

Table 1

Variable	Description	Source			
	Dependent Variables				
ays	Average number of years of education	Barro and Lee (2013), UNESCO Institute			
	received by people aged 25 and older	for Statistics (2013b) and HDRO estimates			
gini	Gini index measures the extent of deviation	1. World Development Indicators, The			
	from a perfectly equal distribution of income	World Bank			
	or in some cases consumption expenditure	2. Estimated Household Income Inequality			
		Data Set (EHII), UTIP			

Data set – descriptions and sources

	Explanatory Variables								
kof	Globalization Index that encompasses three								
	main dimensions of globalization - economic,								
	social and political	KOF Index of Globalization Database,							
kofe	Index for economic dimension of	Dreher, Axel, Noel Gaston and Pim							
	Globalization	Martens (2008)							
kofs	Index for social dimension of globalization								
kofp	Index for political dimension of globalization								
fo	Sum of net inflows and net outflows of								
	Foreign Direct Investment as a percentage of	World Development Indicators. The World							
	GDP	Bank							
to	Sum of exports and imports of goods and								
	services measured as a share of gross domestic								
product									
~ d ~ ~ ~ ~	CDD are conite based on numbering neuron	les							
gappe	BDP per capita based on purchasing power								
000	Government (Local Regional and Central)								
ug	expenditure on education total (% of GDP)								
heo	Health expenditure, public (% of GDP)								
urb	Urban population (% of total)								
ptrp	Pupil-teacher ratio, primary								
ptrs	Pupil-teacher ratio, secondary								
flf	Labor force, female (% of total labour force)								
adr	Ratio of people younger than 15 or older than								
	64 to the working-age population i.e. ages [15-								
	64]								
рор	Total Population	World Development Indicators, The World							
gfce	General government final consumption	Bank							
	expenditure (% of GDP)								
lfse	Labor force with secondary education (% of								
	total)								
ae	Employment in agriculture (% of total								
	employment)								
ie	Employment in industry (% of total								
	Employment)								
sse	Employment in services (% of total								
infl	Inflation consumer prices (appual %)								
fed	Financial Crisis Dummy – All years following								
icu	2008 assigned 1								
	2000 assigned 1								

3.1 Dependent Variables

"Mean years of schooling" is used as a measure of educational outcomes (the dependent variable) in this study. One of the most simple and instinctive ways of measuring educational attainment of a person is by referring to his "number of years of schooling". Although education and schooling are not the same things as education can be acquired by a person by virtue of her family, colleagues, friends, culture etc., apart from her formal schooling; however, schooling can be argued to play a principal role in the person attaining education in a given country. Hence, we use mean years of schooling in a country to represent its educational outcomes.

The other candidates for the choice of the variable representing educational outcomes were countries' average standardized scores in international surveys cum tests such as Programme for International Student Assessment (PISA)¹ and The Trends in International Mathematics and Science Study (TIMSS)². The objective of such evaluation tests is to measure problem-solving skills and cognitive skills of students in daily life. Moreover, these standardized tests facilitate creation of comparable data across countries and consequently enable nations to improve their education policies and outcomes. It can hence be argued that the scores in international tests represent educational quality in a country. Studies which have included such measures in growth regressions have found that the quality of education is important for economic growth and that its effect is more significant than that of educational quantity (school enrolment and attainment) (Hanushek & Woessmann, 2007).

Despite its inherent strengths, we do not consider PISA, and TIMSS scores in our main analysis as the two have been in existence only since the years 2000 and 1995 respectively. Also, these are only conducted every three years and four years respectively. Moreover, the countries participating in these surveys are not representative of the global population as most of them belong to the Organization for Economic Co-operation and Development (OECD) group of countries. Hence, in view of the data constraints with respect to the PISA and TIMSS test scores

¹ PISA tests a sample of 15-year-old school pupils' scholastic performance in mathematics, science, and reading of its member and non-member nations.

² TIMSS conducts evaluations for a sample of students in grades four and eight of participating nations in mathematics and science.

as a measure of educational outcomes; we restrict ourselves to the measure of average years of schooling (ays) as one of the explanatory variables for this study.

In the next part, we have used Gini coefficient for income/consumption expenditure inequality as the dependent variable in this study. The Gini coefficient is a widely-used measure, and it captures the range between a perfectly egalitarian society (Gini coefficient of zero) and a society where all the wealth is hogged by one person (Gini coefficient of one). Despite Gini Index's popularity, various conceptual and methodological issues make comparability of Gini Indices over time and across countries difficult. As pointed before, some Gini indices are based on household surveys that investigate consumption expenditure (commonly in Asia, Sub-Sharan Africa, Central and emerging Europe etc.). Others are based on income surveys (mainly in developed economies), and this introduces differences of the order of 0.15 points owing to methodological differences (Lall et al., 2008). Moreover, consumption-based Gini coefficients underestimate the inequality on account of consumption smoothing by households, inaccuracy in reporting, variation in the number of consumption items, changes in length of recall period etc. It is also argued that household surveys do not capture the top and bottom ends of income distribution (Emran & Shilpi, 2015).

In this paper, we use Gini coefficients drawn from World Development Indicators, The World Bank database and Estimated Household Income Inequality Data Set (EHII) of the University of Texas Inequality Project. We also make use of a novel dataset on regional income inequality based on satellite nighttime luminosity data by Lessmann and Seidel (2017). In the former database, i.e. The World Development Indicators, the Gini coefficients have been calculated from the data on the distribution of income or consumption from nationally representative household surveys (The World Bank, 2005) or the best available grouped data and have been further adjusted for household size. The coefficients have been attempted to be made as comparable as possible in view of difference in survey methodologies, welfare definitions – income or consumption, weighing procedures etc.

On the other hand, the EHII data set has been created by a statistical approach to create a consistent Global dataset. The statistical procedure is based on a regression that shows a very close relationship between industrial pay inequalities and household income inequalities as measured in 430 overlapping country-year observations from a separate standard dataset – Deininger and Squire (DS) (1996). Control variables that specify whether the DS dataset measures inequality of

households or individuals, whether the data is based on income or consumption expenditure, or whether it is gross or net of tax, are used in this regression. The resulting coefficients are stable and consistent and are further used to produce the near-complete table of estimated Gini Coefficients (Galbraith et al., 2015). The data for EHII Gini coefficients is available for 149 countries from 1963 to 2008.

Finally, Lessmann and Seidel (2017) use nighttime satellite data to create a regional income inequality dataset for 180 countries spanning the period 1992-2012. They follow a two-step procedure. First, the authors use the relationship between luminosity data and regional incomes of the countries where such information is available and perform an out-of-sample prediction of regional income of countries where income data is lacking. Second, from the predicted income data, they compute different measures of income inequality within countries including the population-weighted Gini coefficient. For our study, we have considered Gini coefficients from the three data sources in separate regressions with all other variables remaining the same. This also helps us check for robustness of the findings.

3.2 Explanatory Variables

There have been more than 100 studies to have used the KOF index of globalization (Potrafke, 2014) to probe the association between globalization and variables such as growth, inequality, human development, government credibility, terror, inflation, health outcomes, etc. (Dreher, 2006; Bergh & Nilsson, 2010; Sapkota, 2011; Gassebner & Luechinger, 2011; Dreher & Voigt, 2011; Samimi et al., 2012; Jani, 2016).

There have also been studies to have measured globalization as financial and trade openness. Openness to trade is denoted by the total of imports and exports as a percentage of GDP, and financial openness is indicated by inflows of FDI as a percentage of GDP (Jaumotte et al., 2013). However, trade openness or financial openness, on their own, are not adequate measures to measure the outcomes of globalization or even the economic bearings of globalization. Globalization cuts across dimensions beyond mere trade and commerce as it encompasses creation of social networks across trans-continental distances and entails exchange of information and ideas besides capital and goods (Dreher, 2006). Hence, in this study, we include the KOF index of globalization and its three dimensions (economic, social, and political), sum of imports and exports as a proportion of GDP, and sum of net inflows and net outflows of Foreign Direct Investment as a proportion of GDP as explanatory variables in various model specifications.

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Brought out annually by the KOF Swiss Economic Institute at ETH Zurich and used for the first time as a part of study in Dreher (2006), the KOF Globalization Index captures the multidimensional nature of globalization encompassing economic, political, cultural and technological aspects. The final index is a combination of three important aspects of globalization – economic, social, and political, which in turn are a combination of 23 variables overall (Dreher, 2006). The same is listed in Appendix table A.1. The economic dimension is made up of two components – actual flows and restrictions. Measures of trade, foreign direct investment (FDI), portfolio investment, and income payments to foreign national, all as a proportion of GDP, combine to form actual flows. The composite sub-index of Restrictions is composed of measures of hidden import barriers, tariff rates prevalent in the country under consideration, taxes on international trade, and capital account restrictions. The political dimension of the KOF index simply measures embassies in a country, membership in international organizations, and level of participation in UN security council missions. Finally, the social component subsumes data on personal contact, information flows, and cultural proximity.

The next explanatory variable - sum of imports and exports in a country as a proportion of its GDP - represents trade openness of a country. It is a close proxy for economic globalization a country experiences. With the flow of goods and services across nations, trade openness is attributed with bringing in economic benefits to a nation in the form of technology transfers, skill transfers in workers, and an increase in productivity as a result. As per Edwards (1997), trade openness spurs economic growth. A country which is more open than the rest is better able to absorb the technological advancements of developed nations. As a measure, it has one inherent weakness – even if a country's trade volume is relatively high, the ratio representing trade openness might turn out to be low if the country's GDP is very high.

The last measure of globalization we have used is the sum of net inflows and net outflows of Foreign Direct Investment as a proportion of GDP, and it reflects financial openness of a country. De facto financial openness consists of foreign direct investments, portfolio investments, debt, financial derivatives, and total reserves less gold (Lall et al., 2007). However, in our study, we consider the FDI aspect alone to be the measure of financial openness as the principal effect of financial openness was felt through FDI alone.

3.3 Control Variables

In addition to the explanatory variable used in this study to ascertain the intended relationships, we have employed the variables listed in table 1 to control for the impact they might have on the dependent variables. We take up the explanation of a few of them in this section.

We use Gross Domestic Product per capita (GDPPC) in all our specifications. GDP per capita can be argued to be a measure of the level of resources a country has and can potentially use a proportion of those towards spending on education and thus have a bearing on education outcomes. It provides a good approximation of the number of resources an average family can spend on their children's education. It can be assumed that greater the number of resources a family has, more can they spend on education which could then take forms such as tuitions, supplemental learning resources, stationery and books etc. in addition to actual schooling, thereby increasing the probability that higher educational outcomes can be achieved. Hence, the conjecture here can be that of a positive relationship between GDP per capita and the average number of years of schooling.

One of the obvious measures of a country's prioritization of education is total public expenditure on education as a proportion of its GDP (Hanushek & Kimko, 2000). Spending on education can be gauged as an investment in human capital as it leads to skill formation/augmentation in individuals and increases their productivity. The government's role in education sector mandates framing of policies and plans, propose strategies to address inefficiencies and maintaining accountability, in addition to generation and further allocation of economic resources. Our control variable, i.e. Government expenditure on education (as % of GDP) represents such financing of resources towards development of education sector in a country.

Education is considered to be a public good, albeit an imperfect one as more number of non-state actors such as private sector and for-profit organizations are now increasingly involved in educational landscape. However, considering the positive externalities of a more educated citizenry on the society wherein social marginal benefits exceed private marginal benefits, an argument could be made regarding the importance of the state partaking in financing of education for its citizens. Moreover, the state's role is also emphasized from the standpoint of equitable distribution of educational opportunities for its citizens. Hence, given our specification where government expenditure on education (as percentage of GDP) is a determinant of education outcomes in a country, we hypothesize a positive relationship between the two, i.e. greater the public spending on education (as percentage of GDP), the higher would be the mean years of schooling in a country. The channels through which this works out include making education accessible to a greater proportion of population by building new schools and expanding infrastructural capacities, appointment of more teachers and staff in existing schools, and a subsequent increase in enrolment rates and improvement in quality as pupil-teacher ratio decreases.

