A REVISION ON THE EFFECT OF FDI ON INEQUALITY-ADJUSTED HUMAN DEVELOPMENT INDEX

Cao Thi Hong Vinh[1]
Nguyen Thi Ngan Ha[2]
Pham Hong Dien[3]

Abstract

Inequality-adjusted Human Development Index (IHDI) is a new measurement of human development (HD) designed by the UNDP which addresses a renowned shortcoming of the previously used Human Development Index (HDI), which is inequality in distribution of human development achievements. Despite its advantages, this new approach has not been fully integrated into studies relating to the human development field, especially as far as FDI is concerned. FDI is an important factor affecting human development. Studies on the impact of these financial inflows on human development have only used HDI as a HD proxy. Using a panel data of 106 countries from the database of World Bank over the period of 2010 - 2015, our paper offers new understanding on how FDI affects HD with inequality being taken care of using IHDI. We find that FDI significantly and negatively affects human development. When samples of countries separated by continents are taken into account, the effects of FDI are different. Institutional quality index is found to have no notable contribution to human development. Several sub-indices, however, do positively and significantly affect human development. Regarding inequality, our findings confirm that FDI inflows widen the gaps in income, especially among countries in Asia. Regarding different aspects of IHDI, FDI contributes to increase life expectancy but reduce income of people in Latin America and Caribbe.

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[1] Foreign Trade University, Vietnam, Email: caovinhftu@ftu.edu.vn
[2] Foreign Trade University, Vietnam, Email: nganhanguyen273@gmail.com
[3] Foreign Trade University, Vietnam, Email: dienpham.ftu@gmail.com

1. Introduction

In this increasingly globalized world, foreign direct investment (FDI) is a hotly debated topic regarding its effects on the host countries' economic growth and social development. Contrary to the popular belief that FDI is contributing significantly to economic growth and indirectly have positive effects on human development of the recipients, some argue that FDI on its own has negative consequences to the host countries for both human development and inequality.

Insofar as FDI is concerned, when countries worldwide are making efforts to fulfill the targets of sustainable development, human development is considered a key element of development. Therefore, recently, there have been many studies on the effects of FDI on growth of human. A salient way used to determine those effects is assessing the HDI (Human Development Index) of host countries before and after receiving FDI. HDI is calculated with regards to three aspects of education, longevity and income. Although, until now, the index is still widely used to measure human development, HDI has its own drawbacks that need special attention. Specifically, there is no consideration for inequality across regions eventhough unequal distribution has become a big social concern. Therefore, since 2010, Inequality-adjusted Human Development Index (IHDI) has been created and calculated by the United Nations Development Program (UNDP). The new index is a better proxy for sustainable development as it does not only cover the human development in general but also take into account the inequality in human development.

Many studies have focused on the impact of FDI on recipient economies in different regions with respect to HDI or inequality. Nonetheless, impacts of FDI on human development with proper control of inequality in the host countries is still in doubt. Moreover, there have been virtually no emprical studies that on Inequality-adjusted Human Development, of which human development is taken into consideration when inequality is controlled for). One exception is Cao et al. (2017). In this study, they analyze the effects of inward FDI on IHDI in 23 Asian countries in the period of 2013 - 2015 and find no significant impact of FDI for all countries or for each of the three groups of countries with very high, high, or medium level of human development. This research further address this matter on world scale based on the empirical model adopted from Cao et al. (2017). Our aim is to analyze the effects of FDI on IHDI. The paper addresses three main research questions: *(1) How FDI affect the Inequality-adjusted Human Development Index (IHDI); (2) To what extent the effects of FDI on IHDI vary across regions; (3) How FDI affects Inequality.* We also deal with the causality effect between FDI and IHDI.

The remainder of the paper is organized as follows. Section 2 presents the literature review, while Section 3 looks into the theoretical effects of FDI on IHDI. Section 4 is about the data. Section 5 presents empirical strategies. Section 6 shows the main results. The final section concludes the paper.

2. Literature review

There is limited literature on the impact of FDI on Inequality-adjusted Human development index (IHDI). Most researches just focus on the impact of these financial

flows on either HDI or inequality, which is mostly from the income aspect. The only relevant study is Cao et al. (2017) conducted using data from 23 Asian countries from 2013 to 2015. Cao et al. (2017) present statistically insignificant effects of FDI on human development as inequality is controlled for. As far as inequality was concerned, FDI did raise the income inequality in these countries. Yet, when inequality is broken down to components, FDI helps to mitigate the inequality in education.

