Article

An Asymmetric Nexus: Remittance-Led Human Capital Development in the Top 10 Remittance-Receiving Countries: Are FDI and Gross Capital Formation Critical for a Road to Sustainability?

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Abstract: As a growth input, human capital and remittances have received significant attention and their role on other macro fundamentals has also been investigated. However, the effects of remittances on human capital development are not yet conclusive in the literature. The motivation of the study is to gauge the role of remittances in the process of human capital development in the topb10 remittance recipients for the period spanning from 1980 to 2019. The study has implemented symmetric and asymmetric estimations to explore the effects of remittances, FDI, and gross capital formation on human capital development. The study documented a positive and statistically significant linkage between remittances and human capital development; a similar linkage was revealed for FDI and gross capital formation. Asymmetric assessment detected asymmetric effects running from remittances, FDI, and gross capital formation to human capital development, both in the long-run and the short-run. Moreover, asymmetric shocks in remittances and FDI have exposed positive and statistically significant human capital development. In contrast, gross capital formation revealed a negative and statistically significant connection with human capital development. Referring to a directional causality test, the study documented a feedback hypothesis that holds in explaining the causality between remittances, FDI, and human capital development and unidirectional causality running from gross capital formation and human capital development. In regard to policy formulation, the study suggested that offering additional incentives could induce migrants to send more remittances into the economy, eventually supporting sustainable economic growth. Second, an efficient and effective financial sector can ensure optimal utilization through the channel of capital formation in the economy; therefore, countries must pay attention to the establishment of efficient intermediation.

Keywords: remittances; human capital development; FDI; asymmetry; gross capital formation

1. Background of the Study

Human capital development has been demonstrated as being one of the pillars required for economic growth without question. To put it another way, the need for human capital development for economic success is no longer debatable. The empirical literature, such as Odia and Omofonmwan [1], notes that Omojimite [2] conducted a study on a more recently established human-capital-development-driven economic growth. Today, there is no need to show the relevance of human capital in economic growth. Several studies have proven that human capital, both the actor and the recipient of growth, is the goal (that is, the end or purpose). According to modern growth theory, human capital accumulation is a significant factor in economic development. Numerous cross-country studies have exhaustively examined whether educational attainment may make a major contribution

to an economy's total output. Economic development and poverty alleviation need a significant investment in human capital. From a macroeconomic viewpoint, human capital accumulation boosts labor productivity, accelerates technological innovation, raises capital returns, and makes growth more sustainable, all of which contribute to poverty alleviation. Thus, human capital is seen as a critical production element in the economy's production function at the macroeconomic level. From a microeconomic standpoint, education boosts one's ability to find work and increases one's earning potential. Thus, human capital is defined at the micro-level as the component of education that adds to an individual's labor productivity and profits, while also serving as a critical component of company output. In other words, human capital refers to people's capacity and efficiency in transforming raw resources and capital into products and services, and the agreement is that these talents may be acquired via education. That being said, human capital development is critical for development for its inherent worth as a development objective in and of itself, not only for its instrumental usefulness.

There has been little empirical research conducted on the factors of human capital development. According to Shuaibu [3], solid economic institutions are critical for human capital development. This idea was reinforced by De Muro and Tridico [4], who found that excellent and robust institutions provide more opportunities for individuals to acquire or improve their competencies. Personal remittances from abroad were especially essential since they could be directly transmitted to the poorest people in labor-sending nations, boosting education, training, health care, food availability and consumption, and overall, they improved living circumstances and aided in poverty reduction [5,6]. According to Gundlach [7], the three most significant determinants of human capital growth are health, skills, and education.

Remittances from migrants to their countries of origin—which amounted to USD 401 billion in 2012 and are expanding rapidly—are critical for lowering the magnitude and severity of poverty in the developing world (see Figure 1). Apart from monetary advantages, remittances have improved human development outcomes in various categories, including health, education, and gender equality. This money provides a lifeline to the needy, raising individual and family income. Research on the impact of remittances in certain situations demonstrates that they positively influence school dropout rates and average birth weights of children born to remittance-receiving households. Over the past decades, remittances have emerged as critical sources of economic progress through mitigating poverty and inequality, thriving financial development, financial inclusion, the accumulation of domestic capital formation, and trade expansion, especially in developing economies. Evidence indicates that remittances positively affect welfare and growth and may contribute to economic growth, especially via their beneficial effect on consumption, savings, and investment [8]. Previous studies indicate that remittances reduce poverty levels, promote access to finance [9], increase household consumption [10], and reduce inequalities in income distribution [11]. Many empirical studies have been conducted on the effect of remittances on economic development and growth in developing countries. The aggregate, long-term influence of remittances on economic growth is conceptually difficult, even though short-run multiplier effects and the favorable impact of remittances on the welfare of recipient families are acknowledged. The empirical evidence on this topic is inconclusive. One of the mechanisms via which remittances are predicted to impact long-term economic development is domestic capital creation, which may be influenced by various factors such as an induced increase in savings and the alleviation of financial restrictions.
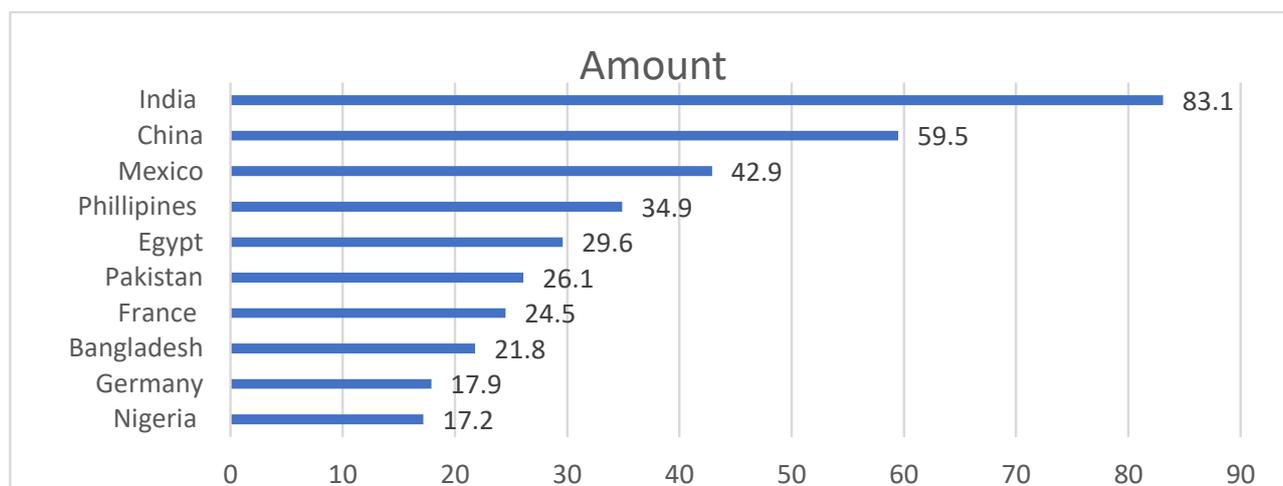
Figure 1. Remittance inflows in the year 2020.