Pupil-teacher ratio is one of the other variables we control for and keeping everything else constant; there exists a negative relationship between educational outcomes and pupil-teacher ratio. As pupil-teacher ratio lowers, a given teacher potentially has more time to teach each student, which in turn improves quality and hence, the outcomes.

Having argued in favour of a positive relationship between government education spending and education outcomes in a nation, the concern of efficiency remains as state spending on education is regarded inefficient on the count of misallocation of resources. This means higher investment may not necessarily translate into favorable education outcomes. The empirical evidence also throws up a conflict between the two sides – whether or not, a higher allocation of resources ensures better outcomes in education. While certain researchers argue in favor of more money bringing better school quality and hence better results (James, King & Suryadi, 1996; Obi et al., 2016), others have found negligible role of extra school resources on student learning and achievements (Coleman et al., 1966; Hanushek, 1986; Hanushek, 1996; Lips, Watkins & Fleming, 2008). In more recent literature, Jackson, Johnson and Persico (2016) made use of event study and instrumental variable models to establish a favourable relation between an increase in per-pupil spending on completed years of schooling, adult labour market outcomes and even a drop in the annual incidence of adult poverty. Overall, it can be said that any impact of an increase in education expenditure on educational outcomes depends more on how (efficiently) the money is spent than on the quantity of the money spent.

Next, public expenditure on health (as % of GDP) can be considered yet another source of investment in human capital. Greater government spending on health, if channeled in an efficient way, ensures better health care for the population which then goes on to improve health status of people in the country. There would be fewer cases of students dropping out of school or absenteeism due to poor health.

Urbanization, i.e. population in urban centres as percentage of total population in the country, is the next variable in our list of control variables. People residing in rural areas often migrate to urban areas for greater opportunities of earning their livelihood, leading to a better life. Moreover, in most cases, the standard of living of residents in urban centres is higher than those in rural areas. There is also greater access to schools and better quality education in urban regions of a country. Hence, as urbanization happens, i.e. the proportion of population living in urban centres rises, the outcomes of education can be argued to improve, paving the way for a positive relation between urbanization and mean years of schooling.

In literature, a positive shift in female labour force participation is shown to have a positive impact on children's educational outcomes. One of the channels by which this happens is discussed in Afridi, Mukhopadhyay and Sahoo (2016) in the Indian context. Once the female labour force participation increases, the decision-making power of working mothers improves in the household and resource allocation decisions weigh in favour of investing more in children's health and education. Moreover, mother's employment supplements the household income and the positive relation follows from pure income effect. However, if we consider that a working mother must let up on her household chores, and children's time in doing household work is a close substitute to the mother's time, then the mother's labour market participation can have repercussions on the educational outcomes of her children. On the other hand, if a possibility arises where the children's and mother's time are not close substitutes but complementary, and childcare services are either unavailable or unaffordable. Also, there are no other family members to take care of the children when the parents are at work. In such cases, it can be argued that school substitutes for childcare services and children end up spending more time at school, enhancing their educational outcomes (Afridi, Mukhopadhyay & Sahoo, 2016).

We also attempt to control for the age structure of the population. To this effect we make use of Age Dependency Ratio (ADR) which is the ratio of dependents i.e. people below the age of 15 or above the age of 64 to the working age population between the ages 15 and 64. Age dependency ratio can increase in the wake of either of the following reasons – First, fertility rates are low and age expectancy is high leading to old age dependency ratio. This phenomenon is usually seen in rich countries such as Japan, Germany, USA etc. Second, in case of regions such as Africa and South Asia, the fertility rates are high which outweigh the effect of old age population in the age dependency ratio. Although in both cases smaller workforce and a greater dependency on them would mean slower growth due to lesser savings leading to lesser investments and hence lesser investment in human capital. In the former case, i.e. for developed nations, the mean years of schooling is already at a high level; whereas in the latter case, the average years of schooling would be lower. Hence, the relationship between our dependent variable and age structure would depend on which case dominates overall.

The year 2008 is when the financial crisis started, and we intend to test its effect on education outcomes. Thus, we use a dummy variable, assigning zero for the years before 2008 and one to 2008 and the years following it.

For the next part our study, we again control for GDP per capita of countries. Additionally, we also use the squared term and attempt to determine whether the Kuznets' inverted U-shaped curve reigns true in our study. Kuznets (1955) explored what direction does inequality take in the course of a nation's economic growth and found that as an economy develops, inequality initially increases and as the nation keeps on treading on the path of development, it then decreases. We also include the variable of population to control for the size effect (Williamson, 1965; Ezcurra & Rodriguez-Pose, 2013). This is in view that country size may affect regional inequality as heterogeneity is greater in larger countries than smaller countries.

We include share of government's consumption expenditure in a country's GDP as a variable to control the size of the public sector. Rodriguez-Pose and Ezcurra (2010) use the size of public sector as a proxy for redistributive capacity of a country. Redistribution of resources across regions would then ameliorate skewed distribution of income and hence reduce regional inequality.

One of the prime reasons behind rising inequality is attributed to the rise in earnings/skill premium (Stokey, 1996; Wood and Ridao-Cano, 1996). The earnings of workers depend on their productivity, which in turn depends on the workers' capabilities/skill and the scarcity of their skillset. The skill premium arises by virtue of how scarce a skill is. A scarcer skill commands a higher premium. By this logic, if the skill set in the labour market is relatively homogenous, i.e. the variance in education levels/skill levels of potential employees is relatively low, the earnings premium remains contained. Hence, we control for education level of the labour force, specifically, with the use of variable – percentage of labour force with secondary education of the total labour force – and conjecture that this variable is negatively associated with inequality. Additionally, we include controls for occupation structure of the population to examine if the changes in labour market structure have resulted in a rise in income inequality (Mikhalev, 2000). With the nations

making transition as market economies, new social and economic classes have emerged, and with rising capitalism, the social hierarchy has undergone a change wherein blue-collar workers, farmers and state-sector employees have borne the cost of transition.

Our final control variable is that of inflation. It is a common refrain in both the journalistic circles and the academic ones that inflation hits the poor hardest. As the poor spend the largest proportion of their earnings on essentials such as food, fuel/energy, etc., which see more significant price swings than other items, the adverse effect of an overall price increase in the economy is acuter on the poor than on the public at large. Moreover, the incomes of the poorest lot in a country are mostly stagnant. In contrast, in the upper quantiles of economic class, the incomes are indexed to inflation, which magnifies the income differences further.

3.4 Methodology

Although the term globalization has been in the common parlance since the 1980s thanks to Levitt (1993), the world has been integrated since long, and the phenomenon of globalization has been around since time immemorial. However, in our study, we delve into the association between globalization and inequality in the period between 1990 and 2013. This is partly because globalization picked up momentum in later 1970s with economic policy re-orientation in China and it opening up its shores to the world, and as mentioned earlier, in part due to data constraints in case of one of the explanatory variables – mean years of schooling. In this study, we shall work with unequally spaced panels. The time-period of our consideration includes the period of the sub-prime crisis in the US and the subsequent economic slowdown of 2008-09. To account for the same, we include a dummy variable assuming the value of zero for the pre-slowdown period i.e. all years preceding 2008, and the value of one post-crisis, i.e. 2008-2013.

The empirical studies to have looked at the association between globalization and other variables (growth, inequality, human capital outcomes, etc.) have commonly used cross-country regressions or panel data methods. Panel data methods proffer advantages in terms that degrees of freedom increases, unobserved time-invariant variables such as geographical factors, etc. can be accounted for, and causal analysis is made possible to a certain extent. Hence, owing to such benefits, we adopt panel data methods in this study.

To resolve the objectives of this study, several variants of the following general regression model were estimated. The base models are -

- 1. $EO_{it} = \beta_0 + \alpha_j G_{it} + \gamma_k X_{it} + a_i + \epsilon_{it}$
- 2. $II_{it} = \beta_0 + \beta_1 G_{it} + \beta_2 EO_{it} + \beta_3 (G_{it} * EO_{it}) + \gamma_k X_{it} + a_i + \epsilon_{it}$

where, in equation 1, EO_{it} represents education outcomes of i^{th} country for the t^{th} time-period, G_{it} is a vector of independent variables used for globalization, X_{it} is the vector containing the control variables, a_i captures unobserved time-invariant country-level effects, ϵ_{it} is the error term where $E(\epsilon_{it}/X_{it}) = E(\epsilon_{it}) = 0$; $Var(\epsilon_{it}) = \sigma_{\epsilon}^2$; $Cov(\epsilon_{it}, \epsilon_{is}) = 0$ where $t \neq s$; $Cov(X_{it}, \epsilon_{it}) = 0$ (Weak Exogeneity Assumption); $Cov(X_{it}, a_i) = 0$ (in case of Random Effects); $Cov(X_{it}, a_i) \neq 0$ (in case of Fixed Effects).

In equation 2, II_{it} is Gini Index for Income inequality, G_{it} denotes KOF Globalization Index, EO_{it} captures education outcomes of i^{th} country for the t^{th} time-period, X_{it} is the vector of control variables, a_i again captures unobserved time-invariant country-level effects, ϵ_{it} is the error term which bears the same assumptions as in the previous paragraph, and finally, the coefficient β_3 can be interpreted as the amount of change on the slope of the regression of income inequality on globalization when number of years of schooling changes by one unit. It must be borne in mind that the two equations represent separate models and shall hence be estimated separately.

For the first part of this study, we run the model for different country groups, (i) high income and low-income countries, and (ii) based on geographical regions – Europe and North America clubbed together, South Asia and Sub Saharan Africa clubbed together, and the Rest of the World. For the next part, we run the regressions with the GINI coefficients taken from, (i) World Development Indicators, The World Bank Data, (ii) EHII data, University of Texas Inequality Project, and (iii) Lessmann and Seidel (2017)

The error structure given above assumes a_i and ϵ_{it} being IID, i.e. no heteroscedasticity, no autocorrelation and no cross-sectional dependence. Given our data, we are also dealing with unequally spaced time intervals and an unbalanced panel³.

In running panel regressions, we need to choose between random effects model and fixed effects model. Attributing random effects to a model is a more restrictive assumption as the regressor X_{it} is taken to be strictly exogenous, i.e. $Cov(X_{it}, \epsilon_{it}) = 0$ as well as $Cov(X_{it}, a_i) = 0$, whereas in case of fixed effects only the weak exogeneity condition is assumed. If the underlying

³ As STATA commands handle unbalanced data, we tread further by ruling out selection/attrition bias as an assumption.

model obeys fixed effects assumptions, then a fixed effects regression would yield consistent estimates and a random effects regression would yield inconsistent estimates. On the other hand, if the underlying model fulfils random effects assumptions, both fixed effects and random effects regressions would bear consistent estimates, although the estimates in fixed effects regressions would not be efficient. In this case, we are conducting a cross-country study. We are not picking up a representative sample randomly from a given population. Instead, our inferences shall be made on the population, i.e. all countries, subject to data availability for different variables. Hence, as per Searle, Casella, and Mc Culloch (2009), since our interest is in the population (countries of the world) itself and not on a random sample of countries, we employ fixed effects model in the regressions.