Impact of FDI on HDI

Several studies point out positive impacts of FDI on IHDI of the host countries. Gökmenoğlu et al. (2018) investigated the impacts of FDI on HDI in Nigeria for the period of 1972–2013 by applying country-specific and panel cointegration techniques. They confirm significant impacts of FDI on HDI in Nigeria during the study period. Agusty and Damayanti (2015) examined the effects of FDI on HDI of developing countries in the period 2009-2013 by exerting data panel regressions. Their results uncover positive effects of FDI on HDI. Similarly, Reiter and Steensma (2010) find positive impacts of per capital FDI on HDI by using data of 49 developing countries over the period of 1980-2005. Furthermore, Colen et. al. (2009) discover that FDI could make a positive contribution to human development of the host countries given appropriate conditions. Sharma and Gani (2004) analyse the effects of FDI on human development measured by HDI for middle and low-income countries in the period from 1975 to 1999. Their regression results showed positive effects of FDI on human development for both groups of countries. A similar conclusion was reached by Makki and Somwaru (2004).

On the other hand, there also exist studies which had the equivocal results or failed to find statistically significant relationship between FDI and HDI. Santosa (2014) conducted a research focusing on Indonesia and other ASEAN countries after the financial crisis during the period of 1999-2012. The paper illustrates unclear influence of FDI in seven ASEAN countries including Singapore, Malaysia, Brunei Darusalam, Thailand, Indonesia, Lao and Campuchia. Nonetheless, positive results of FDI on human development were found for Vietnam and Myanmar and negative results were found for the Philippines. Additionally, Tamer (2013) provided evidences for different relationships between FDI and HDI in different areas as classified by the World Bank. In low-income countries, FDI has ambiguous effects, while in lower-middle, upper-middle, and high income countries, FDI has positively significant impacts on HDI.

Impact of FDI on inequality

The empirical literature shows mixed results. Studies across countries unanimously establish a positive relationship between FDI and inequality. Tsai (1995) finds that FDI inflows are likely to worsen income distribution in developing countries, especially those in the East and Southeast Asia. He warned the danger of not taking geographical dummies into consideration such that the positive relationship might ‘‘capture more of the geographical difference in inequality than the deleterious influence of FDI’’. Apart from this caution, other studies also yeild similar results (Choi, 2006; Basu et al., 2007). Bhandari (2007)

tested the link between FDI and income inequality for transitional economies in Eastern Europe and Central Asia during the 1990-2002 period. The study shows that FDI exacerbated income inequality. Herzer et al. (2012) examined long-term effects of FDI on income inequality in five Latin American countries, namely Bolivia, Chile, Colombia, Mexico and Uruguay. The result shows that except for Uruguay FDI contributed to expanding the income gap in all four countries. Meanwhile, Figini and Görg (2011) show two opposite outcomes for two groups of countries. For OECD countries, FDI did not raise inequality. For non-OECD, income inequality rose considerably. Some studies focus specifically on wage inequality between skilled and unskilled workers in a single country (Feenstra and Hanson, 1995; Figini and Gorg, 1999; Mah, 2002; Driffield, 2005). These studies confirm positive impacts of FDI on inequality.

The Vietnam Industrial Investment Report in 2011 of UNIDO (2012) confirms that FDI led to the rise in income inequality in Vietnam due to the fact that FDI created a big gap in the wages offered by FDI and non-FDI enterprises. Although mixed findings are reported, it seems that positive effects of FDI on HDI and inequality are found dorminant.

It is important to note that beside the effects of inward FDI on human development, there also exist studies about the opposite impact. Sharma and Gani (2004), while reporting significant positive impact of FDI on HDI, confirm that there is a significant bi-causal relationship between FDI and HDI. Alsan et al. (2006) investigated the role of health, which is one aspect of HDI, on FDI attraction in 74 low and middle income countries over the period of 1980–2000. Their estimates suggest that raising life expectancy by one year increases gross FDI inflows by nine percent.

Furthermore, Gohou and Soumaré (2010) examined a potential problem of endogeneity between FDI and HDI. The authors performed a two-stage least squares (2SLS) estimation with the results indicating that there is a significantly positive relationship between HDI and FDI in Africa. In another study, Dehshiri et al. (2012) looked into whether HDI and rule of law affect FDI inflows in 23 developing countries during 2001-2010. They confirm a positive and significant impact of HDI on the attraction of FDI. Additionally, Curtis et al. (2013) while investigating which of Dunning's location-specific advantages of host countries, presented as composite indices for Global Competitiveness, Human Development and Corruption Perception, better predicts the level of inward FDI, find that HDI is a significant FDI determinant in non-OECD countries. In his paper, Das (2017) states that HDI influenced FDI inflows in Brazilbut there was no significant impact of HDI on FDI inflows in India. He concludes that the intensity of this effect varies from one country to another. As a result, the endogeneity problem needs to be taken into consideration.

3. Theoretical effects of FDI on IHDI

The impacts of FDI on the diferent variables could be found via two main channels: *capital widening and capital deepening*. It has long been established that FDI as a capital flow could facilitate host countries' capital accumulation (UNCTAD 1999). This effect is called capital widening. FDI effects on promoting technology transfer,

improving labor skills, expanding linkages between domestic firms and global networks could also raise host countries' productivity. This impact is called capital deepening.