The present study has contributed to the literature surrounding human capital development and macroeconomics fundamental's role. First, researchers have invested time and effort in examining the role of remittances, especially in financial and economic development. Moreover, there is very limited literature on the effects of remittances on human capital accumulation [12–18], especially considering the top 10 remittances recipients in a panel. To the best of our knowledge, this is the first-ever empirical study where the top 10 remittance-receiving countries have been grouped and an attempt has been made to explore fresh insights focusing on the nexus of remittance-led human capital development. Furthermore, literature focusing on panel data estimation in remittance-led human capital development has yet to reach a conclusive statement, with three lines of association available in the literature: positive, negative, and neutral effects. The effects of remittances vary due to the impact of the economy and the application of econometrical assessment. The present study has implemented empirical estimation with two proxies for measuring human capital development: the Human Capital Development Index and secondary school enrollment. The possible reason for considering two proxies for establishing conclusive evidence is that a single proxy for measurement can mislead the empirical assessment. Therefore, comprehensive proxy inclusion support is necessary to establish conclusions.

Second, our study refers to the nexus between FDI and human capital development. A plethora of evidence is available, focusing on human capital as a determinant of FDI inflows in the economy. For instance, [19,20]; that is, the availability of a quality workforce attracts foreign capital flows. Specifically, the positive and statistically significant linkage between FDI and human capital is a driving force for FDI development in the economy [19,21–25]. Conversely, the role of FDI in human capital development has yet to be extensively investigated in the literature. According to the existing literature, there is no conclusive evidence regarding the nexus of FDI-led human capital development, even though several researchers have failed to investigate the nexus. The motivation of the study is to establish the bridge and mitigate the research gap by unleashing fresh evidence for the nexus between FDI-led human capital developments. The output for FDI effects on HCD preferably opens an alternative avenue in rethinking and strategic formulating in FDI attraction in the economy on human capital accumulation. Furthermore, the FDI effects of the Human Capital Development Index and secondary-school enrollment have opened up a diversified assessment. Even though both proxies represent HCD in the economy, the economic consequences and macroeconomic policy formulation of both proxies act differently. Therefore, the study findings extend the existing findings by offering conclusive evidence for the first time as far as the literature is concerned.

Third, in terms of the methodological aspects, the existing literature has suggested that explaining the empirical nexus with a linear assessment is tremendously challenged

due to structural changes in the macro fundamentals and global integration. In the recent literature, it is extensively revealed that the implementation of an asymmetric framework in empirical assessment has opened different ways for rethinking the conventional belief and offering effective strategic formulation. The present study contributes to the empirical nexus by incorporating both symmetric and asymmetric frameworks to bring fresh insight into the nexus between REM, FDI, GCF, and HCD. Furthermore, the symmetric and asymmetric assessment has offered a different way of assessment that is the confirmation of a conventionally established theory, along with innovation in literature extension; that is, what we did in the study.

The motivation for the study is to explore the fresh insights focusing on the role of remittances on human capital development. According to the existing literature, the impact of remittances on macro fundamentals is not conclusive, implying that economic structural changes in different economies have produced different directional associations, especially in addressing the impact on human capital development. Therefore, in the study, we considered the Human Capital Development Index and secondary-school enrollment as proxies for human capital development to gain conclusive evidence. Furthermore, according to the existing literature, the role of remittances on gross capital formation and FDI has continually been investigated; thus, we include both in this empirical assessment so as to disclose their role in human capital development.

The article's remaining structure is as follows: Section 2 focuses on a review of the relevant literature and hypothesis creation, while Section 3 focuses on the study's variables and methods. Section 4 contains a report on empirical model estimates and interpretations. Section 5 discusses the study's findings, and Section 6 offers closing thoughts and policy recommendations.

2. Literature Review

2.1. Remittance and Human Capital Development

The migration–development nexus has been addressed by researchers from several social sciences. Remittances, or money sent home by migrants, are the greatest direct contribution of migration to host economies [26]. It has been hotly debated how remittances serve as critical drivers for human and economic growth [27]. Since the 1960s, the link between migration and national development has been debated; migration was formerly seen as a cure for developing nations in the early stages of their development. Due to an increase in the number of individuals traveling across international boundaries in the previous two decades, migration and development have been brought back to the forefront of discussion. According to recent studies, international migration may have a substantial role in reducing poverty and improving the quality of life for the poor in developing countries. Migrant remittances account for a large amount of the foreign income pouring into many countries, helping to encourage domestic consumption and investment. According to several cross-sectional studies, remittances have a favorable influence on education and health, which improves the host country's economy. [28]. The spending patterns of recipient families were examined in research to determine the influence of migration on human capital results. The statistics are inconsistent; several studies show that remittances are mostly used to fund nonproductive investments or conspicuous spending, while other studies indicate that remittances are used to support education, health care, and other investment goods [29,30].

The study of Irdam has investigated the role of remittances on human capital development by implementing OLS. Study findings advocated that remittance inflow positively assists in accumulating human capital development in the long run. Moreover, Adams and Cuecuecha [31] established that families receiving domestic or international remittances spend more on two investment goods—education and housing—than they would without remittances. These results provide weight to the emerging notion that remittances might assist nations receiving remittances in efforts to improve investment in people and physical resources. Furthermore, migration has been demonstrated as boosting the educational

attainment of families in the sending nation. As evidenced in Ethiopia and Sri Lanka, where migrant children are more likely than their peers to attend private schools, families that receive remittances spend much more on their children's education. [32] According to one study conducted in rural Pakistan, temporary migration is connected with increased school enrolment among sending families, particularly females [33]. Similar tendencies have been reported in Ethiopia, Ghana, and India. However, the research in this instance examined remittances sent by domestic migrants rather than foreign migrants [34].

There are several ways that a household member's migration influences the human capital creation of non-migrant household members. Different pathways may produce varying incentives for education/child work, particularly depending on the home structure and economic conditions. Remittances have a positive income impact, particularly if they compensate for income lost due to migration. Therefore, they may enhance the household's consumption of basic commodities, such as education, increasing the demand for child schooling [35]. Remittances may also have negative impacts if they demonstrate that low-skilled jobs may be enjoyable and that more cash can be acquired without attending school ([29]. A study conducted by Koska, et al. [36] gauged the role of remittances on human capital development in Egypt. The study documented a substantial link between remittances and human capital formation: the greater the likelihood of receiving remittances, the greater the likelihood of enrolling in school, and the later the age at which the children joined the labor field. Further evidence can be found in the study by Adenutsi [37]. Study findings revealed a positive, statistically significant effect on human capital development in SSA countries in the long run.