Moreover, it would be extremely constrictive to assume that the unobserved time-invariant country effects or the omitted variables are uncorrelated with the explanatory and control variables already present in the study. However, we shall still test for the robustness of our assumptions by applying Hausman test (Hausman, 1978). This test evaluates whether the random effects model is more suitable when compared to the fixed effects model. Under null hypothesis, estimators resulting from both models are consistent but the random effects coefficients are more efficient as they have smaller standard error. In case the null hypothesis is rejected, we are left with the fixed effects estimators, which are at least, consistent.

Post Hausman test, to ensure robustness of the estimators, we conduct certain tests. We earlier assumed our error structure to be free of heteroscedasticity, autocorrelation and cross-sectional dependence. However, these are tenuous assumptions as according to Hoechle (2007), most panel datasets are likely to exhibit all kinds of serial correlations and cross-sectional dependencies.

The first test is to check the standard errors of the coefficient estimates for heteroscedasticity and modified Wald Test is employed for the same. The modified Wald Test⁴ tests for group-wise heteroscedasticity. Since it is restrictive to assume that all countries have

⁴ The null hypothesis of the modified Wald Test assumes the errors to be homoscedastic. Consequently, if the null hypothesis is rejected, we correct for heteroscedasticity by using the "robust" option (in STATA) with the fixed effects panel regression command and thus generate standard error estimates robust to heteroscedastic disturbances.

similar variance distributions, the test examines whether the error structure across time and countries has the same variance.

Next, we test for the presence of autocorrelation or serial correlation in the error structure. If an error structure is autocorrelation inconsistent, it means that errors are correlated across periods⁵. Since autocorrelation biases the standard errors and renders the coefficients to be less efficient (Drukker, 2003), to check for the presence of autocorrelation in the error structure, we apply Wooldridge's test for autocorrelation in panel-data models proposed in Wooldridge (2002)⁶. That being so, the treatment for serial correlation in error structure is done by adjusting VCE for clustering at panel level (Drukker, 2003). This procedure also makes the standard errors robust to heteroscedasticity in addition to serial correlation.

Lastly, we need to test our final assumption of the error structure being free from any crosssectional dependence, i.e. $Corr(\epsilon_{it}, \epsilon_{jt}) = 0$, where $i \neq j$. Given the scope of study wherein, we analyze the interactions between globalization, education outcomes and income inequalities across world, the supposition that the dependent variables and the independent variables are not related across the unit of analysis (countries) is fragile. The very concept of globalization is grounded on interconnections and interdependencies among actors across the world and a variety of flows among countries. Therefore, it is necessary to account for spatial dependence in the standard errors to lend robustness to the model. One of the tests for assessing cross-sectional dependence is Pesaran cross-sectional dependence⁷ (CD) test as it is also applicable to panels with short *T* and

⁵ In a simple linear regression framework - $u_{it} = \theta u_{i(t-1)} + \delta_{it}$, where $|\theta| < 1$ is called the autocorrelation parameter and $\delta_{it} \sim_{iid} N(0, \sigma^2)$. In this stated case, the autoregressive model follows AR(1). That is, the dependent variables and the independent variables at time *t* most likely bear a relationship with the ones at time (*t*-1).

⁶ Wooldridge's test uses the residuals obtained from a regression in first-differences after which the timeinvariant effects are eliminated and we are left with $-\Delta EO_{it} = \alpha_j \Delta G_{it} + \gamma_k \Delta X_{it} + \Delta \epsilon_{it}$, where Δ is the firstdifference operator. Then, the parameters α_j and γ_k are estimated by running the above regression, and the residuals are obtained. Under null hypothesis, if the errors in the original model are not autocorrelated, then $-Corr(\Delta \epsilon_{it}, \Delta \epsilon_{i(t-1)}) = -0.5$.

⁷ The test statistic of CD test is "based on a simple average of all pair-wise correlation coefficients of the Ordinary Least Square (OLS) residuals from the individual regressions in the panel" (Pesaran, 2004, p. 3).

large *N*. Under the null hypothesis, there is no cross-sectional dependence in the error structure of the model. In case the null hypothesis stands rejected, we need to employ an estimator that corrects for cross-sectional dependence in the data. One such estimator is given by Driscoll and Kraay (1998) who proposed an estimator which, in addition to accounting for general forms of spatial dependence, also produces standard errors that are heteroscedasticity consistent and are robust to general forms of serial correlation⁸.

In this paper, the structure of data for our variables of interest is in the form of unequally spaced panels. To overcome this limitation of unequally spaced panel data patterns, Baltagi and Wu (1999) came up with a procedure that handles unequally spaced panel data and overcomes the problem of serial correlation in the errors. The procedure⁹ makes use of feasible generalized least squares (FGLS) estimation method for unbalanced panels.¹⁰ In addition to tests on error structure, we also check each regression for multicollinearity. The respective variance inflation factors of variables were found to be within permissible bounds.

Having set down the data description, variables and methodology in place, we move on to the results of the analysis in the next section.

It is given as - $CD = \sqrt{\frac{2T}{N(N-1)} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \widehat{\rho_{ij}} \right)}$, where, *T* represents number of time periods, *N* represents total number of cross-sectional units, $\widehat{\rho_{ij}}$ is pairwise correlation of errors given by $-\frac{\sum_{t=1}^{T} \widehat{\epsilon_{it}} \widehat{\epsilon_{jt}}}{(\sum_{t=1}^{T} \widehat{\epsilon_{it}})^{1/2} (\sum_{t=1}^{T} \widehat{\epsilon_{jt}})^{1/2}}$.

⁸ In contrast to the original Driscoll and Kraay's (1998) estimator which only considers balanced panel, the estimators produced by the "xtscc" command in STATA works with unbalanced panels as well (Hoechle, 2007).

⁹ The STATA command that implements this procedure is 'xtregar'.

¹⁰ In case of a fixed effects model, 'xtregar' proposes a within estimator which does away with the nuisance parameter (a_i) and produces a linear AR(1) model, with unequally spaced observations. A Cochrane-Orcutt transformation is then performed on each panel, within-panel means are removed, and the overall mean is then added back for each variable. In the final step, ordinary least squares regression is performed on the transformed data to yield the within estimates of β_0 , α_i , and γ_k (Stata manual for 'xtregar').

4. Results

4.1 Globalization and Education Outcomes

Before we analyze the empirical relationship between educational globalization and educational outcomes, we look at the summary statistics of the variables of this study. Table 2 contains the list of variables, their summary statistics, and their respective operationalization as used in this study. The operationalization of the variables has been done based on ease of interpretation of estimated coefficients. Most variables are used in ratio or percentage terms, and for the remaining variables, we have considered their respective natural logarithmic forms to capture their rate of change rather than absolute change. However, in case of the variable – mean years of schooling (ays) – we have retained its level form.

Table 2

Summary Statistics

Variables	Ν	Mean	Std. Dev.	Min	Max	Form
Mean Years of Schooling (ays)	552	8.42	3.06	1.10	13.10	level
Globalization Index (kof)	552	63.62	15.74	24.74	92.19	log
Economic Dimension (kofe)	552	63.23	16.69	18.12	92.45	log
Social Dimension (kofs)	552	55.41	21.83	12.62	92.49	log
Political Dimension (kofp)	552	75.35	16.43	22.46	98.30	log
Financial Openness (fo)	552	5.97	6.17	-9.31	45.07	level
Trade Openness (to)	552	81.94	35.35	16.68	199.68	level
Per Capita GDP (gdppc)	552	18,584.8	19,007.56	677.53	132,514.50	log
Public Spending on Education (eeg)	552	4.54	1.45	1.00	10.68	level
Pubic Spending on Health (heg)	552	4.18	2.11	0.55	9.96	level
Urbanization (urb)	552	59.18	21.75	9.38	99.06	level
Pupil-Teacher Ratio - Primary (ptrp)	552	23.95	13.58	8.68	94.61	level
Pupil-Teacher Ratio - Secondary (ptrs)	552	16.87	8.19	7.06	80.05	level
Female Labor Force Participation (flf)	552	42.28	7.50	11.79	54.31	level
Age Dependency Ratio (adr)	552	57.92	17.74	17.03	112.31	level

In figures 1 to 4, we present matrices of scatter-plots of some variables of the study. In figure 1, the relationship between average years of schooling and globalization (as represented by the KOF Index) appears to be positive. More globalized countries seem to have a better-educated population, although a causal link cannot be established at this point. Next, as hypothesized earlier,

the plot between education outcomes and per capita GDP conveys a positive association, albeit with a few outliers.



Figure 1 Matrix Plot 1

Notes: 'lgdppc' – natural log of GDP per capita; In the matrix of plots above, cell (1,2) contains the scatter plot between average years of schooling and KOF Index of Globalization, and cell (1,3) contains the plot between average years of schooling and natural log of per capita GDP.



Figure 2 Matrix Plot 2

Notes: In the matrix of plots above, cell (1,2) contains the scatter plot between average years of schooling and public expenditure on education as a proportion of GDP, and cell (1,3) contains the plot between average years of schooling and expenditure on education as a proportion of GDP.



Figure 3 Matrix Plot 3

Notes: Cells (1,2) and (1,3) contain the scatter plots between average years of schooling and pupil-teacher ratio at the primary level, and between average years of schooling and pupil-teacher ratio at the secondary level respectively.



Figure 4 Matrix Plot 4

Notes: Cell (1,2) contains the scatter plot between average years of schooling and urbanization, cell (1,3) contains the plot between average years of schooling and female labor force participation, and cell (1,4) contains the plot between average years of schooling and age dependency ratio.

Next, in Figures 2 and 3, we examine the relationship between average educational attainment (ays) and variables related to government expenditure in human capital as a share of GDP and educational inputs (Pupil-teacher ratios at primary and secondary level). There is no clear association emerging from the plot between average years of schooling (ays) and the government expenditure on education (as % of GDP) (eeg). In the case of a few countries (outliers in the plot), higher spend on education as a proportion of their GDP do not translate into better educational attainments. Similar outliers are present in the scatter plot between 'ays' and health expenditure (as % of GDP) (heg), but a semblance of a positive relationship between the two variables comes through. This is in accordance our hypothesis as higher spending on health is expected to ensure better health of the population, which in turn is argued to prevent dropouts from school because of poor health. As far as the associations between 'ays' and pupil-teacher ratios ('ptrp' and 'ptrs') are

concerned, there is a negative relationship between 'ays' and 'ptrp' and between 'ays' and 'ptrs', although the latter relationship is not as clear. This directionality in the two sets of associations is also along the expected lines. This is because a lower pupil-teacher ratio potentially indicates a more significant amount of individual attention by a teacher to a given student, enhancing his/her learning outcomes.

Some of the remaining scatter plots between educational outcomes and control variables are given in Figure 4. The association between 'ays' and urbanization is positive and between 'ays' and age dependency ratio is negative, a few outliers notwithstanding. Although a positive relationship is expected between 'ays' and female participation in the labour force (as conjectured earlier), the scatter plot does not offer a clear explanation.

In summary, it can be concluded from the scatter plots that countries that are characterized by higher educational outcomes are the ones where public spending on health as proportion of GDP is higher, pupil to teacher ratio at primary level is lower, urban population as a percentage of total population is higher, and lesser proportion of total population of the country is dependent on those in labor force. This being not conclusive, we move to the empirical results to ascertain the relationships.

4.1.1 Empirical Results

In this study, we intend to empirically ascertain the relationship between globalization and educational outcomes across countries. Specifically, we investigate the impact of globalization and its three dimensions – economic, social, and political – on education achievements characterized by mean years of schooling in a country after controlling for other factors that are related to educational outcomes.

Tables 3, 4, and 5 present the results where various versions of the base model from section 3.4 are estimated for all sample countries. This is done by performing Fixed Effects panel data regression following the method derived in Baltagi and Wu (1999) that accommodates unbalanced panels with observations which are unequally spaced over time. The measures of globalization are KOF index of globalization(kof) and its three dimensions – economic (kofe), social (kofs), and political (kofp), financial openness (fo), and trade openness (to).