Inequality-adjusted Human development index (IHDI) is developed by United Nations Development Program (UNDP). This index is more advanced than the previous Human development index (HDI) because it is adjusted for inequality with three sub-indices of health measured by life-expectancy, education measured by adult literacy index and gross enrollment combined index, income measured by GDP per capita, as well as inequality among regions for each above sub-index. In this paper, we examine the impacts of FDI on IHDI through its effects on different IHDI's components. The following section will demonstrate the theoretical impacts of FDI on IHDI's components via either capital widening or capital deepening.

3.1. Positive impacts

3.1.1 Positive impacts of FDI on income

FDI can raise the income of the labor force mainly by creating jobs and improving the quality of local human resources. Craigwell (2006) investigated the impacts of FDI on employment in the Caribbean region in the period of 1990-2000. The results suggest that an increase in FDI "leads to an approximate one-to-one increase in employment". Similarly, consistent results are found in studies for a single host country such as in Ghana (Abor and Harvey, 2008), in Mexico (Waldkirchet al., 2009), in Tanzania (Mpanju, 2012; Utouh and Rao, 2016), in Parkistan (Habib and Sarwar, 2013), and in India (Narender and Dhanka, 2015). Also, Karlsson (2007) points out in his study that FDI had a positive impact on employment growth both in FDI sectors and in non-FDI ones, contributing significantly to household incomes and purchasing power of local residents.

FDI inflows are not just creating more employment. According to Javorcik (2012), jobs generated by the FDI sector tend to be 'good' ones. Such jobs are likely to pay higher wages than those of domestic firms in developing countries. Foreign employers tend to offer more training than local firms. Studies confirmed this include Bircan (2007), Lipsey and Sjoholm (2001), and Te Velde and Morrissey (2001). Kurtishi -Kastrati (2013) argues that, foreign firms have high quality training given to their employees. Some of those skills are taken with the workers when they enter domestic firms. Consequently, the host countries can benefit from "managerial superiority" of multinational companies by learning and imitating. Simultaneously, employees can have higher income as they improve their skills and apply for subsequent jobs.

Income may also increase as FDI inflows drive economic growth of countries and indirectly boos income. Borensztein et al. (1998) show that FDI contributes even more to economic growth than domestic investment. Tsai (1995) and Dollar and Kraay (2002) argue that economic growth improves income of the poor more than the rich. As a result, FDI is a useful tool in reducing poverty.

3.1.2. Positive impacts of FDI on health

FDI can affect health of people through several channels. The first channel is through the self – consciousness of the population on health issues as their income increases. As people earn more and are aware of the importance of health, they are willing to

spend larger share of their disposable income on health services. Furthermore, they can also use that extra income to buy more high-quality consumer goods such as organic food. Higher spending on healthcare and high-quality goods ensures better quality of life, which in turn increases life expectancy.

Beside raising public awareness, FDI inflows into the health sector can also improve public health by providing more affordable medical products and services, for example pharmaceuticals. In addition to the direct supply effect, FDI can increase the productivity of domestic healthcare suppliers in the host country through the expansion of international medical knowledge.

Finally, FDI could help improve health conditions in host countries because FDI firms pay higher salary and provide safer workplaces and better social services. Safe workplace is one of compulsory criteria for operation in developed countries and is expected to be exercised by all FDI companies. When foreign firms set up affiliates in the host country, it also pays more attention to working conditions of employees than the domestic ones. Lwanda (2006) emphasizes important contribution of multinational companies (MNCs) based in South Africa in preventing the spread of HIV/AIDS. Likewise, MNCs could improve health conditions by employing cleaner technologies.

3.1.3. Positive impacts of FDI on education

It cannot be denied that education is an essential part of the development of a nation, in which FDI is one of the most influential factors. Foreign investors build additional scientific research institutions such as schools and universities as well as invest in existing facilities. As a result, people can study in their hometowns, thus, saving costs and avoiding brain drain. More foreign investors start to see education as a good option for investment. They often seek investmens in countries where people are in high demand for global standard education or have desire to study abroad. By investing in the education system in the host countries, foreign investors can create a win-win situation. They could earn profit through investment and eventually be able to utilize the human resources, while local people enjoy high-quality education at lower costs. Consequently, the school enrollment rate in host countries may rise as people can remain in their own country while participating in world - standard training.

There are several evidences supporting those positive impacts. Egger et al. (2005) studied the effects of foreign investment on higher education and economic growth using FDI data from 87 countries during the period of 1960 – 2000. They confirm that FDI has a positive impact on higher school participation. A study conducted by Yildirim and Tosuner (2014) also pointed out that FDI had contributed positively to a country's education. The positive impact was also reached by Agénor and Moreno-Dodson (2006).