Mohamed Aslam and Sivarajasingham [38] investigated the impact of remittances on human capital formation in Sri Lanka by using macro-level, time-series data from 1975–2020. The study documented a positive, statistically significant association between remittances and human capital formation in both the long and short run. Moreover, directional causality confirmed the feedback hypothesis between remittances and human capital formation.

2.2. Foreign Direct Investment and Human Capital Development

Not every nation can attract the appropriate kind of FDI, and not every investor risks his investment without first researching the host country's circumstances. Generally, the technique of attracting FDI includes a slew of fiscal and monetary incentives. However, it should be noted that attracting FDI should be accompanied by development and growth in the level of human capital, as a requirement for attracting the correct kind of FDI, not just any type of foreign investment. Along with human capital development, FDI is seen as a crucial engine of growth because of its complimentary impacts and mutual reinforcement. Human capital's role in supporting FDI and vice versa is a contentious subject in development literature, as seen in Dunning, 1988 [39,40]. Regarding the nexus between FDI-led human capital developments, studies have yet to establish conclusive evidence; however, considering the empirical associations, the existing literature can be grouped into three directions.

First, a growing number of studies have revealed positive and statistically significant associations, implying that foreign ownership in the form of capital assistance boosts human capital accumulation in the economy. (See, for instance, Teixeira [41], Zeqiri, and Bajrami [42], Puig and Álvaro-Moya [43], among others.) The study of Bačić, et al. [44] established that "FDI can facilitate the growth of recipient country via capital formation channel directly and via positive spillovers and inclusion into international productive and innovate networks indirectly." The study of Kar [45] revealed unidirectional causality running from FDI to human capital development in India. The study postulated that human capital development through the channel of primary education development triggered long-run sustainability in the economy's quality workforce, which eventually attracts FDI inflows in the economy. Furthermore, Zhuang [46] documented unidirectional causation between FDI and human capital development in China. Kaulihowa and Adjasi [47] investigated the nonlinear effects of FDI on human capital development measured by primary educa-

tion development. The study established a statistically significant association between a nonlinear term of FDI and human capital development.

Henri, et al. [48] investigated the role of FDI inflows in SSA human capital development by considering primary- and secondary-school enrolment as a proxy of human capital development. The study documented that FDI inflow positively and statistically influenced increasing the school enrolment rate, especially in the long run.

FDI presence in the economy brings multidimensional progress, including new technology, new management skills, and new standards for business performance [49]. Furthermore, multinational corporations (MNCs) provide training to local workers and suppliers, distributors, subcontractors, and consumers. Employees of multinational corporations who have received training from the companies may use that training to switch careers, which has an indirect impact. It is also possible for multinational corporations (MNCs) to encourage their workforce to pursue higher training and education in the form of incentives. The spillover impact of MNCs on human capital leads to a better business climate in the host nation, which in turn attracts additional FDI. On the other hand, if the host nation lacks an efficient workforce, the country's competitiveness is weakened in the global market. However, MNCs will deploy highly mechanized production techniques or fill all senior managerial positions with foreign employees. In both scenarios, the job landscape would be harmed. Given India's enormous labor supply, more FDI inflows should be geared at maximizing the usage of this resource base.

Moreover, spillovers in productivity and technology are not a natural outcome of FDI. Rather FDI and human capital are intricately linked. While FDI inflows generate the possibility of knowledge spillovers to the local labor force, the host country's level of human capital dictates the amount of FDI it can attract and the ability of local enterprises to absorb the possible spillover's advantages. The link between FDI and human capital is almost certainly extremely non-linear, with several equilibria imaginable. For example, host economies with relatively high levels of human capital may attract many technology-intensive foreign multinational corporations (MNCs) that contribute considerably to the continued development of local labor skills. Simultaneously, countries with worse beginning circumstances will likely see lower FDI inflows. Those foreign businesses that join will likely deploy simpler technologies that contribute only minimally to local learning and skill development.

In a recent study, Henok and Kaulihowa [20] established the mixed effects of FDI on human capital development with various measurements. More precisely, when the primary-school enrolment rate is considered, there is evidence that FDI improves human capital. However, the opposite is true for secondary schooling. Although FDI has a good influence on elementary education, ideal spillovers to human capital development have not been achieved, it might be claimed. A suggestion that a specific level of human capital may be necessary to maximize the benefits of FDI or the sorts of present FDI does not support the FDI-led human capital hypothesis.

2.3. Remittances and Gross Capital Formation

Domestic capital production is driven by remittances, which originate from a diverse array of interrelated sources. If remittances are reliable and sufficient, they may provide additional benefits and means to recipient households. Remittances may also be beneficial in lowering the financial barriers associated with investing activity. Although it was anticipated that the circulation of remittances results in a decreased degree of moral hazard [50], remittances may also benefit small- and medium-sized businesses by providing funds for building purposes, such as housing finance [51]. Savings and investments are inextricably intertwined, and they may be expanded by the receivers' use of available financial resources.

Remittances are becoming an increasingly significant source of income and, possibly, investment capital for people in developing nations, as well as a reliable supply of foreign money for governments [52]. Remittances may have a variety of effects on the recipients'

well-being that either impact domestic capital creation by promoting savings and low-ering financial barriers, or by primarily influencing consumption demands if very poor or highly wealthy households receive them. Given its immediate influence on recipients' earnings and well-being, as well as the perception that it is a steady source of external development money [53], the flow of remittances has piqued the interest of policymakers and academics alike.

Domestic capital creation is one of the mechanisms via which remittances are predicted to impact long-run economic development by, among other things, induced increases in savings and the easing of financial limitations. Furthermore, domestic capital production is critical to economic growth. It raises production and people's living standards by boosting its development efforts. Domestic capital creation may come from a variety of sources. National savings are the primary source, with remittances, foreign direct investment, and local development aid as secondary sources. The GDP per capita in undeveloped nations is quite low. Poverty is common. As a result, private revenues are insufficient to keep domestic capital creation acceptable.

Remittances play an important role in developing nations' domestic capital development by promoting financial activities. Aggarwal, et al. [54] asserted that remittances might also contribute to financial development when sent via official channels. Additionally, it may boost intermediation by encouraging savings and increasing demand for and access to financing, with a favorable and beneficial effect on investment activity. Liquidity and credit constraints may be alleviated by employing remittances as a substitute, particularly in a financial system that is poorly managed. It should be noted that, although the particular investment effects of remittances are considered to be conditional, a well-established banking sector may provide additional cash for further investment [55]. The study conducted by Nasim [56] explores the role of remittances on capital formation in SAARC nations by examining 38 years of data. Study findings revealed that remittance inflows in SAARC countries do not accumulate domestic capital, especially in the long run.