4.1.1.1 Globalization and Education

Table 3

Association between globalization (lkof) and education outcomes across the world (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3	Model 4
	1 252***	0.022***	0.755***	0.757***
IKOI	1.353***	0.833***	0.755***	0.757***
	(0.28)	(0.27)	(0.27)	(0.27)
lgdppc	1.384***	1.081***	0.879***	0.876***
	(0.12)	(0.13)	(0.14)	(0.14)
eeg		0.0325*		0.00287
		(0.02)		(0.02)
urb		0.0444***	0.0311***	0.0312***
		(0.01)	(0.01)	(0.01)
flf		0.0969***	0.0815***	0.0809***
		(0.01)	(0.01)	(0.01)
heg			0.0716***	0.0720***
			(0.02)	(0.02)
adr			-0.0156***	-0.0150***
			(0.01)	(0.01)
ptrp			-0.0171***	-0.0145**
			(0.01)	(0.01)
ptrs				-0.007
				(0.01)
fcd			0.0395*	0.0399*
			(0.02)	(0.02)
Observations	552	552	552	552
Number of Countries	112	112	112	112
Country Effects	RE	RE	RE	$RE^{\#}$

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics - Hausman Test - # Prob>chi2 = 1.0000. The null hypothesis of the country-level effects being adequately modelled by random effects cannot be rejected at the significance level of 1%. We choose Random effects model.

It can be seen from the regression coefficients in table 3 that an increase in the level of globalization in a country is associated with an enhancement in the educational outcomes of the country. In various specifications, the results show that a percentage improvement in the globalization index of a country sees a contemporaneous increase of 0.007 to 0.014 in average years of schooling of the same country. This effect is significant in all specifications, although the
economic significance is low. That there exists a statistically significant relationship is in consonance with Carnoy (2005) who conjectured globalization to have a profound impact on transmission of knowledge. An argument goes that the current world economy is knowledge-driven and rewards those who are skilled and educated. This incentivizes individuals to acquire greater skills and become more aware and thus prompts policymakers to allocate further resources to meet the increased social demand for education. Moreover, as per Carnoy, Hallak and Caillods (1999), the education reforms are driven by equity concerns as well as competition and financial concerns. This is to say that globalization could have a positive effect on the distribution of educational achievements, although we have not tested the same. To summarize, in case of our study, all pathways led to compensation hypothesis reigning over efficiency hypothesis, whereby the educational outcomes grew in the wake of globalization as the political machinery responded positively to the increasing demand for higher education and skilling.

Furthermore, most of the control variables used in the regressions return coefficients with expected signs where the coefficients on per capita GDP (lgdppc), spending on health (as % of GDP) (heg), public spending on education (as % of GDP) (eeg), urbanization (urb), pupil-teacher ratio at primary school level (ptrp), female labor force participation (flf), and age dependency ratio (adr) show statistical significance in at least one of the variants listed in Table 3. Specifically, GDP per capita, urbanization, the participation of females in the overall labour force, and age dependency ratio are the factors that seem to have a major bearing on education outcomes in a country. The financial crisis dummy exhibits a statistically significant positive coefficient pointing towards a thesis that financial crisis led to people going back to school and improving their educational credentials. Anecdotal evidence provides further support to this conjecture¹¹.

As a robustness check, we have performed regressions which correct for heteroscedasticity, auto-correlation and cross-sectional dependence for all specifications. This method has been proposed by Driscoll and Kraay (1998). However, in this method, the aspect of panels being unequally spaced has not been accounted for. The results are listed in Appendix B. Most of the regression coefficients in Table B.1 are in line with the coefficients obtained by the Baltagi and Wu (1999) method.

¹¹ According to Stanford economist Caroline Hoxby, enrolment in higher education has increased in every recession since the 1960s (Parker, 2015). Retrieved from http://news.stanford.edu/2015/03/06/higher-ed-hoxby-030615/.

To account for the potential endogeneity in the relationship between globalization and the educational outcomes in a country due to omitted variables, we employ instrumental variable (IV) strategy. Doing so, we further check for the robustness of our findings. For IV analysis, instrument(s) that is (are) highly correlated with globalization but has no direct effect on educational achievements in a country was (were) sought. We borrowed one such variable from Cho (2013), who used one of the indicators of the social dimension of KOF Globalization Index – 'cultural proximity to western cultures' - in his study. Dreher (2006) defined cultural proximity of a country to western cultures by simply considering the number of McDonald's outlets in the country. We found a high correlation between the instrument and KOF Globalization Index (lkof). Moreover, we safely argue that having a certain number of McDonald's outlets would not directly affect the education systems in a country. Hence, we proceed with the estimation by adopting a two-way fixed effects (2SLS) method for panel data. Table B.9 in Appendix B contains the results. The results allude towards a possible positive causal relationship between globalization and average educational attainment in a country at conventional levels of statistical significance. While the statistical significance of the relationship between some of the other variables and average years of schooling disappears, the signs remain true to our earlier hypotheses.

4.1.1.2 Dimensions of Globalization and Education

Table 4

Association between globalization (lkofe, lkofs, lkofp) and education outcomes across the world (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3	Model 4
lkofe	0.378**			0.214
	(0.162)			(0.181)
lkofs		0.133		0.0965
		(0.203)		(0.206)
lkofp			0.140	0.114
			(0.164)	(0.168)
lgdppc	0.939***	0.678***	0.659***	0.555***
	(0.135)	(0.136)	(0.138)	(0.163)
urb	0.0318***	0.0620***	0.0659***	0.0634***
	(0.00749)	(0.0143)	(0.0147)	(0.0144)
flf	0.0819***	0.0294	0.0245	0.0270
	(0.0122)	(0.0202)	(0.0206)	(0.0205)

adr	-0.0167***	-0.0436***	-0.0408***	-0.0454***
	(0.00545)	(0.00919)	(0.00919)	(0.00923)
heg	0.0757***	0.0455**	0.0471**	0.0488**
	(0.0212)	(0.0214)	(0.0212)	(0.0215)
eeg	0.00779	0.00947	0.0108	0.00913
	(0.0186)	(0.0185)	(0.0181)	(0.0185)
ptrp	-0.0139**	-0.0104	-0.0104	-0.0104
	(0.00598)	(0.00684)	(0.00686)	(0.00689)
ptrs	-0.00656	-0.00546	-0.00574	-0.00567
	(0.00602)	(0.00622)	(0.00619)	(0.00623)
fcd	0.0442*	0.0251	0.0226	0.0295
	(0.0240)	(0.0224)	(0.0222)	(0.0231)
Observations	552	440	440	440
Number of Countries	112	96	96	96
Country Effects	RE [#]	FE	FE	FE

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics - Hausman Test - # Prob>chi2 = 0.9971. The null hypothesis of the country-level effects being adequately modelled by random effects cannot be rejected at the significance level of 1%. We choose random effects model.

While the coefficients of the rest of the variables listed in the regressions in tables 4 and table 5 maintain consistency with respect to their sign and statistical significance as compared to those in table 3, the association between the globalization variables and our dependent variable is less clear. Of the three dimensions of globalization, only the economic attribute of globalization seems to have a statistically significant relationship over education outcomes in a country. To cite an instance, in regression 1 of table 4, a hike of one percent in the economic dimension of KOF globalization index is accompanied by a contemporaneous increase of 0.00378 in average years of schooling.

Economic globalization encompasses trade flows and financial flows along with elements of trade liberalization such as import barriers, taxes and tariff rates, capital account restrictions, etc. All these facets of economic globalization combine to affect educational outcomes in a country through the channel of economic growth (Dreher, 2006; Rao & Vadlamannati, 2010; Tomohara & Taki, 2011; Gurgul & Lach, 2013) leading to higher income (increasing GDP per capita), in turn resulting in greater disposable income enhancing the ability to spend on schooling and supplemental education (tuitions, study material, MOOCs etc.), and a higher degree of public spending on education and health in quest for better human capital outcomes.

Social and political dimensions of globalization also have a positive impact on educational attainments, although without the effect being statistically significant. In case of the social aspect of globalization, societies have come closer owing to the flow of information and communication, impacting the life and work of its people and their families. The increasing flow of information has come through newer sources of knowledge sharing and dissemination such as cell phone, internet, and television among others and has played a massive role in expanding scope and breadth of individuals and societies across the world. This expansion in scope manifests itself in the form of geographical mobility (migration, urbanization, etc.), increase in awareness (introducing newer choices), enhancement of skillset, etc., further giving rise to economic as well as social mobility. Improvement in educational outcomes, thus, is one of the by-products of economic and social mobility.

Finally, in KOF index of globalization, a country's political dimension of openness is characterized by elements such as the presence of embassies in the country, its membership in international organizations, participation in UN Security Council Missions, and the country's role in international treaties. Although neither of these factors is expected to have a direct bearing on the way education is managed in the country or the outcomes, there could be indirect pathways passing through the course of diplomacy, (a need to abide by) international regulations, competition, and the emergence of new political structures. The results obtained w.r.t. the effect of the dimensions of globalization on educational outcomes are broadly comparable with those achieved in Jani (2016), both regarding the direction of the effect and its statistical significance.

4.1.1.3 Indicators of Globalization and Education

In table 5, while the financial openness measure (sum of FDI inflows and outflows in a country as percentage of its GDP) bears a negative coefficient, the trade openness measure (sum of imports and exports of a country as a proportion of its GDP) exhibits a positive relationship with the average educational outcomes in a country, albeit statistically insignificant one in all specifications. This is a surprising finding as 'fo' and 'to' make up for almost 25 percent of the economic dimension of the KOF Globalization Index (kofe) and the latter impacts average years of schooling positively.

Table 5

Association between globalization (fo, to) and education outcomes across the world (Dependent

VARIABLES	Model 1	Model 2	Model 3
to	0.00112		0.00130
	(0.000983)		(0.000995)
fo		-0.00155	-0.00189
		(0.00160)	(0.00163)
lgdppc	0.980***	1.035***	0.986***
	(0.137)	(0.131)	(0.138)
urb	0.0330***	0.0324***	0.0329***
	(0.00754)	(0.00754)	(0.00754)
flf	0.0840***	0.0860***	0.0841***
	(0.0122)	(0.0122)	(0.0122)
adr	-0.0187***	-0.0172***	-0.0190***
	(0.00557)	(0.00547)	(0.00557)
heg	0.0766***	0.0694***	0.0757***
	(0.0218)	(0.0212)	(0.0218)
eeg	0.00903	0.00680	0.00801
	(0.0188)	(0.0186)	(0.0188)
ptrp	-0.0146**	-0.0150**	-0.0146**
	(0.00604)	(0.00597)	(0.00603)
ptrs	-0.00699	-0.00645	-0.00678
	(0.00607)	(0.00603)	(0.00607)
fcd	0.0322	0.0331	0.0292
	(0.0240)	(0.0238)	(0.0241)
Observations	552	552	552
Number of Countries	112	112	112
Country Effects	RE	$RE^{\#}$	RE

Variable – 'ays')

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics - Hausman Test - # Prob>chi2 = 0.4056. The null hypothesis of the country-level effects being adequately modelled by random effects cannot be rejected at the significance level of 1%. We choose Random effects model.

Given the results discussed earlier, the two measures, especially trade openness, should have had a statistically significant positive association with education outcomes considering that exchange of goods and services across national borders involves the movement of labour and capital and this movement necessitates a thriving exchange of skill and knowledge. Moreover, there is also the channel of economic growth as trade integration is said to have a positive effect on economic growth (Afonso, 2001; Busse & Koniger, 2012) and hence on income and standard of living (Frankel & Romer, 1999).