3.1.4. Positive impacts of FDI on inequality

Inequality in income distribution is typically discussed within the context of North – South model of vertical FDI. The availability of cheap labor in poor countries in the South encourages richer countries in the North to undertake efficiency – seeking FDI by offshoring labor- intensive production processes. According to Feenstra and Hanson (1996), the increase in FDI outsourcing of

Northern multinationals lead to a worldwide increase in the demand for skilled workers relative to their unskilled counterparts. Correspondingly, the wage gap, which is called skill premium between the two, exists. In other words, 'this type of FDI may adversely affect the wage and employment prospects of less skilled workers if offshoring involves activities that are relatively skilled-labor intensive in the host country, even though they are relatively unskilled-labor intensive by the standards of the source country' (Herzer and Nunnenkamp, 2011). FDI inflows may then widen the skill premium and dampens inequality problem in developing host countries.

In a single country framework, several studies show meaningful and consistent results that FDI has negative effects on income distribution of recipient economies (Feenstra and Hanson, 1997; Mah, 2002; Driffield, 2005). In a cross-country framework, a number of studies also support this view. Using a sample of 33 developing countries, Tsai (1995) reports that FDI had increased income inequality in South/East Asian countries. This finding is in line with that of Basu et al. (2007) who used a panel data set of 80 developing countries where FDI is concluded to have exacerbated inequality. Similar findings are also reported in Gini coefficient studies such as those of Reuveny and Li (2003) with a sample of 69 countries and Choi (2006) with a sample of 119 countries. Regarding other more developed regions, studies by Bhandari (2007) for transitional economies in Eastern Europe and Central Asia and Mihaylova (2015) for Central and Eastern Europe present consistent evidence that FDI leads to inequality. For Latin America, Herzer et al. (2012) when investigating the long-term effects of FDI on income inequality in Bolivia, Chile, Colombia, Mexico and Uruguay conclude that except for Uruguay, inward FDI contributed to the increase in income inequality in all economies. Finally, with a panel data set 55 countries at different stages of development, Lessmann (2012) finds that net FDI inflows increase inequality in low and middle income countries, while there are no negative redistributional consequences in high income economies.

3.2. Negative impacts

3.2.1 Negative impacts of FDI on income

Many of negative impacts of FDI on income come from that of FDI on the rise of income inequality, which have been discussed in details in the previous section on the impacts of FDI on inequality.

3.2.2 Negative impacts of FDI on health

Although it is argued that FDI can have positive impact on health, there are some contradictory evidences. It is widely known that increasing income can lead to higher life expectancy in poor countries. As income rises, this relationship becomes weaker or even absent in rich countries. In other words, health is affected by living standards in low-income countries, while rising income has little or no effect on health in high-income countries. Indeed, if higher income is associated with longer working hours, less social contact, more stress, less sleep, and increase in unhealthy food consumption, the income – health relationship might become negative. Moreover, multinational corporations (MNCs) have been notoriously criticized for discriminative and exploitative practices towards local employees and other resources of the host country. Regarding local labor, their

working conditions in FDI enterprises have been alarming. The presence of sweatshops in some countries, which subject laborers to dangerous, sub-human working conditions often in violation of local workplace regulations, is a serious issue. According to Brown et. al. (2004), although multinationals pay their workers more than their domestic competitors, many people have complained that multinationals abuse their workers in sweatshop conditions and have demanded that products from these sweatshops to be banned from the U.S. markets.

Second, there are many studies on the effects of environmental pollution on health. Eskeland and Harrison (2003) state that pollution tends to migrate from countries with high standard of environment, which are typically developed countries, to developing countries where this standard is low. Indeed, in order to reduce costs, foreign companies usually dump unprocessed wastes, causing irreversible environmental damages, thereby negatively affecting health of the local people.

Other effects of FDI on health may be reflected by business travelers, who may unintentionally spread infectious diseases. In summary, FDI can have both positive, as discussed previously, and negative health effects. The net effect will vary with the level of income.

3.2.3. Negative impacts of FDI on education

According to De Groot (2014), the increase in FDI is often associated with the decrease in HDI as a result of deteriorating government policies. Due to the attractiveness of FDI, one government may have two options of investing in FDI incentives or investing in other public projects. FDI incentive policies reduce other public expenditures, leading to sub-optimal social welfare. For instance, foreign investors may ask for expansion of infrastructure, which a government must pay for via cutting down its budget on education, causing negative effects on HDI. The negative impact of FDI on education also depends on types of investors. For instance, horizontal foreign investors tend to seek potential markets and they are often bound to support the development of the host country's market to gain profit. Meanwhile, efficiency – seeking investors tend to look for cheap labor only. Therefore, they usually offer lower wages leading to less opportunities for the local people to pursue higher education.

In their study about the correlation between higher-income, high-human-capital countries and poor-income, low-human-capital countries, Akin and Vlad (2011) find a negative one. Mughal and Vechiu (2009) also confirm significant negative impacts of FDI on tertiary and secondary education by analyzing two samples of low-income and middle-income developing countries.