2.4. Research Gap, Conceptual Model and Proposed Hypothesis

Referring to the existing literature focusing on human capital development, and in the process of empirical investigation, researchers have investigated the determinants and critical role of remittances in economic progress. However, the impact of remittances on human capital development is not conclusive because the role of remittances varies with the economic structure of the recipient's economy. Furthermore, as far as other key determinants, the existing literature has yet to establish conclusive evidence focusing on top remittance-receiving economies. Therefore, we tried to establish a bridge and explore fresh evidence with this study. The motivation of the study is not to explore the key determinants, but rather to gauge the role of remittances in the process of human capital development in the top 10 remittance recipients with the process of foreign direct investment gross capital formation. According to the existing literature, very scanty empirical evidence has been produced to explain the hypothesis that FDI leads to human capital development and gross capital formation-led human capital development. This study extends the existing literature in human capital development through the channel of FDI and gross capital formation with remittances' predominant role. Furthermore, the study has proposed the hypothesis shown in Figure 2 in detecting the directional association between REM, FDI, GCF, and HCD.
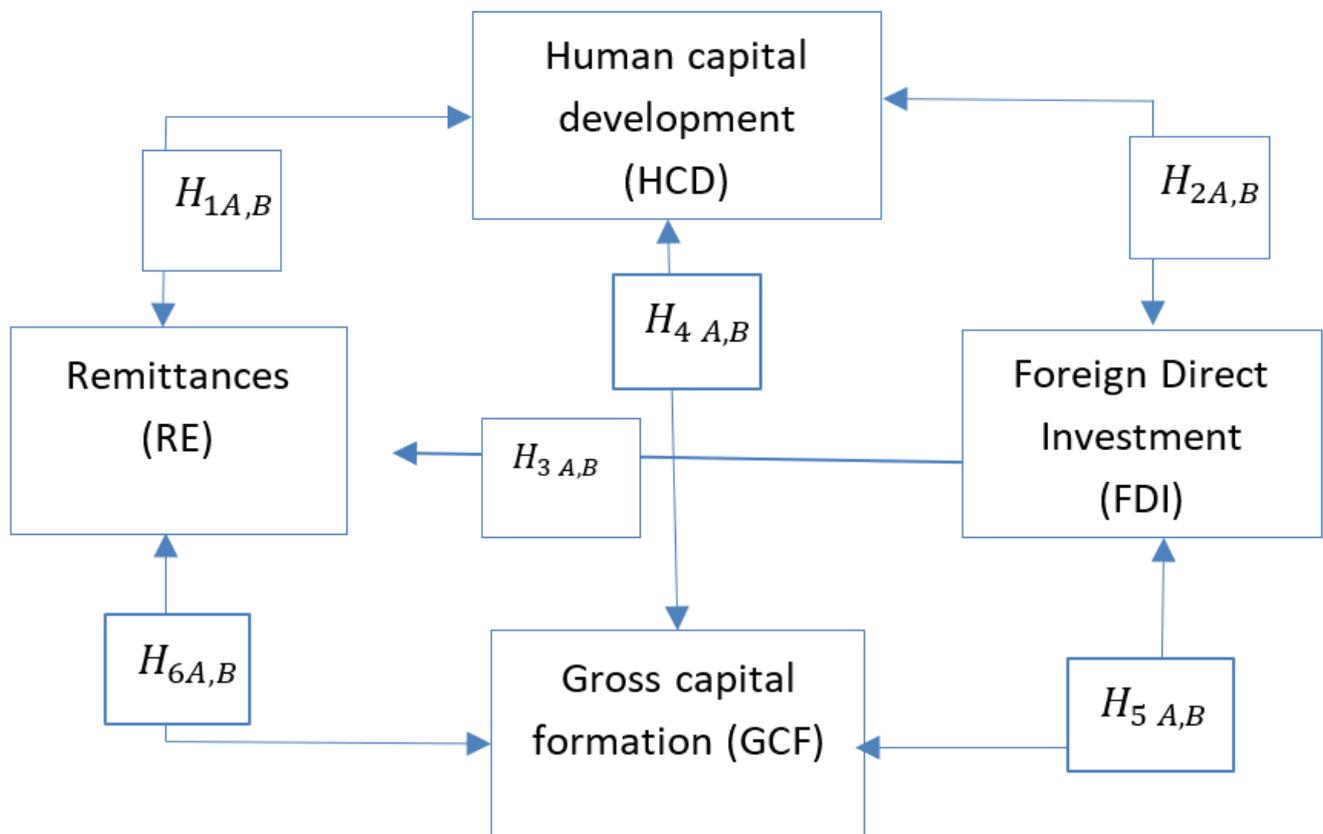
Figure 2. Conceptual model and proposed hypothesis.

H_1: Remittances Granger causes human capital development, and vice versa
H_2: FDI Granger causes human capital development, and vice versa
H_3: Gross capital formation Granger causes human capital development, and vice versa
H_4: Remittances Granger causes FDI, and vice versa
H_5: FDI Granger causes gross capital formation, and vice versa
H_6: Gross capital formation Granger causes remittances, and vice versa

3. Data and Methodology of the Study

3.1. Mode Specification

The motivation of the study is to gauge the effect of remittances on human capital accumulation through the channel of domestic capital formation in the top 10 remittance-recipient countries in 2020. The selection of the study period purely depends on the data availability for empirical investigation. By taking account of the dependent, independent and control variables, the generalized equation for empirical estimation can be displayed in the following manner:

$$HCD_{(HCDI \ \& \ SSE)} \int REM, \ GCF, \ FDI, \ FD, \ GEX \qquad (1)$$

where *HCD* stands for human capital development, measured by the Human Capital Development Index (*HCDI*), (*SSE*) stands for secondary-school enrollment, *REM* denotes remittances, *GCF* denotes gross capital formation, *FD* represents financial development, and *GEX* stands for government expenditure. The summary of descriptive statistics is displayed in The mean value of the Human Capital Development Index is 0.7117, with a standard deviation of 0.2707, suggesting a range of *HDI* from 0.4211 to 0.9824. The maximum value of *HDI* is 1.3016, and the minimum value is 0.1792. For remittance, the average value is 0.6455, with a standard deviation of 1.6202, suggesting a range value of

remittances from -1.1652 to 2.0752. The maximum value of remittances is 2.6798, and the minimum is -5.2591.