In tables 4, and 5, most of the control variables behave in an expected manner by maintaining their respective direction of relationship (positive or negative) with educational achievements in a country conforming to the explanations given in sections 3.2 and 3.3.

The regression results in tables B.2 and B.3 lend robustness to our findings as they return more statistically significant relations between the globalization variables and the dependent variable. In fact, in all regressions of table B.3, the measure of trade openness carries statistically significant positive coefficients; this, in turn, is more in line with the results obtained earlier. In the next few sets of regressions, we classify countries based on income level and geographical regions and estimate similar specifications.

4.1.1.4 Country Classifications

The country classifications in this section have been done based on income and geographical regions. For this, we have taken cues from classifications done by the World Bank. The World Bank has divided the countries into four income groups – low, lower-middle, upper-middle, and high. The income thresholds for the same are \$1,025 or less; between \$1,026 and \$4,035; between \$4,036 and \$12,475; \$12,476 or more respectively, as of 2015. We have combined the countries on the lower end of the income spectrum - the low and the lower-middle – together and termed them 'low-income countries' in our study. Similarly, the upper rungs in the income spectrum – upper-middle and high – have been clubbed together and are termed 'high-income countries'. As for geographical regions, the World Bank placed countries into seven groups (East Asia and Pacific, South Asia, Sub-Saharan Africa, Latin America and the Caribbean, Middle East and North Africa, Europe and Central Asia, and North America) for administrative purposes. We have further combined the groups and are left with – one, Europe and North America, South Asia and Sub Saharan Africa, and Rest of the Word – for our analysis. Tables 6 through 10 furnish the regression results.

Table 6

Association between globalization and education outcomes in the High-Income Countries (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3
lkof	0.649***		
	(0.232)		
lkofe		0.178	
		(0.174)	
lkofs		0.135	
		(0.182)	
lkofp		0.233**	
		(0.114)	
fo			-4.77E-05
			(0.000)
to			-0.000163
			(0.001)
lgdppc	0.364***	0.420***	0.585***
	(0.133)	(0.135)	(0.110)
heg	0.0121	0.0291	0.0303*
	(0.015)	(0.018)	(0.018)
urb	0.0513***	0.0486***	0.0477***
	(0.014)	(0.014)	(0.014)
ptrp	-0.00131	-0.000287	0.00182
	(0.008)	(0.008)	(0.008)
ptrs	-0.0204**	-0.0224**	-0.0204**
	(0.009)	(0.009)	(0.009)
flf	0.0420***	0.0428***	0.0620***
	(0.016)	(0.017)	(0.017)
adr	-0.0138	-0.0158	-0.0205*
	(0.010)	(0.010)	(0.011)
fcd	0.0353*	0.0281	0.0242
	(0.019)	(0.021)	(0.020)
Observations	459	446	448
Number of Countries	69	67	68
Country Effects	FE	FE	FE

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Tables 6 and 7 provide a comparison of the impact of globalization on the education outcomes for countries differing in income status. The coefficient on KOF Globalization Index (lkof) for high-income countries is statistically significant and markedly higher than in the case of low-income countries. From this, it can be construed that globalization has a greater bearing on education outcomes in high-income countries than in low-income countries. It has been

documented in the literature that higher income countries have been able to extract the benefits of globalization in a better way than their lower income counterparts, sometimes at the expense of the latter. It may also be so that low-income countries are not fully equipped to tap the opportunities created by globalization owing to a low resource base. For example, globalization might bring in newer technologies of production by means of technology transfers from more accomplished nations and an opportunity for the labour force to enhance their skills and improve total factor productivity. However, the labour force might then lack the basic wherewithal in terms of education and minimum skillset to be able to adopt higher technologies, hence keeping them at the same status of expertise as before.

Apropos the dimensions of globalization, the political dimension of the KOF index seems to have a greater association with educational attainments in high-income countries while the economic dimension is more forceful than the other two attributes of globalization in impacting average educational outcomes in low-income countries. It is intuitively clear that the pathway of economic growth is more at work for low-income countries. In fact, the higher coefficient magnitude of GDP per capita on average years of schooling for low-income countries than for high-income countries further vindicates this point. The same channel can be argued to have hit a saturation level in case of high-income countries. In wealthier countries, diplomatic channels combine to dominate and advance the educational achievements. The regression coefficients on measures of financial openness and trade openness continue to be statistically insignificant as can be seen in tables 6 and 7.

Among the rest of the control variables, public expenditure on health as a percentage of GDP (heg) bears positive and statistically significant coefficient in regressions 3 for high-income countries but the positive relation between 'heg' and 'ays' is not statistically significant for low-income countries. The relationship between pupil-teacher ratio at the secondary level of schooling and average years of schooling (ays), and between female labour force participation and 'ays' are statistically significant in case of high-income countries only. All other control variables carry forward their behaviour as found in the earlier set of regressions.

The regressions carrying Driscoll and Kraay standard errors for their respective coefficients as listed in table B.4 and B.5 provide solidity to our main findings as more number of coefficients here are statistically significant while maintaining the signs intact, except in the case of age dependency ratio. There is a negative and statistically significant relationship between age dependency ratio and average years of schooling for low-income countries and a positive and statistically significant relation between the two variables for high-income countries in these regressions. The population in richer countries is more aged on an average, e.g. Germany, US, Japan etc. The proportion of those above the age of 65 is relatively higher than those below the age of 15 in the make-up of the dependent population. In case of low-income countries, the proportion of under-15 age group is greater. Thus, the above set of relationships reign as the older bunch of population is expected to have greater education levels than those who are yet to complete their education.

Table 7

VARIABLES	Model 1	Model 2	Model 3
lkof	0.439		
	(0.413)		
lkofe		0.357**	
		(0.162)	
lkofs		0.158	
		(0.169)	
lkofp		-0.0686	
		(0.134)	
fo			-0.0037
			(0.004)
to			-0.00208
			(0.001)
lgdppc	0.490*	0.590**	0.921***
	(0.276)	(0.191)	(0.207)
eeg	0.0141		0.0232
	(0.021)		(0.024)
heg		0.0132	
		(0.020)	
urb	0.0683**	0.0413*	0.0636**
	(0.028)	(0.024)	(0.031)
ptrp	-0.00206	0.00465	-0.00328
	(0.007)	(0.005)	(0.008)
ptrs	0.00303	-0.00175	0.00148

Association between globalization and education outcomes in the Low-Income Countries (Dependent Variable – 'avs')

	(0.006)	(0.004)	(0.006)
flf	-0.0152	0.0326	-0.0337
	(0.030)	(0.025)	(0.032)
adr	-0.0245*	-0.0199**	-0.0118
	(0.013)	(0.010)	(0.014)
fcd	0.0553	0.0668**	0.0700*
	(0.040)	(0.030)	(0.042)
Observations	161	249	156
Number of countries	46	52	45
Country Effects	FE	FE	FE

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

In tables 8, 9 and 10, we observe the region-wise comparison of the effect of globalization on education outcomes in a country. The results obtained for geographical groupings provide a degree of robustness to the results obtained in case of income groupings. South Asia and Sub Saharan African countries are mostly poor, while the countries slotted in the geographical regions of North America and Europe belong to the other end of the spectrum. In line with the expectations, per capita GDP (gdppc) has a higher positive impact on average years of schooling (ays) for former group of countries. Most of the other coefficients also exhibit similar behaviour as in the case of income classification regressions and can be explained in similar ways.

Table 8

Association between globalization and education outcomes in Europe and North America (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3
lkof	-0.16		
	(0.259)		
lkofe		-0.142	
		(0.187)	
lkofs		-0.0573	
		(0.194)	
lkofp		0.0179	
		(0.150)	
fo			-1.71E-05
			0.000
to			-0.000882

			(0.001)
lgdppc	0.359**	0.370**	0.349***
	(0.147)	(0.153)	(0.132)
heg	0.0245	0.0227	0.0164
	(0.022)	(0.023)	(0.023)
urb	0.0970***	0.0950***	0.0939***
	(0.022)	(0.022)	(0.023)
ptrp	0.000375	0.00029	-0.000246
	(0.013)	(0.014)	(0.013)
ptrs	-0.00417	-0.00363	-0.0062
	(0.014)	(0.014)	(0.014)
flf	0.0648***	0.0661***	0.0591***
	(0.019)	(0.019)	(0.018)
adr	-0.00792	-0.00837	-0.00479
	(0.015)	(0.015)	(0.015)
fcd	-0.00383	-0.00704	-0.000971
	(0.023)	(0.024)	(0.022)
Observations	260	254	260
Number of countries	38	37	38
Country Effects	FE	FE	FE

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 9

Association between globalization and education outcomes in South Asia and Sub Saharan Africa (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3
lkof	-0.349		
	(0.312)		
lkofe		-0.00422	
		(0.173)	
lkofs		0.09	
		(0.249)	
lkofp		-0.354*	
		(0.177)	
fo			-0.000166
			(0.003)
to			-0.00397*

			(0.002)
lgdppc	0.859***	0.854***	1.197***
	(0.179)	(0.169)	(0.112)
eeg	0.0161	0.0135	0.0248
	(0.016)	(0.016)	(0.024)
heg	0.0165	0.016	0.03
	(0.020)	(0.021)	(0.027)
urb	0.0386**	0.0373**	
	(0.018)	(0.017)	
gerp	0.00857***	0.00929***	0.00414
	(0.003)	(0.003)	(0.004)
gers			0.0114**
			(0.006)
ptrp	-0.0135**	-0.0135**	-0.0170**
	(0.006)	(0.006)	(0.007)
ptrs	-0.000221	9.13E-05	-0.00667
	(0.004)	(0.004)	(0.005)
adr	-0.0325***	-0.0335***	-0.0559***
	(0.008)	(0.008)	(0.009)
fcd	-0.0193	-0.0114	0.0305
	(0.032)	(0.033)	(0.043)
Observations	102	102	97
Number of countries	32	32	31
Country Effects	FE	FE	FE

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 10

Association between globalization and education outcomes in the rest of the regions apart from those in tables 8 and 9 (Dependent Variable – 'ays')

VARIABLES	Model 2	Model 4	Model 6
lkof	1.160***		
	(0.344)		
lkofe		1.060**	
		(0.440)	
lkofs		0.449	
		(0.430)	
lkofp		0.117	

		(0.323)	
fo			-0.00536*
			(0.003)
to			-9.33E-05
			(0.001)
lgdppc	0.326*	0.0514	0.777***
	(0.195)	(0.361)	(0.162)
heg	0.00973		0.0249
	(0.021)		(0.029)
urb	0.0262*	0.0459*	0.0171
	(0.015)	(0.025)	(0.016)
ptrp	-0.000682	-0.0255	0.00216
	(0.010)	(0.019)	(0.010)
ptrs	-0.00664	-0.00234	-0.00171
	(0.008)	(0.018)	(0.009)
flf	0.00603	0.0707*	0.0362
	(0.021)	(0.041)	(0.024)
adr	-0.019	-0.0712***	-0.0237*
	(0.012)	(0.019)	(0.013)
fcd	0.0700**	0.117**	0.0671**
	(0.031)	(0.050)	(0.034)
Observations	299	283	283
Number of countries	52	51	51
Country Effects	FE	FE	FE

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

4.2 Globalization and Inequality

Now, we present the results which attempt to discern the association between globalization and income inequality in a country through the channel of education. We start by listing the descriptive statistics in table 11.