3.2.4. Negative impacts of FDI on inequality

Literature of the effects of FDI on inequality reduction is less extensive. There are concrete theories on the mechanisms of such reduction in inequality. Simon Kuznets (1955) hypothesizes that as an economy develops, market forces first increase then decrease the overall economic inequality of the society, which is demonstrated by the inverted U-shape of the Kuznets curve. For instance, the hypothesis holds that in the early development stages of an economy, new investment opportunities emerge for those who already have capital to invest, meaning that the rich have opportunities to become

even richer. In constrast, the surplus of cheap rural labor migrating to cities in search for better paying job pushes wages down, thus, widening the income gap and escalating inequality. The worse is as the economy slowly shifts its center around cities, the more migration hapens, the more rural population decreases and urban population increases. It becomes harder for the rural areas to develop, resulting in increase in rural-urban inequality. When inequality reaches its peak, it is expected to decrease as people become aware of their problems. In addition, other beneficial processes associated with industrialization such as democratization and the development of a welfare state will take hold and inequality problem is slowly addressed.

It could be that FDI, which is a force to drive economic growth and development, can have this inverted U-shape relationship with inequality. If that is the case, then it might make sense that FDI worsens inequality in developing countries and improves that in more developed ones. Also, when a developing country reaches a turning point, then inequality within that country may decrease as FDI increases. That is exactly what Figini and Görg (2011) find in their study of more than 100 countries that the effects of FDI on income inequality vary with the level of economic development. Moreover, some literature suggests that this inverted U-shape relationship do hold for a single country (Figini and Gorg, 1999; Lessmann, 2012; Ucal et al., 2014).

4. Empirical strategies

To study the impacts of FDI on IHDI, we run the following regression:

$$LogIHDI_{it}=\alpha LogFDI_{it}+\beta LogPRS_{it}+\phi_t+\epsilon_{it} \quad (1)$$

Institutional quality is added to our empirical specification, which applies the Fixed effect model[4] for panel data. Along with FDI, institution is an important factor affecting human development of a country. The role of institutional quality is widely acknowledged in the development fields. Insofar as institutional quality (PRS) is concerned, we want to examine the effects of PRS sub-indices on IHDI by the following equation:

$$LogIHDI_{it}=\alpha LogFDI_{it}+\beta LogPRS_{lit}+\phi_t+\epsilon_{it} \quad (2)$$

Moreover, to further look into the impacts of FDI inflows on particular aspects of inequality, an additional specification is:

$$Inequality_{kit}=\alpha LogFDI_{it}+\beta LogPRS_{it}+\phi_t+\epsilon_{it} \quad (3)$$

where i denotes country i; t is year t; k is a specific aspect of inequality (comprising of inequality in life expectancy, education and income), l is a particular sub-index of institutional quality as mentioned above.

- $LogIHDI_{it}$ is the natural logarithm of inequality-adjusted Human Development Index of country i in year t;
- $LogFDI_{it}$ is the natural logarithm of FDI inflows of country i in year t;
- $LogPRS_{it}$ is the natural logarithm of indices calculated from sub-indices taken from International Country Risk Guide data provided by the PRS group. This variable is a proxy for institutional quality of countries. Sub-indices are comprised of:
- $Prsva_{it}$ is the index of Voice and Accountability of country i in year t;

[4] As Fixed effect could help control for all countries' time-invariant characteristics, it is considered a good model for panel data.

♦ $Prsge_{it}$ is the index of Government Effectiveness of country i in year t;

♦ $Prscc_{it}$ is the index of Control of Corruption of country i in year t;

♦ $Prsrq_{it}$ is the index of Regulatory Quality of country i in year t;

♦ $Prspv_{it}$ is the index of Political Stability and Absence of Violence of country i in year t;

♦ $Prsrl_{it}$ is the index of Rule of Law of country i in year t.

♦ $Inequality_{kit}$ is the value of inequality in different aspects of human development, which are life expectancy, education and income, of country i in year t (in percentage);

♦ ϕ_t denotes time dummies;

The coefficient of interest in the previous equations is α, which measures the effects of FDI inflows on inequality-adjusted Human Development Index in Equations 1 and 2 and on inequality in Equation 3 for all countries in the sample. If FDI does help these countries improve their human development, as shown in Equations 1 and 2, or raise the inequality in Equation 3, this coefficient will be positive. Table 1 presents the summary statistics.[5]

Table 1. Summary Statistics of Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
LogIHDI	457	-0.57744	0.3433549	-1.575037	-0.10759
LogHDI	457	-0.35438	0.2306914	-1.133204	-0.04604
LogFDI	457	1.060098	1.120.714	-6.389286	5.530651
LaglogFDI	457	1.075091	1.074056	-6.389286	5.530651
LogFDIPOP	457	-15.52697	2.198337	-24.2914	-7.651764
Inequalityinlifeexpectancy	457	15.12388	1.142.244	0.611	50.1
Inequalityineducation	457	17.62175	13.17317	0.642	46.4
Inequalityinincome	457	23.97665	10.93458	0.73	68.3
Inequalityadjustedlifeexpectancy	457	0.74842	0.9992595	0.221	21.7
Inequalityadjustededucation	457	0.595519	0.420473	0.117	8.3
Inequalityadjustedincome	457	0.532589	0.2474174	0.187	4.5
LogPRS	457	-0.52722	0.2401743	-1.22078	-0.05783
LogPRSVA	457	-0.4181	0.3665805	-1.568616	0
LogPRSPV	457	-0.38688	0.137721	-0.8915981	-0.12783
LogPRSGE	457	-0.65222	0.4485587	-1.386294	0
LogPRSRQ	457	-0.46912	0.258797	-1.966.113	0
LogPRSRL	457	-0.57931	0.3838851	-1.791.759	
LogPRSCC	457	-0.89318	0.3948903	-1.791.759	-0.08338

[5] Please contact the authors for further information of the appendix about the correlation of the main variable.