For the results of the descriptive statistics (Table 1) the variables were transformed into a natural logarithm for empirical assessment to ensure better distributional properties [57]. Natural logarithmic transformations aid in eliminating autocorrelation and heteroskedasticity from the data [58]; moreover, in comparison to linear transformations, log-transformed models provide more consistent and efficient estimation [59,60]. The above equation can be rewritten with log transformation in the following manner:

$$lnHCD_{it} = \alpha_0 + \beta_1 lnREM_{it} + \beta_2 lnGCF_{it} + \beta_3 lnFDI_{it} + \beta_4 lnFD_{it} + \beta_5 lnY_{it} + \beta_6 lnGEX_{it} + U_i \qquad (2)$$

Table 1. The results of descriptive statistics.

	HC	REM	FDI	GCF	GEX	FD	SES
Mean	0.711682	0.645568	−0.025772	3.181915	2.312946	3.476066	4.013990
Median	0.687905	1.117530	0.373190	3.123107	2.398158	3.356079	4.140200
Maximum	1.301656	2.679880	1.822431	4.492909	3.183286	4.840871	4.672151
Minimum	0.179283	−5.259146	−7.057022	2.613241	0.198966	1.600906	2.824363
Std. Dev.	0.290743	1.620231	1.409125	0.326166	0.566585	0.742415	0.504647
Skewness	0.186316	−1.345366	−2.057372	0.948588	−1.379856	−0.143068	−0.627875
Kurtosis	2.358259	4.536041	8.219565	4.334258	5.675182	2.595166	2.395885
Jarque–Bera	6.286988	109.5939	504.3310	61.41620	168.6539	2.805812	22.16961
Probability	0.043132	0.000000	0.000000	0.000000	0.000000	0.245881	0.000015
Observations	274	274	274	274	274	274	274

The mean value of the Human Capital Development Index is 0.7117, with a standard deviation of 0.2707, suggesting a range of *HDI* from 0.4211 to 0.9824. The maximum value of *HDI* is 1.3016, and the minimum value is 0.1792. For remittance, the average value is 0.6455, with a standard deviation of 1.6202, suggesting a range value of remittances from -1.1652 to 2.0752. The maximum value of remittances is 2.6798, and the minimum is -5.2591.

3.2. Variables Definition and Data Sources

Human capital development: The phrase "human capital" is often used to refer to the incorporation of aspects such as health, on-the-job training, nutrition, and formal education that are inherent in an individual and have the potential to result in future advantages (Bardhan and Udry 1999: chapter 10). Much emphasis has been paid to the function of health and education expenditures as investments. Individuals do not demand health and education for their own sake but as advantages for future income generation. Economic theorists have long postulated that educational attainment, nutrition, and health can improve labor power. The Human Development Index, produced by the United Nations Development Program (UNDP), quantifies a nation's degree of human capital. The index summarizes three elements of human capital: knowledge as assessed by school enrollment and literacy, a high standard of living as measured by per capita GDP and purchasing power parity, and life expectancy as a proxy for quality of life.

According to the existing literature, two studies have measured human capital development with empirical assessments: The Human Capital Development Index [38] and secondary-school enrollment [37]. Adenutsi [37] was the first to examine the link between foreign remittances and human development; in his study, he suggested that remittances had a beneficial influence on human development. Ustubici and Irdam [61] discovered a direct correlation between remittances and human development in similar research. They assert that most money inflows of remittances are spent on health and education. As a result, it indirectly affects the country's human development.

Remittance: The amount of money returned home by migrant workers is called a "remittance." When remittances are invested in productive businesses, GDP growth speeds

up, and a country's creditworthiness improves, making it simpler to access the international capital market.

Foreign direct investment: Money invested in the home nation by foreign or non-resident investors is a foreign direct investment (FDI). FDI boosts a host country's economy through establishing industries, generating jobs, improving infrastructure, and sharing technological know-how.

The term "gross capital creation" refers to the amount added to fixed assets, including the change in inventory. Fixed assets include real estate, machinery, and equipment, while inventories refer to partly produced items. The phrase "export of goods and services" refers to the total amount of products and services exported by a home nation to other countries during a certain period.

Apart from the above-explained variables, the study considered a list of controlled variables, such as financial development, foreign direct investment, government expenditure, and economic growth. The motivation for selecting control variables is that several studies have revealed the interlinkage between human capital development and macro development. See Table 2 for more details on variables, definitions, and proxy measures.

Table 2. Variable definition and date sources.

Variables	Notation	Measurement	Sources	Sign
Human Capital Development	HDC	Human Capital Development Index	PWT	
		Secondary-school enrollment	WDI	
Remittances	REM	Personal remittances received (% of GDP)	WDI	+
Foreign direct investment	FDI	Foreign direct investment, inflow (% of GDP)	WDI	+
Financial development	FD	Domestic credit to the private sector (% of GDP)	WDI	+/−
Government expenditure	GEX	General government final consumption expenditure (% of GDP)	WDI	+

3.3. Methodology of the Study

The study began empirical estimation with the assessment of cross-sectional dependency tests by following the Lagrange multiplier (LM) test, which was proposed by Breusch and Pagan [62], the LM—scale test proposed by Pesaran [63], and the bias-adjusted LM test familiarized by Pesaran, et al. [64]. The next study documented heterogeneous properties by employing a slope of the homogeneity test familiarized by Pesaran and Yamagata [65]. Furthermore, observing the variable's stationary properties, the study implemented conventional and cross-sectionally integrated panel unit root tests, widely known as CADF and CIPS tests. For the long-run association, the study implemented a panel cointegration test following Pedroni [66], an ADF test following Kao [67], and an error-correction-based cointegration test offered by Westerlund [68].

Panel ARDL

Following Pesaran, et al. [69], a study has implemented panel ARDL framework, widely known as the pool-grouped mean (PGM), by considering the lower degree of heterogeneity. Panel ARDL can derive both long-run and short-run coefficients in empirical assessments. Following the ADRL framework, the following generalized ARDL (p, q . . . .n) explains the nexus between remittances (*REM*), foreign direct investment (*FDI*), gross capital formation (*GCF*), and human capital development (*HCD*) as follows.

$$\Delta HCD_{it} = \beta_{0i} + \beta_{1t}HCD_{it-1} + \beta_{2t}REM_{it-1} + \beta_{3t}FDI_{it-1} + \beta_{4t}GCF_{it-1} + \sum_{J=1}^{M-1}\gamma_{iJ}\Delta HCD_{it-J} +$$
$$\sum_{J=0}^{N-1}\gamma_{ij}\Delta REM_{it-J} + \sum_{J=0}^{O-1}\gamma_{ij}\Delta FDI_{it-J} + \sum_{J=0}^{P-1}\gamma_{ij}\Delta GCF_{it-J} + \mu_i + \varepsilon_{it}\,i = 1\ldots N; t = 1\ldots T \qquad (3)$$

where *HCD* stands for human capital development, *REM* for remittances, *FDI* denotes Foreign direct investment, and *GCF* represents gross capital formation. The long-run coefficients can be documented from $\beta_{1t}\ldots\ldots\beta_{4t}$, and the short-run coefficients from $\gamma_{iJ}\ldots.\gamma_{5J}$; the coefficient of μ_i explains the speed of disequilibrium adjustment [69–72].