Table 11

Summary Statistics

Variables	Ν	Mean	Std. Dev.	Min	Max	Form
Gini Coefficient (gini)	421	36.732	8.943	23.72	63.38	log
Mean years of Schooling (ays)	421	9.970	1.965	3.6	13.1	level
Globalization Index (kof)	421	72.994	12.740	36.88	92.63	log

Per Capita GDP (gdppc)	421	25,384.880	17,002.110	1,374.2	95,577.9	log
Total Population (pop)	421	2.57E+07	4.18E+07	206962	3.09E+08	log
Government Consumption	421	17.388	4.510	6.344	28.064	level
Expenditure (gfce)						
Labor Force with Secondary	421	45.226	16.341	1.4	79.1	level
Education (lfse)						
Employment in Agriculture	421	13.280	12.738	0.6	82	level
(ae)						
Employment in Industry (ie)	421	24.165	6.184	3.4	41.7	level
Employment in Services (sse)	421	61.882	11.596	14.6	84.2	level
Inflation (infl)	421	5.119	6.138	-4.480	66.007	level

Figure 5 displays the matrix plot where we focus on the graphical representation of the relationships between economic inequality and per capita GDP, economic inequality and globalization, and economic inequality and average years of schooling. Although not perfectly clear, there appear to be negative correlations between each set of variables. Prima facie, our study seems to be siding with the literature which supports a decline in income inequality as the forces of globalization become stronger in a country. The negative relationship between income inequality and per capita GDP is not definitively expected as per theory and prior literature. To understand the relationships further, we proceed to the regression results and subsequently attempt to explain the findings.



Figure 5 Matrix Plot 5

Notes: 'lgdppc' – natural log of GDP per capita; In the matrix of plots above, cell (1,2) contains the scatter plot between Gini Coefficient and natural log of Per Capita GDP, cell (1,3) contains the plot between Gini Coefficient and KOF Globalization Index, and cell (1,4) contains the plot between Gini Coefficient and Average Years of Schooling.

4.2.1 Empirical Results

Our main enquiry in this study is whether the effect of globalization on economic inequality is higher at higher levels of education. That is, we shall be focusing on the estimated coefficient on the interaction between globalization variable (lkof) and education outcomes (ays). The coefficient is to be interpreted as the amount of change on the slope of the regression of income inequality (lgini) on globalization when mean years of schooling in a country changes by one unit. To this effect, we have estimated various specifications using the method derived in Baltagi and Wu (1999) for unequally spaced panels. Our main dataset of income inequality measure as Gini coefficients extracted from World Development Indicators, The World Bank Data. We conduct robustness checks on our empirical results by considering Gini coefficients from Estimated Household Income Inequality (EHII) database, University of Texas Inequality Project and Lessmann and Seidel (2017) and see if they remain consistent.

To start with, let is focus our attention on Regression 4 in table 12. Once we include the estimated coefficients, the model looks like –

lgini = 1.785 - 0.298 * lkof - 0.215 * ays + 0.0446 * kofaysint + Rest of the terms

Table 12

Association between Globalization and Income Inequality (WDI Data) (Dependent Variable – 'lgini')

VARIABLES	Model 1	Model 2	Model 3	Model 4 ^{\$}	Model 5
lkof	-0.393*	-0.363	-0.370	-0.298	-0.232
	(0.232)	(0.229)	(0.233)	(0.232)	(0.230)
ays	-0.265**	-0.246**	-0.220**	-0.215**	-0.158
	(0.107)	(0.107)	(0.107)	(0.107)	(0.106)
kofaysint	0.0554**	0.0532**	0.0463*	0.0446*	0.0303
	(0.0258)	(0.0256)	(0.0257)	(0.0257)	(0.0254)
lgdppc	0.438	0.617*	0.402	0.810**	0.592**
	(0.317)	(0.316)	(0.324)	(0.316)	(0.290)
lgdppc2	-0.0271	-0.0370**	-0.0276	-0.0462***	-0.0371**
	(0.0168)	(0.0168)	(0.0169)	(0.0167)	(0.0153)
lpop		0.0164	0.0175	0.0148	0.0182*
		(0.0118)	(0.0108)	(0.0111)	(0.00977)
gfce		-0.00717***	-0.00886***	-0.00789***	-0.00982***
		(0.00191)	(0.00200)	(0.00195)	(0.00198)
lfse		-0.000285	-0.000391	-0.000279	-0.000250
		(0.000469)	(0.000478)	(0.000477)	(0.000487)
infl			-0.0000398	-0.000142	0.000287
			(0.000602)	(0.000593)	(0.000620)
ae			-0.00378***		
			(0.00146)		
ie				-0.00356**	
				(0.00163)	
sse					0.00504***
					(0.00111)
fcd			0.00481	0.00182	0.00120
			(0.00682)	(0.00699)	(0.00698)
Observations	421	421	421	421	421
Country Effects	$RE^{#1}$	RE	RE ^{#2}	RE	RE

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics - Hausman Test - #1 Prob>chi2 = 0.6394, #2 Prob>chi2 = 0.1900. The null hypothesis of the country-level

effects being adequately modelled by random effects cannot be rejected at the significance level of 1%. We choose Random effects model; Inflection point in the non-linear relationship between Income Inequality and Per Capita GDP - $\frac{\exp(-(0.810)}{(2^*-0.0462)} = \frac{6412.47}{2}$.

'kofaysint' represents the interaction between KOF Globalization Index (lkof) and average years of schooling (ays). Looking at the model, it can be said that the effect of Globalization on income inequality is not limited to its own coefficient of -0.298 but is different for different values of 'ays'. The same is represented by -0.298 + 0.0446 *ays. Hence, the coefficient on lkof, i.e. -.298 can be interpreted as the unique value of globalization on income inequality only when ays = 0. Our main parameter of interest here is the coefficient on 'kofaysint'. From the expression -0.298 + 0.0446*ays, it can be construed that as education level in a country increases, the ameliorative effect of globalization decreases. In other words, when ays = 0, an increase of a percent in KOF globalization leads to a drop in economic inequality (represented by a decrease in Gini coefficient if income inequality) by 0.298 percent. However, as educational achievements in the country increase and assuming the average years of schooling attains a value of two, then if a country becomes more open (an increase in KOF globalization index by one percent), the income inequality lessens by a lower extent, i.e. (0.298 - 2*0.0446 =) 0.2088 percent. The turnaround point, in this case, i.e. the point where increasing globalization worsens the income inequality occurs at (0.298/0.0446 =) 6.68 mean years of schooling in a country. Similar figures emerge in case of other specifications as well. To the best of our knowledge, there is no support in the literature for the obtained value of the turnaround point of approximately 6.7 average years of schooling. This is one of the contributions of this study and further robustness checks by way of alternative data sources, and/or specifications, and/or estimators, need to be performed to establish this result.

As for the control variables in these regressions, the coefficients on most of them show expected behaviour with some being statistically significant. In all specifications, GDP per capita displays a non-linear relationship with income inequality. Taking the specific case of regression 4, 'lgdppc' shows an inverted U-shape profile with respect to income inequality with the inflection point occurring at \$6412.47. This finding is consistent with Kuznets inverted U-curve hypothesis wherein as an economy develops, economic inequality first rises and then at a certain stage of development, it falls. The turnaround point obtained in our study also approximately matches the figure of \$6000 obtained in Kapstein and Milanovic (2002).

The rest of the statistically significant and expected coefficients include a positive relationship between the size of the country (lpop) and income inequality and a negative relationship between the size of the government proxied by 'gfce' and the dependent variable. Occupation structure was also taken as one of the control variables in this study. While the proportion of workers in agriculture in the total labour force and the workers in the industrial sector as a percentage of the total labour force bear a negative association with income inequality, a higher service sector employment in the labour force contemporaneously worsens economic inequality. All three relationships are statistically significant.

A similar set of regression models have been run with the data on the measure of inequality (lgini) extracted from EHII, University of Texas Inequality project and Lessmann and Seidel (2017) to check the robustness of the obtained empirical results. The same are listed in the appendix (Tables C.1 and C.2).

5. Summary and Conclusion

Previous studies have investigated the relationship between globalization and education outcomes and between globalization and income inequality in the context of a single country or country groupings (E.g. Latin American Countries, OECD Countries, etc.) due to the paucity of worldwide data. This paper attempts to bridge this gap in the literature in two parts. One, by probing the association between globalization (and its dimensions and indicators) and educational outcomes. Two, by examining how globalization relates to economic inequality through the pathway of education. Our dataset includes a panel of about 120 countries over a period of 20 years (1990 – 2013) including a wide number of developing and developed economies.

The results display a positive association between globalization and educational outcomes for the panel of countries. As a country becomes more open, various pathways converge and result in citizens of the country acquiring more education and enhancing their skill levels. Specifically, the compensation hypothesis seems to have the dominant effect as compared to the efficiency hypothesis as the government domain positively intervenes in response to the increasing public demand for higher education and skill formation.

Resolving globalization into its dimensions and then assessing their respective effects on education outcomes brought about an expected positive association between the economic aspect of globalization and schooling outcomes, and positive but numerically insignificant relationships for the other two dimensions (social and political) with education outcomes. Next, coming onto the measures of financial openness and trade openness as indicators of globalization, despite FDI (as proportion of GDP) and Trade (as proportion of GDP) weighing in for a net of approximately 25 percent of Economic Dimension of KOF globalization index, the two measures do not have a statistically significant impact on education outcomes, despite the latter having a positive as well as a statistically significant effect on the same.

With reference to the empirics on various classifications of countries, globalization was seen to have a higher effect on educational outcomes of high-income countries than on the educational attainments of the low-income countries. Moreover, it was found that political dimension of globalization imposes itself better than the other two dimensions in impacting the dependent variable for high-income countries. In case of low-income countries, economic globalization is more pivotal than social or political aspects of globalization in improving educational outcomes.

For the second part, the study yields an outcome wherein globalization improves the situation of economic inequality in a country, i.e. the forces of globalization work towards decreasing inequality in a country. The pre-condition to this is an initial condition where a high proportion of a country's population is illiterate, and in general, the educational attainment levels are very low. Beginning at this situation, as the people of the country start attaining education, the restorative effects of globalization on income inequality go down. The result can be explained in the following way: as the country opens up to the rest of the world, there is a spread of ideas and proliferation of information and technology. This creates a need for the people of the country to equip themselves with skills and higher education on account of higher returns to higher levels of education. In case the government is unable to respond to the demand due to lack of resources, it creates a situation where competition increases for the limited places in the system and those already endowed have better opportunities at acquiring those places. Even if gaps are filled with respect to the increasing demand for higher education, there are repercussions on the quality of deliverance at all levels of education as each level acts as a feeder to the next level and hence, are interconnected. In such a scenario, the already well-endowed accumulate further returns and worsen the income inequality existing in the society.

As for other associations, economic inequality in a country bears a non-linear relationship with income per capita and a positive relation with the size of the country (which is assumed to indicate heterogeneity in its population). A nation's economic inequality is also negatively dependent on the size of the public sector in the country and the degree of homogeneity in the skill-set/education levels of its population. Further, it was also found that a country with a higher proportion of its workforce engaged in agriculture and the manufacturing sector as compared to the proportion employed in the service sector is economically more equal.

Considering the results, it would be instructional for the government of a country to engage greater percentage of its resources in expanding the scope and quality of the education system. Expansion in education aggravates income inequality in a highly globalized country only when there exists heterogeneity in skill levels of its population which gives rise to the skill premium. Hence, it is imperative for the public sector to bridge the gap in educational achievements of the society at large by focusing on the quality aspect in addition to a general expansion of educational facilities at all levels.