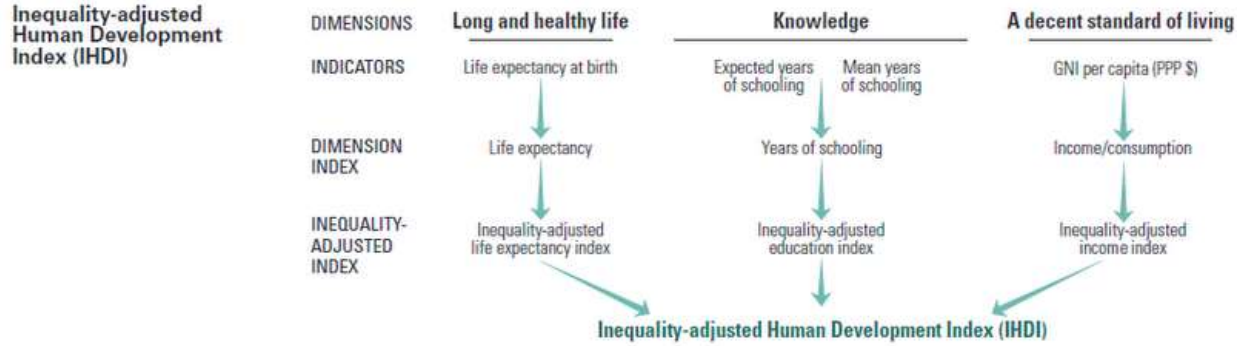
5. Sample and data

For the above research objectives, our sample thus comprises of 23 African countries, 21 Asian countries, 21 Latin American and Carribean countries, and 32 European countries in the period of 2010 – 2015. All the variables except laglogFDI have at least 616 observations. In our analysis, we dropped variables with incomplete observations to guarantee consistency. Hence, only 457 observations remained. The data are from the following sources.

Inequality-adjusted Human development index (IHDI)

The data is taken from the official website of the United Nations Development Programme (UNDP). The data for the other variables of ***Inequalityinlifeexpectancy, Inequalityineducation, Inequalityinincome, Inequalityadjustedexpectancy, and Inequalityadjustededucation, Inequalityadjustedincome*** are also from the UNDP. Figure 1 describes steps to calculate IHDI.

Figure 1. Steps to calculate Inequality-adjusted Human development index



Source: United Nations Development Programme (2018)

FDI flows

Data of FDI net inflows were collected from the online database of World Development Indicator on the website of World Bank. We used FDI per capita (FDIPOP), which is calculated by FDI net inflows over population, as an intrumental variable in the 2SLS regression to correct for the potential problem of endogenity. The population data come from the same online database of World Development Indicator.

PRS (Institution)

Indices for countries' institution such as Political Stability and Absence of Violence (Prspvit), Regulatory Quality (Prsrqit), Control of Corruption (Prsccit), Voice and Accountability (Prsvait), Government Effectiveness (Prsgeit) and Rule of Law (Prsrlit) are from the International Country Risk Guide (ICRG) database provided by PRS Group. The final index of PRS is calculated by taking the simple average of these above six sub-indices.

6. Results

To address the research questions, the authors analyzed the effects of FDI on IHDI in general for all countries using the sample during 2010- 2015. We examined how the effects of FDI on IHDI change across four

continents. Finally, we discussed the effects of FDI on inequality across continents.

Prior to running the models, the Hausman test is used to determine the most suitable estimation method. The results of the test confirmed that the Fixed-Effect (FE) estimation method should be used in this study. Thus, in the following sections, we will only consider estimation results applying the FE method. In addition, to solve the potential endogenity problem between FDI and IHDI, we performed two stage least square (2SLS) estimation method for our models.

6.1. Baseline results for the effects of FDI on human development

This section addresses our first research question of how FDI affects the Inequality adjusted Human Development Index. Regressions with basic variables of $LogFDI_{it}$,$LogPRS_{it}$, and $LogPRS_{lit}$ yield the following baseline results Columns (1) and (2) in Table 2 indicate that FDI has no statistically significant effect on IHDI for all countries. The results of 2SLS regressions in Columns 3 and 4 show significantly negative impacts of FDI net inflows on human development. The negative sign is consistent across four regressions, which means that FDI does have negative impacts on human development as the endogeneity problem is controlled for.