3.4. Nonlinear ARDL

In recent literature, the application of an asymmetric framework has gained significant attention in examining the empirical nexus. (See [57,73–75].) Following the present trend in applying non-linearity, the present study has implemented the nonlinear framework familiarized by Shin, et al. [76] in investigating the asymmetric effects of remittances, *FDI*, and gross capital formation on human capital development. By incorporating the asymmetric shocks of *REM*, *FDI*, and *GCF*, the above linear equation can be reproduced in the following manner:

$$
\begin{aligned}
\Delta HCD_{it} = \beta_{0i} \quad & +\beta_{1i}HCD_{it-1} + \beta_{2i}^{+}REM_{t-1}^{+} + \beta_{2i}^{-}REM_{t-1}^{-} + \beta_{3t}^{+}FDI_{t-1}^{+} + \beta_{3t}^{-}FDI_{t-1}^{-} + \beta_{4t}GCF_{t-1} + \beta_{5t}FD_{t-1} \\
& +\beta_{6t}GEX_{t-1} + \beta_{7t}INF_{t-1} \\
& + \sum_{J=1}^{M-1} \gamma_{iJ}\Delta HCD_{i,t-J} + \sum_{J=0}^{N-1} \left(\gamma_{ij}^{+}\Delta REM_{i,t-j}^{+} + \gamma_{ij}^{-}\Delta REM_{i,t-j}^{-} \right) \\
& + \sum_{J=0}^{O-1} \left(\left(\delta_{ij}^{+}\Delta FDI_{i,t-j}^{+} + \delta_{ij}^{-}\Delta FDI_{i,t-j}^{-} \right) \right) + \beta_{4t}FD_{t-1} + \beta_{5t}GCF_{t-1} + \beta_{6t}GEX_{t-1} + \beta_{7t}INF_{t-1} \\
& +\varepsilon_{it}
\end{aligned}
\tag{4}
$$

where REM^{+} & REM^{-} stand for the positive and negative shocks of remittances, FDI^{+} & FDI^{-} represents the positive and negative shock of foreign direct investment, and GCF^{+} & GCF^{-} explain the asymmetric shocks of gross capital formation. These shocks are computed as the positive and negative partial sum decomposition of institutional quality and tourism in the following ways:

$$
\begin{cases}
REM_{i}^{+} = \sum_{k=1}^{t} \Delta REM_{ik}^{+} = \sum_{K=1}^{T} MAX(\Delta REM_{ik}, 0) \\
REM_{i}^{-} = \sum_{k=1}^{t} \Delta REM_{ik}^{-} = \sum_{K=1}^{T} MIN(\Delta REM_{ik}, 0)
\end{cases}
\tag{5}
$$

$$
\begin{cases}
FDI_{i}^{+} = \sum_{k=1}^{t} \Delta FDI_{ik}^{+} = \sum_{K=1}^{T} MAX(\Delta FDI_{ik}, 0) \\
FDI_{i}^{-} = \sum_{k=1}^{t} \Delta TOR_{ik}^{-} = \sum_{K=1}^{T} MIN(\Delta FDI_{ik}, 0)
\end{cases}
\tag{6}
$$

$$
\begin{cases}
GCF_{i}^{+} = \sum_{k=1}^{t} \Delta GCF_{ik}^{+} = \sum_{K=1}^{T} MAX(\Delta GCF_{ik}, 0) \\
GCF_{i}^{-} = \sum_{k=1}^{t} \Delta GCF_{ik}^{-} = \sum_{K=1}^{T} MIN(\Delta GCF_{ik}, 0)
\end{cases}
\tag{7}
$$

Finally, the above asymmetric equation can be derived from estimating in terms of error correction term (ECT) as follows:

$$
\begin{aligned}
\Delta HCD_{it} = \tau_{1i}\xi_{it-1} \\
& + \sum_{J=1}^{M-1} \gamma_{iJ}\Delta HCD_{i,t-J} + \sum_{J=0}^{N-1} \left(\gamma_{ij}^{+}\Delta REM_{i,t-j}^{+} + \gamma_{ij}^{-}\Delta REM_{i,t-j}^{-} \right) \\
& + \sum_{J=0}^{O-1} \left(\left(\delta_{ij}^{+}\Delta FDI_{i,t-j}^{+} + \delta_{ij}^{-}\Delta FDI_{i,t-j}^{-} \right) \right) + \sum_{J=0}^{P-1} \left(\mu_{ij}^{+}\Delta GCF_{i,t-j}^{+} + \mu_{ij}^{-}\Delta GCF_{i,t-j}^{-} \right) + \varepsilon_{it}
\end{aligned}
\tag{8}
$$

Finally, following the existing literature such as [77,78], the study implemented the heterogeneous panel causality test offered by Dumitrescu and Hurlin [79] for detecting the bivariate causality between variables in the short run. The studies of Rahman [80] and Miao and Qamruzzaman [58] postulated that the heterogeneous causality test could handle the issue of cross-sectional dependency among the research units. Furthermore, the proposed causality test has produced stable and efficient outputs in the composition with N > T or T > N in any circumstances [81]. This test is built on the premise that all coefficients are unique across cross-sections and two separate distributions: asymptotic and

semi-asymptotic. When T exceeds N, the asymptotic distribution is used; when N exceeds T, the semi-asymptotic distribution is used. The following model is to be implemented for evaluating the directional causality in the empirical assessment:

$$y_{it} = \alpha_i + \ldots + \sum_{j-1}^{J} \beta_i^J y_{i,t-j} + \sum_{j-1}^{J} \gamma_i^j x_{i,t-j} + \theta_{i,t} \tag{9}$$

4. Estimation and Interpretation

4.1. Results of Cross-Sectional Dependency

The study implemented both homogeneity and cross-sectional dependency tests, and their results are displayed in Table 3. At a 1% significance level, the results of the ▲ and Adj. Δ show that the slope coefficients are diverse for the seven models. As a result, credible policy choices regarding the remittance-led human capital development link may be formed by taking into account the country-specific data. Furthermore, the findings of the four different cross-sectional dependency tests show that the null hypothesis is rejected. In other words, nations rely on one another cross-sectionally. Globalization has increased the interconnectedness of wealthy nations. As a result, changes in remittances, FDI, and gross capital formation caused by positive or negative shocks in one developed nation might impact other countries. After defining the parameters of the panel data, the series' stationarity is tested using a second-generation panel unit root test.