One of the limitations of our study is that only a quantitative measure of educational outcomes has been considered. Hence, as a direction towards future research, average country scores in standardized examinations such as PISA, TIMSS etc. could be characterized to represent the quality aspect of educational achievements and can be hence utilized as the dependent variables in regressions like the ones conducted for this study once more such data points are available. A more granular region-wise analysis could also be conducted to understand other factors (groupings based on homogenous factors such as whether the country lies in the core region or the periphery, whether the country is highly industrialized and technology-driven or is it agriculture-based economy, political ideology of the country, etc.) that affect the linkage between globalization and education and educational outcomes in a country could be conducted. As the amount of interaction a given country indulges in with other countries is usually not determined exogenously, it would be instructive to employ instrumental variable approach in a similar study beyond what has already been done in this study.

For the second part, in future, we also intend to determine lagged effect of globalization (in interaction with educational outcomes) on income inequality. Additional robustness checks would involve the use of inequality indices from other data sources such as World Income Inequality Database (WIID) by UNU-WIDER, and World Wealth and Income Database (WID.world) by the economists from Paris School of Economics and University of California at Berkeley. Another possibility for analysis lies in using the change in inequality measure rather than the inequality measure itself. This would essentially take care of the inherent biases in level estimation, e.g. biases due to different definitions of welfare used in calculating inequality indices – wealth, income, and consumption expenditure, etc.

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Appendix A

Table A.1

Components of KOF Globalization Index

А.	Economic Integration	[35%]
	(i) Actual flows	{50%}
	Trade (in percentage of GDP)	(23%)
	Foreign direct investment (in percentage of GDP)	(29%)
	Portfolio investment (in percentage of GDP)	(27%)
	Income payments to foreign nationals (in percentage of GDP)	(22%)
	(ii) Restrictions	{50% }
	Hidden import barriers	(20%)
		(30%)
	Mean tariff rate Taxas on international trade (in percentage of current revenue)	(24%)
	Capital account restrictions	(26%)
B	Political Integration	[28%]
р.	Embassies in country	{ 3 4%}
	Membership in international organizations	{34%}
	Participation in UN Security Council missions	{32%}
C.	Social globalization	[38%]
	(i) Data on personal contact	{24%}
	Outgoing telephone traffic	(31%)
	Transfers (in percentage of GDP)	(9%)
	International tourism	(1%)
	Telephone average costs of call to USA	(33%)
	Foreign population (in percentage of total population)	
		(26%)
	(ii) Data on information flows	(26%) { 39% }
	(ii) Data on information flows Telephone mainlines (per 1000 people)	(26%) {39%} (18%)
	(ii) Data on information flowsTelephone mainlines (per 1000 people)Internet hosts (per capita)	(26%) { 39% } (18%) (15%)
	(ii) Data on information flowsTelephone mainlines (per 1000 people)Internet hosts (per capita)Internet users (as a share of population)	(26%) {39%} (18%) (15%) (18%)
	 (ii) Data on information flows Telephone mainlines (per 1000 people) Internet hosts (per capita) Internet users (as a share of population) Cable television (per 1000 people) Deile memory (per 1000 people) 	(26%) {39%} (18%) (15%) (18%) (16%)
	 (ii) Data on information flows Telephone mainlines (per 1000 people) Internet hosts (per capita) Internet users (as a share of population) Cable television (per 1000 people) Daily newspapers (per 1000 people) Padiag (per 1000 people) 	(26%) {39%} (18%) (15%) (18%) (16%) (16%)
	 (ii) Data on information flows Telephone mainlines (per 1000 people) Internet hosts (per capita) Internet users (as a share of population) Cable television (per 1000 people) Daily newspapers (per 1000 people) Radios (per 1000 people) 	(26%) {39%} (18%) (15%) (18%) (16%) (16%) (17%)
	 (ii) Data on information flows Telephone mainlines (per 1000 people) Internet hosts (per capita) Internet users (as a share of population) Cable television (per 1000 people) Daily newspapers (per 1000 people) Radios (per 1000 people) (iii) Data on cultural proximity 	<pre>(26%) {39%} (18%) (15%) (15%) (16%) (16%) (16%) (17%) {37%}</pre>

Source – Dreher (2006)

The sub-indices and variables have been combined using a statistical procedure. The subindices of globalization are individually constructed as follows. The variables as listed in table A.1 are transformed to an index on a scale of one to hundred, where hundred is the maximum value for the given variable over the period between 1970-2013 and one is the minimum value. Higher values of a variable would mean greater globalization. Then, principal components (PCA) analysis is used to calculate the weights for the sub-indices for the entire sample of countries and all years. PCA partitions the variance of the variables in each sub-group and the weights are then determined to maximize the variation of the resulting principal component so as for the indices to fully capture the variation. Finally, this procedure is then applied to sub-indices to finally derive the overall index of Globalization (Dreher, 2006).

Appendix B

Table B.1

Association between globalization (lkof) and education outcomes across the world (with standard errors corrected for heteroscedasticity, autocorrelation, and cross-sectional dependence) (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3	Model 4
lkof	1.674***	1.095***	1.199***	1.206***
	(0.343)	(0.161)	(0.171)	(0.166)
lgdppc	1.566***	1.084***	0.897***	0.884**
	(0.166)	(0.162)	(0.280)	(0.286)
eeg		0.0296		-0.0259
		(0.0172)		(0.0180)
urb		0.0328***	0.0265***	0.0272***
		(0.00488)	(0.00665)	(0.00653)
flf		0.152***	0.134***	0.131***
		(0.0166)	(0.0225)	(0.0238)
heg			0.0949***	0.107***
			(0.0222)	(0.0196)
adr			0.00520	0.00525
			(0.00700)	(0.00693)
ptrp			-0.00628	-0.00481
			(0.00686)	(0.00705)
ptrs				-0.00972
				(0.00672)
fcd			0.0921**	0.0931**
			(0.0367)	(0.0377)
Observations	552	552	552	552
Number of Countries	112	112	112	112
Country Effects	FE	FE	FE	FE

Notes: Driscoll Kraay standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics Performed - 1. Modified Wald Test to check for Heteroscedasticity. 2. Wooldridge's Test to check for autocorrelation.

Table B. 2

Association between globalization (lkofe, lkofs, lkofp) and education outcomes across the world (with standard errors corrected for heteroscedasticity, autocorrelation, and cross-sectional dependence) (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3	Model 4
lkofe	0.696***			0.451***
	(0.134)			(0.0880)
lkofs		1.155***		1.047**
		(0.298)		(0.334)
lkofp			0.0521	-0.207
			(0.155)	(0.221)
lgdppc	1.010***	0.967***	1.284***	0.881**
	(0.290)	(0.258)	(0.404)	(0.292)
urb	0.0298***	0.0238***	0.0356***	0.0215***
	(0.00692)	(0.00394)	(0.00671)	(0.00413)
flf	0.129***	0.124***	0.132***	0.120***
	(0.0249)	(0.0210)	(0.0257)	(0.0174)
adr	0.00359	0.00237	0.00394	0.00108
	(0.00770)	(0.00741)	(0.00707)	(0.00646)
heg	0.115***	0.101***	0.110***	0.106***
	(0.0168)	(0.0198)	(0.0199)	(0.0175)
eeg	-0.0135	-0.0274	-0.0234	-0.0169
	(0.0242)	(0.0165)	(0.0214)	(0.0237)
ptrp	-0.00293	-0.00379	-0.00417	-0.00252
	(0.00805)	(0.00846)	(0.00849)	(0.00919)
ptrs	-0.00777	-0.0109	-0.0101	-0.00896
	(0.00571)	(0.00686)	(0.00609)	(0.00623)
fcd	0.0973**	0.102**	0.0763	0.115**
	(0.0408)	(0.0377)	(0.0460)	(0.0392)
Observations	552	552	552	552
Number of Countries	112	112	112	112
Country Effects	FE	FE	FE	FE

Notes: Driscoll Kraay standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics Performed - 1. Modified Wald Test to check for Heteroscedasticity. 2. Wooldridge's Test to check for autocorrelation.

Table B. 3

Association between globalization (fo, to) and education outcomes across the world (with standard errors corrected for heteroscedasticity, autocorrelation, and cross-sectional dependence) (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3
to	0.00196*		0.00217**
	(0.000900)		(0.000901)
fo		-0.00483*	-0.00529*
		(0.00236)	(0.00253)
lgdppc	1.208***	1.339***	1.238***
	(0.337)	(0.378)	(0.342)
urb	0.0364***	0.0360***	0.0368***
	(0.00698)	(0.00634)	(0.00671)
flf	0.129***	0.132***	0.130***
	(0.0261)	(0.0280)	(0.0272)
adr	0.00140	0.00317	0.000708
	(0.00719)	(0.00804)	(0.00728)
heg	0.113***	0.103***	0.106***
	(0.0177)	(0.0162)	(0.0143)
eeg	-0.0159	-0.0197	-0.0125
	(0.0217)	(0.0193)	(0.0215)
ptrp	-0.00253	-0.00562	-0.00412
	(0.00893)	(0.00872)	(0.00933)
ptrs	-0.0106	-0.00876	-0.00938
	(0.00612)	(0.00567)	(0.00574)
fcd	0.0757	0.0660	0.0635
	(0.0448)	(0.0453)	(0.0447)
Observations	552	552	552
Number of Countries	112	112	112
Country Effects	FE	FE	FE

Notes: Driscoll Kraay standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics Performed - 1. Modified Wald Test to check for Heteroscedasticity. 2. Wooldridge's Test to check for autocorrelation.

Table B. 4

Association between globalization and education outcomes in the High-Income Countries (With standard errors corrected for heteroscedasticity, autocorrelation, and cross-sectional dependence) (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3
lkof	2.222***		
	(0.168)		
lkofe		0.446**	
		(0.177)	
lkofs		1.204***	
		(0.217)	
lkofp		0.539***	
		(0.098)	
fo			-0.000257
			0.000
to			0.00286***
			(0.001)
lgdppc	0.365**	0.380**	1.052***
	(0.116)	(0.154)	(0.224)
heg	0.0356**	0.0538**	0.0739***
	(0.012)	(0.019)	(0.021)
urb	0.0198**	0.00973	0.0177*
	(0.007)	(0.008)	(0.009)
ptrp	-0.0165***	-0.0139***	-0.00748
	(0.004)	(0.003)	(0.005)
ptrs	-0.0392***	-0.0440***	-0.0567***
	(0.004)	(0.004)	(0.009)
flf	0.116***	0.121***	0.133***
	(0.014)	(0.015)	(0.018)
adr	0.00580*	0.00518*	0.00437
	(0.003)	(0.003)	(0.005)
fcd	0.171*	0.164	0.118
	(0.089)	(0.092)	(0.076)
Observations	535	520	523
Number of countries	76	74	75
Country Effects	FE	FE	FE

Notes: Driscoll Kraay standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics Performed - 1. Modified Wald Test to check for Heteroscedasticity. 2. Wooldridge's Test to check for autocorrelation.

Table B. 5

Association between globalization and education outcomes in the Low-Income Countries (With standard errors corrected for heteroscedasticity, autocorrelation, and cross-sectional dependence) (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3
lkof	0.145		
	(0.226)		
lkofe		0.483***	
		(0.135)	
lkofs		0.229**	
		(0.089)	
lkofp		-0.0973	
		(0.167)	
fo			-0.00279
			(0.005)
to			-0.000975
			(0.002)
lgdppc	-0.221	0.508*	0.229
	(0.131)	(0.268)	(0.227)
eeg	0.0311*		0.014
	(0.015)		(0.011)
heg		0.0593***	
		(0.009)	
urb	0.0778***	0.0371**	0.0722***
	(0.024)	(0.014)	(0.022)
ptrp	-0.0124**	0.000624	-0.0172***
	(0.005)	(0.005)	(0.003)
ptrs	0.00666	-0.00731	0.00695*
	(0.004)	(0.006)	(0.004)
flf	0.104***	0.0844***	0.115***
	(0.012)	(0.018)	(0.009)
adr	-0.0413***	-0.0204**	-0.0350***
	(0.005)	(0.007)	(0.004)
fcd	0.0302	0.135**	0.0454
	(0.055)	(0.048)	(0.046)
Observations	216	307	209
Number of countries	55	58	53

Country Effects	FE	FE	FE
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Notes: Driscoll Kraay standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics Performed - 1. Modified Wald Test to check for Heteroscedasticity. 2. Wooldridge's Test to check for autocorrelation.