The results are once again consistent when we juxtapose the similar regressions for HDI against those for IHDI for comparison. The sign, value and significance level of logFDI in Columns (5) and (6) show negative impacts on logHDI. The results reaffirm that FDI inflows do not help host countries to improve their human development. This may be partly due to the inequality problem caused by FDI inflows, which we will discuss further later. Column (9) demonstrates the influences of independent variables on the difference between IHDI and HDI. Although the sign is positve, the effect is not statistically significant.

Regarding the institutional quality variables, the coefficients are not significant in all regressions, where logIHDI or logHDI is the dependent variable. This may be due to the fact that the six sub-indices of institutional quality PRS generally have different effects on the IHDI index and such effects are not simultaneous in a single direction. Therefore, in addition to the PRS in general, we will study in greater details the impacts of different PRS components, which are Prsva, Prspv, Prsge, Prsrl, Prsrq, Prscc, on IHDI.

6.2. Results for the effects of FDI on IHDI by continents

This section addresses our second research question of to what extent the effects of FDI on IHDI vary across regions. Accordingly, we categorized the sample into four groups of different geographical regions. The classification of groups is based on the classifications listed on the United Nation‘s website. After categorizing, Groups 1, 2, 3, and 4 include countries in Africa, Asia, Latin America & Caribbean, and Europe, respectively.

Our other regression results show that FDI inflows positively impact human development in Asia, but not in the other continents. We also run 2SLS estimations to deal with the endogenity problem. The results remain more or less the same. In particular, when FDI inflows in Asian countries increase, IHDI decreases, which is consistent with the baseline results.

Table 2. Baseline results for the effects of FDI on Human Development

VARIABLES	LogIHDI				LogHDI				LOSS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LogFDI	-0.00509	-0.00547	**-0.00676***	**-0.00695****	-0.00339	-0.00370	-0.00474*	-0.00490*	0.141
	(0.00390)	(0.00361)	(0.00345)	(0.00336)	(0.00299)	(0.00281)	(0.00281)	(0.00275)	(0.106)
LogPRS	-0.0649		-0.0625		-0.0554		-0.0535		1.136
	(0.0971)		(0.0774)		(0.0737)		(0.0631)		(3.322)
Logprscc		-0.0336		-0.0336		-0.0215		-0.0214	
		(0.0351)		(0.0224)		(0.0292)		(0.0184)	
Logprsrq		0.0396		0.0401		0.0403		**0.0407****	
		(0.0295)		(0.0249)		(0.0254)		(0.0204)	
Logprsrl		-0.0354		-0.0357		-0.00922		-0.00938	
		(0.0795)		(0.0452)		(0.0586)		(0.0371)	
Logprsva		0.103*		0.104**		0.0640		0.0650*	
		(0.0572)		(0.0429)		(0.0450)		(0.0352)	
Logprspv		**-0.234*****		**-0.233*****		-0.197**		-0.197***	
		(0.0874)		(0.0591)		(0.0812)		(0.0485)	
Logprsge		**0.171*****		**0.170***		**0.0601**		**0.0591**	
		(0.0631)		(0.0939)		(0.0364)		(0.0771)	
Constant	-0.606***	-0.539***	-0.603***	-0.538***	-0.380***	-0.366***	-0.378***	-0.365***	19.80***
	(0.0511)	(0.0605)	(0.0413)	(0.0659)	(0.0389)	(0.0376)	(0.0337)	(0.0541)	(1.751)
Observations	457	457	457	457	457	457	457	457	457
Number of id	106	106	106	106	106	106	106	106	106
Regression	Xtreg	Xtreg	Xtivreg	Xtivreg	Xtreg	Xtreg	Xtivreg	Xtivreg	Xtreg
Timedummies	No	No	No	No	No	No	No	No	No

*(Loss (in percentage) is the percentage difference between IHDI and HDI due to the controlling inequality. The panel technique of Fixed effect is applied. ***/**/* present significant level of t-statistics at %/5%/10% level.) The column 3,4,7,8 use the two-stage least squares (2SLS) estimation method where the instrumental variables are log FDIPOP (FDI per capita).*

The impact is mostly not significant when we use current inward FDI. It is significant in Africa when we use the lagged FDI for one year. The sign, value, and significance level of laglogFDI show the statistically positive impacts of FDI in year t-1 on human development in African countries. This is not in contrast with our baseline results as the sign of logFDI for Africa is still negative, though not statistically significant. In this particular continent, previous year inward FDI plays an essential role to enhance human development of the current year. It may be due to the fact that FDI usually comes with problems as discussed in the theoretical section. FDI is a long-term source of capital and it needs long time to serve its purpose.

To futher explore the effect of FDI on IHDI, we consider each continent seperately through smaller sub-regions, with respect to different sub-indices of institutional quality. The results reveal that the impact of FDI inflows on IHDI varies from region to region.