Table 3. The results of the cross-sectional dependency and heterogeneity test.

					Δ	Adj.Δ
lnHCD	232.88 ***	18.645 ***	220.333 ***	50.252 ***	49.806 ***	121.033 ***
lnSSE	298.795 ***	23.482 ***	183.635 ***	15.567 ***	77.276	57.655 ***
inREM	162.763 ***	37.697 ***	245.114 ***	9.591 ***	25.01 ***	94.323 ***
lnFDI	408.999 ***	17.359 ***	155.211 ***	39.682 ***	79.959 ***	139.602 ***
lnFD	297.782 ***	16.043 ***	135.943 ***	52.327 ***	41.866 ***	141.461
lnGCF	388.186 ***	31.906 ***	124.924 ***	55.658 ***	93.453 ***	77.532
lnGEX	376.282 ***	28.723 ***	180.494 ***	55.175 ***	25.527 ***	144.007 ***

Note: *** denotes a 1% significance level.

4.2. CIPS Panel Unit Root Test

The panel unit root test results are displayed in Table 4. with CIPS and CADF, introduced by Pesaran [82]. The study's findings revealed that all the variables were not stationary at a level but became stationary after the first difference. The present status of the variables' stationary properties suggests the possible long-run cointegration between variables, which will be investigated in the following section with a panel cointegration test.

4.3. Results of Panel Cointegration Test

Next, the study employed a panel cointegration test following Pedroni [66,83,84] andKao [67], and their results are displayed in Table 5. According to the test statistics from the Pedroni panel cointegration test (see panel A of Table 5), it is apparent that 9 out of 11 test statistics are statistically significant at a 1% level of significance. Study findings confirmed the long-run connection between REM, FDI, GCF, and HCD. Furthermore, the test statistics of Kao's cointegration test have been exposed as statistically significant at a 1% level, suggesting the presence of a long-run association. Once the long-run cointegration was revealed, the study moved to gauging the variables' magnitudes in the long-run and short-run horizons with symmetry–asymmetry assumption.

Table 4. Panel unit root test with cross-sectional dependency.

| | CIPS | | | | CADF | | | |
| | At level | | Δ | | At level | | Δ | |
	C	C&T	C	C&T	C	C&T	C	C&T
lnHCD	−1.281	−2.675 *	−3.475 ***	−6.694 ***	−2.874 *	−2.889 *	−4.649 ***	−3.533 ***
lnSSE	−2.954 **	−2.36	−4.641 ***	−5.512 ***	−1.649	−2.939	−7.18 ***	−6.049 ***
inREM	−2.545	−1.744	−4.831 ***	−6.113 ***	−1.969	−1.25	−6.195 ***	−2.705 ***
lnFDI	−2.854 **	−2.315	−6.907 ***	−6.443 ***	−2.706	−1.545	−6.024 ***	−3.502 ***
lnFD	−2.477	−1.523	−7.177 ***	−7.849 ***	−1.309	−1.682	−6.857 ***	−5.158 ***
lnGCF	−1.345	−2.334	−7.462 ***	−4.372 ***	−2.142	−1.437	−7.502 ***	−5.904 ***
lnGEX	−1.537	−2.131	−7.665 ***	−2.887 **	−1.497	−2.078	−4.462 ***	−4.273 ***

Note: ***/**/* denote the level of significance at 1%/5%/10%, respectively.

Table 5. Panel cointegration test.

| | [1] | | [2] | |
	Statistic	Weighted Statistic	Statistic	Weighted Statistic
Alternative hypothesis: Common AR coefs. (within dimension)				
Panel v-Statistic	1.21	−0.253	2.736 *	−1.076
Panel rho-Statistic	−4.13	−7.768	−6.213	−9.155 ***
Panel PP-Statistic	−9.808 ***	−9.428 ***	−8.219 ***	−8.952 ***
Panel ADF-Statistic	−5.851 ***	−11.083 ***	−2.067	−7.649 ***
Alternative hypothesis: Individual AR coefs. (between dimension)				
Group rho-Statistic	−10.696 ***		−10.022 ***	
Group PP-Statistic	−8.06 ***		−8.187 ***	
Group ADF-Statistic	−3.507 **		−4.418 ***	
ADF	−2.9726 ***		−1.5814 ***	

Note: ***/**/* denote the level of significance at 1%/5%/10%, respectively.

4.4. Long-Run and Short-Run Symmetric Assessment

The results of the symmetric assessment in empirical relationships between remittances, FDI, and human capital development are displayed in Table 6, which includes four panel outputs (panel A for long-run coefficients; panel B for short-run coefficients; and residual diagnostic test results reported in panel C), with two empirical model assessments; that is, for Model 1, HCD is measured by human capital index, and for Model 2, HCD is measured by the rate of secondary-school enrollment.

Referring to the association between remittance-led human capital development, in the long run, study findings documented positive and statistically significant associations between remittances and human capital development in Model 1 (Model 2) estimation with a coefficient of 0.1381 [0.0515]. Study findings suggest that a 10% development in remittance inflows can increase human capital development by 1.381% (0.515%). In the short run, it is apparent that remittance inflows play a catalyst role in accumulating human capital in the economy, suggesting the positive and statistically significant linkage between them in both model estimations. More precisely, a 10% increase in remittances will boost human capital development by 0.326% (0.915%). Our findings aligned with the existing literature such as Boucher, Stark, and Taylor [29], Koska, Saygin, Çağatay and Artal-Tur [36], and Adenutsi [37].

Table 6. Results of the symmetric assessment.