Table B. 6

Association between globalization and education outcomes in Europe and North America (With standard errors corrected for heteroscedasticity, autocorrelation, and cross-sectional dependence) (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3
lkof	0.715**		
	(0.302)		
lkofe		-0.557**	
		(0.224)	
lkofs		0.782***	
		(0.180)	
lkofp		0.402**	
		(0.168)	
fo			-0.00033
			0.000
to			-0.00101
			(0.001)
lgdppc	1.245***	1.404***	1.510***
	(0.229)	(0.283)	(0.211)
heg	0.0669*	0.0368	0.0445
	(0.032)	(0.022)	(0.034)
urb	0.0483***	0.0551***	0.0459***
	(0.014)	(0.008)	(0.012)
ptrp	-0.0895***	-0.0895***	-0.0984***
	(0.012)	(0.008)	(0.014)
ptrs	0.0055	0.00427	0.00476
	(0.036)	(0.031)	(0.034)
flf	0.244***	0.239***	0.258***
	(0.019)	(0.020)	(0.020)
adr	0.0398***	0.0452***	0.0369***
	(0.008)	(0.012)	(0.007)
fcd	0.0573	0.0378	0.0596
	(0.045)	(0.040)	(0.049)
Observations	303	296	303
------------------------	-----	-----	-----
Number of countries	43	42	43
Country Effects	FE	FE	FE

Notes: Driscoll Kraay standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics Performed - 1. Modified Wald Test to check for Heteroscedasticity. 2. Wooldridge's Test to check for autocorrelation.

Table B. 7

Association between globalization and education outcomes in South Asia and Sub Saharan Africa (With standard errors corrected for heteroscedasticity, autocorrelation, and cross-sectional dependence) (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3
lkof	0.808***		
	(0.241)		
lkofe		0.445**	
		(0.152)	
lkofs		0.246*	
		(0.122)	
lkofp		-0.0586	
		(0.113)	
fo			0.00396***
			(0.001)
to			-0.00556***
			(0.001)
lgdppc	0.358	0.375*	1.185***
	(0.201)	(0.185)	(0.137)
eeg	0.0291**	0.0243*	0.0162
	(0.013)	(0.012)	(0.009)
heg	0.0918***	0.0910***	0.140***
	(0.028)	(0.020)	(0.040)
urb	0.00685	0.00614	
	(0.005)	(0.004)	
gerp	-0.00530*	-0.0037	-0.00918**
	(0.003)	(0.002)	(0.004)
gers			0.0196**
			(0.008)
ptrp	-0.00159	-0.00224	0.00397
	(0.004)	(0.004)	(0.004)

ptrs	-0.00334	-0.000259	-0.00711**	
	(0.003)	(0.003)	(0.003)	
adr	-0.0227***	-0.0280***	0.00697	
	(0.004)	(0.007)	(0.009)	
fcd	0.165**	0.140**	0.0907*	
	(0.060)	(0.050)	(0.043)	
Observations	136	136	130	
Number of countries	34	34	33	
Country Effects	FE	FE	FE	

Notes: Driscoll Kraay standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics Performed - 1. Modified Wald Test to check for Heteroscedasticity. 2. Wooldridge's Test to check for autocorrelation.

Table B. 8

Association between globalization and education outcomes in the rest of the regions apart from those in tables B.6 and B.7 (With standard errors corrected for heteroscedasticity, autocorrelation, and cross-sectional dependence) (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3
lkof	1.022**		
	(0.420)		
lkofe		1.581***	
		(0.285)	
lkofs		1.395***	
		(0.394)	
lkofp		-0.396	
		(0.252)	
fo			-0.0033
			(0.003)
to			0.00273**
			(0.001)
lgdppc	0.0131	0.542	0.206**
	(0.091)	(0.479)	(0.088)
heg	0.0451***		0.0413***
	(0.014)		(0.011)
urb	0.0305***	0.02	0.0388***
	(0.005)	(0.012)	(0.004)
ptrp	-0.0314***	-0.0311*	-0.0246***
	(0.006)	(0.016)	(0.007)

-0.0217**	0.00439	-0.0312**
(0.010)	(0.014)	(0.014)
0.0259*	-0.00907	0.0207
(0.013)	(0.033)	(0.013)
-0.0331***	-0.0210***	-0.0367***
(0.003)	(0.003)	(0.002)
0.0689	0.178**	0.0622
(0.058)	(0.073)	(0.058)
354	337	337
55	54	54
FE	FE	FE
	-0.0217** (0.010) 0.0259* (0.013) -0.0331*** (0.003) 0.0689 (0.058) 354 55 FE	-0.0217** 0.00439 (0.010) (0.014) 0.0259* -0.00907 (0.013) (0.033) -0.0331*** -0.0210*** (0.003) (0.003) 0.0689 0.178** (0.058) (0.073) 354 337 55 54 FE FE

Notes: Driscoll Kraay standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Diagnostics Performed - 1. Modified Wald Test to check for Heteroscedasticity. 2. Wooldridge's Test to check for autocorrelation.

Table B.9

Association between globalization (lkof) and education outcomes across the world (IV Estimates – Second Stage Results) (Dependent Variable – 'ays')

VARIABLES	Model 1	Model 2	Model 3	Model 4
lkof	4.145***	3.019***	3.039***	3.084***
	(1.095)	(0.906)	(0.849)	(0.851)
lgdppc	0.593	0.423	0.260	0.232
	(0.451)	(0.338)	(0.334)	(0.335)
eeg		0.0241		-0.0315
		(0.0270)		(0.0298)
urb		0.0197*	0.0135	0.0140
		(0.0109)	(0.0110)	(0.0110)
flf		0.152***	0.134***	0.131***
		(0.0166)	(0.0171)	(0.0172)
heg			0.0871***	0.101***
			(0.0292)	(0.0318)
adr			0.00788	0.00784
			(0.00516)	(0.00521)
ptrp			-0.00703	-0.00603
			(0.00787)	(0.00854)
ptrs				-0.00931
				(0.00895)
fcd			0.116***	0.118***
			(0.0418)	(0.0418)

Observations	536	536	536	536
Country Effects	FE	FE	FE	FE
SW Chi-sq./P-Value ^a	55.42/0.0000	64.67/0.0000	71.60/0.0000	71.09/0.0000
SW F-Stat/P-Value ^b	55.17/0.0000	63.93/0.0000	70.30/0.0000	69.48/0.0000
AR Wald Test Chi-sq./P-Value ^c	15.71/0.0001	12.06/0.0005	13.83/0.0002	14.22/0.0002
Sargan Statistic ^d	0	0	0	0
Adj. R-sq.	0.229	0.432	0.462	0.460

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; a. Sanderson-Windmeijer (SW) first-stage chi-squared test of underidentification; b. Sanderson-Windmeijer (SW) first-stage F statistics for weak identification; c. Anderson-Rubin Wald test first-stage for Weak-instrument-robust-interference; d. Sargan-Hansen test of overidentifying restrictions.

Appendix C

Table C.1

Association between Globalization and Income Inequality (EHII Data) (Dependent Variable – 'lgini')

igini)					
VARIABLES	Model 1	Model 2	Model 3	Model 4 ^{\$}	Model 5
lkof	0.0730	0.0974	-0.00109	-0.121	0.176
	(0.174)	(0.174)	(0.182)	(0.165)	(0.178)
ays	-0.00332	0.00781	-0.0360	-0.0621	0.0533
	(0.0766)	(0.0771)	(0.0806)	(0.0724)	(0.0790)
kofaysint	-0.00161	-0.00300	0.00729	0.0116	-0.0146
	(0.0182)	(0.0182)	(0.0191)	(0.0171)	(0.0187)
lgdppc	-0.368	-0.328	-0.133	0.484**	-0.360
	(0.243)	(0.245)	(0.269)	(0.241)	(0.240)
lgdppc2	0.0147	0.0128	0.00392	-0.0273**	0.0132
	(0.0126)	(0.0127)	(0.0137)	(0.0124)	(0.0124)
lpop		0.00338	0.00153	0.00161	0.00555
		(0.00772)	(0.00778)	(0.00655)	(0.00737)
gfce		-0.00377*	-0.00309	-0.00309*	-0.00496**
		(0.00193)	(0.00202)	(0.00181)	(0.00200)
lfse		-0.000822	-0.000762	-0.000288	-0.000786
		(0.000520)	(0.000537)	(0.000511)	(0.000540)
infl			-0.000121	-0.000134	0.0000119
			(0.000313)	(0.000302)	(0.000323)
ae			-0.00176*		
			(0.00101)		
ie				-0.00894***	
				(0.00135)	
sse					0.00279**
					(0.00110)
fcd			0.00266	0.00119	0.00491
			(0.00863)	(0.00846)	(0.00884)
Observations	222	222	222	222	222
Country Effects	RE	RE	RE	RE	RE

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Inflection point in the non-linear relationship between Income Inequality and Per Capita GDP - $\frac{1}{2} \exp(-(0.484)/(2*-0.0273)) = 7076.03$.

Table C.2

Association between Globalization and Income Inequality (Lessmann and Seidel (2017) data) (Dependent Variable – 'lgini')

VARIABLES	Model 1	Model 2	Model 3	Model 4 ^{\$}	Model 5 [#]
lkof	-0.522	-0.345	-0.436*	-0.394*	-0.391*
	(0.514)	(0.227)	(0.231)	(0.230)	(0.230)
ays	-0.323	-0.263**	-0.294***	-0.270**	-0.270**
	(0.231)	(0.106)	(0.108)	(0.107)	(0.108)
kofaysint	0.0654	0.0568**	0.0660**	0.0601**	0.0602**
	(0.0540)	(0.0251)	(0.0256)	(0.0253)	(0.0258)
lgdppc	0.955**	0.730	0.879*	0.868*	0.791*
	(0.439)	(0.469)	(0.476)	(0.477)	(0.467)
lgdppc2	-0.0542**	-0.0463*	-0.0527**	-0.0530**	-0.0488**
	(0.0223)	(0.0247)	(0.0249)	(0.0250)	(0.0246)
Ірор		0.0181	0.0269	0.0283	0.0275
		(0.0255)	(0.0255)	(0.0240)	(0.0255)
gfce		-0.00535**	-0.00352	-0.00447*	-0.00401
		(0.00268)	(0.00278)	(0.00278)	(0.00280)
lfse		-0.0000787	-0.0000196	-0.0000249	-0.0000473
		(0.000625)	(0.000622)	(0.000635)	(0.000621)
ae			-0.00128		
			(0.00149)		
ie				-0.00106	
				(0.00215)	
sse					0.000114
					(0.00145)
fcd			-0.0231**	-0.0235**	-0.0233**
			(0.00928)	(0.00973)	(0.00938)
Observations	500	594	594	594	594
Country Effects	RE	RE	RE	RE	RE

Notes: Baltagi and Wu standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Inflection point in the non-linear relationship between Income Inequality and Per Capita GDP - $\frac{1}{2} \exp(-(0.868)/(2*-0.0530))$ = 6754.74; Inflection point in number of years of schooling where Globalization exacerbates income inequality - # -0.391/-(0.0602) = 6.495 years.