6.3. Results for the impacts of FDI on specific aspects of inequality

Apart from investigating the effects of FDI on human development in general, we are particularly interested in inequality. This section addresses the final question of how FDI affects inequality? Rather than looking into inequality in general, we analyzed the effects on life expectancy, education, and income of the host countries.We also look into three aspects of IHDI being adjusted for inequality. Table 3 shows results for the entire sample.

Table 3. Results for the effects of FDI on specific aspects of Inequality and IHDI

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Inequality			Inequalityadjusted		
logfdi	0.111	-0.0370	0.406*	-0.00981	-0.00749	-0.0221*
	(0.106)	(0.119)	(0.240)	(0.0113)	(0.00845)	(0.0112)
logprs	-1.000	3.406	-0.620	0.0881	-0.0722	-0.0492
	(2.411)	(5.637)	(6.390)	(0.109)	(0.137)	(0.199)
Constant	14.48***	19.46***	23.22***	-0.332***	-0.659***	-0.699***
	(1.281)	(2.975)	(3.367)	(0.0660)	(0.0753)	(0.105)
Observations	457	457	457	457	457	457
R-squared	0.003	0.002	0.008	0.002	0.002	0.014
Number of id	106	106	106	106	106	106
Type	FE	FE	FE	FE	FE	FE
Obs	All	All	All	All	All	All
Regression	Xtreg	Xtreg	Xtreg	Xtreg	Xtreg	Xtreg
Timedummies	No	No	No	No	No	No

*(1,2,3: inequality in life expectancy, inequality in education, inequality in income; 4,5,6: inequality adjusted life expectancy, inequality adjusted education, inequality adjusted income. The panel technique of Fixed effect is applied. ***/**/* present significant level of t-statistics at %/5%/10% level.)*

While FDI inflows have no significant impacts on the inequality in life expectancy and education, they aggravate inequality in income. FDI does indeed widen the gaps in income. For three aspects of IHDI, we can conclude that FDI inflows have no significant impact on inequality-adjusted life expectancy and education, but reduce inequality-adjusted income. This is in line with the above results, indicating that FDI inflows have negative implications for income of the host countries. Not only do these foreign capital inflows lower income level in general but they worsen the current inequality problem in the host countries.

Furthermore, even though not reported here our other results show the effects of FDI on inequality when dividing the sample into four continents. The results are mixed from region to region and ambiguous for different aspects of inequality, except for case of Asia. In Asia, FDI has positive effects on income inequality, which means it can broaden the income gaps. The results is consistent with Cao (2017), where FDI contributes significantly to increase in income inequality of 23 Asian countries in the period of 2013 -2015.

We also summarizes results of the effects of FDI on three aspects of IHDI across continents. There are statistically significant results for Latin America and Caribbe but not for Asia. The sign, value and significance level of the results for logadjustedlifeexpectancy demontrate a postive effect of FDI on life expectancy in Latin America and Caribbe, whereas that for logadjustedincome illustrate a negative effect of FDI on income. It means that FDI can contribute to increase the longevity of people in this region but reduce their income level.

The results reflect partly the current situation of Latin America and Caribbean, where recently governments have strengthened policies to attract foreign investment. The 2015 report "Foreign Direct Investment in Latin America and the Caribbean" by UN stated that some countries in the region have clear policies that are focused on supporting the activities of firms with better environmental management. For example, Brazil emphasizes preserving biodiversity, particularly to halt the deforestation of the Amazon. Mexico and Chile support the renewable energy sector. Costa Rica ban on mining activities. Such policies prove to be useful in increasing public health and hence longer life expectancy.

7. Conclusions

Using panel data of 106 countries during the period of 2010-2015, we provide evidence on the impacts of FDI inflows on inequality-adjusted human development index (IHDI) of these countries. We find a negative relationship between FDI and IHDI on a global scale. This relationship remains even after we control for the specific aspects of voice and accountability, government effectiveness, control of corruption, regulatory quality, political stability and absence of violence, and rule of law. Nonetheless, as we examine data separately for four continents, the results demonstrate different effects of FDI on IHDI. Africa is the only exception, where FDI has positive effects on IHDI but these effects are time lagged. When conducting regressions under sub-indices of institutional quality, we find that two sub-indices of control of corruption, voice and accountablity have

significant effects on human development in Africa.

We further find that FDI inflows contribute to broaden the gaps in income. Considering the effects in each continent, we find that FDI increases income inequality in Asia. Regarding different aspects of IHDI, we find no effect in either Africa or Asia but in the most unexpected places, which are Latin America and Caribbean. FDI can contribute to increase the life expectancy of people in this continent but reduce their income level.

Despite our efforts to look into the effects of FDI on IHDI of countries in the world, there are still shortcomings in our research which could be improved in the future. At first, as the impacts of FDI on IHDI could be long-term the time-range need to be widened. This could be only made as future data are available, especially for IHDI. With new data, more lag variables could be taken into consideration. Hence, the impacts of previous FDI inflows on the recipient countries's human development will be better clarified. Moreover, for more information about whether the effects could be different among countries with different levels of development or human development, sub-samples related these points could be taken into account as well.

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