	DIV: Human Capital Development Index				DIV: Secondary-School Enrolment			
	Coefficient	Std. Error	t-Statistic	*p*-Value	Coefficient	Std. Error	t-Statistic	*p*-Value
	Panel-A: Long-run coefficients							
REM	0.13814	0.044883	3.07774	0.0023	0.051549	0.028372	1.816897	0.0707
FDI	0.01698	0.007362	2.30686	0.0219	0.02106	0.00924	2.27933	0.0275
GCF	0.042915	0.006727	6.37961	0.5241	0.09676	0.083747	1.155385	0
GEX	0.279363	0.07242	3.857528	0.0001	0.465801	0.147707	3.153547	0.0019
FD	0.028975	0.0034803	8.32539	0.4059	0.208892	0.113753	1.836365	0.0678
	Panel-B: Short-run Equation							
ECT(-1)	−0.08893	0.04082	−2.17859	0.0303	−0.05824	0.029406	−1.98068	0.049
D(REM)	0.0326	0.01553	2.099163	0.0368	0.0915	0.009468	−9.66413	0.335
D(FDI)	0.0554	0.0112	4.946429	0.2016	−0.01303	0.00659	−1.97724	0.8435
D(GCF)	−0.02002	0.003069	−6.5233	0.5148	−0.02033	0.057253	−0.35504	0.7229
D(GEX)	−0.00808	0.00291	−2.77663	0.8979	0.05252	0.057738	0.909626	0.9276
D(FD)	0.00619	0.00171	3.619883	0.8675	0.027249	0.108152	0.251951	0.8013
C	0.09842	0.001656	59.43237	0	0.044005	0.014039	3.134483	0.002
H-test		0.571				0.812		

Long-run and short-run asymmetric assessment.

Referring to FDI-led human capital development, the study documented positive and statistically significant linkages in empirical estimations with a coefficient of 0.01698 in Model 1 and a coefficient of 0.02106 in Model 2 for the long-run assessment. Study findings suggest that a 10% growth in FDI inflows in the economy can accelerate the present state of human capital development by 0.168% (0.216%). It is evident that capital inflows with foreign ownership support increasing the quality of workforce generation through accelerating the human capital development process, which is in line with the existing literature, for instance, Kar [45]; Teixeira [41]; Zeqiri and Bajrami [42]; Puig and Álvaro-Moya [43]; and Henri, Luc, and Larissa [48]. In the short-run, the study revealed the mixed effects of FDI on human capital development: positive and statistically significant in Model 1 (a coefficient of 0.0554), and negative and statistically significant in Model 2 (a coefficient of −0.01303).

In the long run, the effect of gross capital formation on human capital development was revealed to be positive and statistically significant in Model 1 (a coefficient of 0.0429) and Model 2 (a coefficient of 0.0967). Study findings suggest that a 10% growth in gross capital formation in selected nations can increase human capital formation by 0.429% by changing the Human Capital Development Index and by 0.967% with secondary-school enrollment. Moreover, following short-run estimations, the study findings documented a negative and statistically significant linkage with human capital development in Model 1 (a coefficient of −0.02002) and a statistically insignificant association in Model 2. Study findings suggest that capital adequacy, especially in the long run, acts as a catalyst in accumulating human capital for economic progress.

For the effect of control variables, that are government expenditure and financial development, the study revealed a positive and statistically significant linkage to human capital development in selected sample nations in the long and short run. Furthermore, the verdict of a positive linkage is applicable in both empirical assessments. The coefficient of error correction terms in Model 1(2) exposed negative and statistically significant effects at a 1% level of significance with a coefficient of −0.0893 (−0.05824). It suggests the presence

of long-run cointegration between remittances, FDI, gross capital formation, financial development, government expenditure, and human capital development.

The results of asymmetric effects of remittances, foreign direct investment, and capital formation on human capital development are displayed in Table 6. Empirical output for Model 1 with the Human Capital Development Index and Model 2 with secondary-school enrolment as a measure of human capital development is shown. Moreover, the long-run asymmetric coefficients are displayed in Panel A and short-run coefficients in Panel B.

In the long run (see panel A, Table 7), a standard Wald test has been performed with the null hypothesis of long-run asymmetry. The results of the standard Wald test revealed statistically insignificant test statistics; that is, the p-values are higher than the 5% level of significance. It suggests that the presence of an asymmetric interlinkage between independent variables and human capital development is valid for both models.

Table 7. Results of the long-run and short-run asymmetric assessment.

Variable	DIV: Human Capital Development Index			DIV: Secondary-School Enrolment		
	Panel A: Long-Run coefficients					
	Coefficient	Std. Error	t-Statistic	Coefficient	Std. Error	
REM_POS	0.066991	0.009756	6.866646	0.08333	0.019897	4.188111
REM_NEG	0.074555	0.006029	12.36606	0.236404	0.077294	3.058504
FDI_POS	0.017507	0.002545	6.878978	−0.0689	0.033802	−2.03819
FDI_NEG	0.019953	0.002938	6.791355	−0.24766	0.100521	−2.46371
GCF_POS	−0.09682	0.023602	−4.10219	0.15531	0.039304	3.95158
GCF_NEG	−0.10296	0.018137	−5.67663	0.208851	0.047941	4.356435
GEX	0.184335	0.015899	11.59413	0.080437	0.034146	2.355679
FD	−0.01965	0.010947	−1.79456	0.15435	0.026059	5.923098
W_{LR}^{REM}	0.7841			0.5722		
W_{LR}^{FDI}	0.5122			0.4331		
W_{LR}^{GCF}	0.3711			0.7522		
	Panel B: Short-Run Equation					
COINTEQ01	−0.09176	0.022774	−4.02916	−0.15468	0.013085	−11.8212
D(REM_POS)	0.018574	0.004139	4.487557	0.02998	0.0066	4.542424
D(REM_NEG)	0.025242	0.00513	4.920468	−0.01594	0.00431	−3.69768
D(FDI_POS)	0.02671	0.00174	15.35057	0.06299	0.015043	4.18733
D(FDI_NEG)	−0.00257	0.00209	−1.22727	−0.02447	0.022229	−1.10086
D(GCF_POS)	0.02252	0.009627	2.339254	0.101445	0.00969	10.46904
D(GCF_NEG)	−0.02428	0.014498	−1.67464	0.014184	0.005789	2.450164
D(GEX)	−0.02798	0.005554	−5.03781	0.041778	0.03477	1.201553
D(FD)	0.02899	0.006394	4.533938	0.015467	0.00709	2.181523
C	0.027239	0.015563	1.750241			
W_{LR}^{REM}	0.6234			0.1132		
W_{LR}^{FDI}	0.2243			0.44.12		
W_{SR}^{REM}	0.3316			0.5112		
W_{SR}^{FDI}	0.2251			0.1283		
Hausman test	2.845 (0.1522)			1.622 (0.4824)		

Next, the study included a heterogeneous panel causality test. The results are displayed in Table 8 including panel A with HDI as a measure of human capital development and secondary-school enrollment in panel B. According to the causality test output, several directional causalities have been documented in both models. In particular, the study is interested in assessing the connection between remittances, FDI, gross capital formation, and human capital development. The study documented a feedback hypothesis between REM, HCD, and GCF in both model assessments [REM←→HCD; GCF←→HCD] and unidirectional causality revealed between FDI and HCD [FDI→HCD] in Model 2, but bidirectional effects in Model 1.

Table 8. Results of panel causality test.

	HCD	REM	FDI	GCF	GEX	FD	
			Panel A: Human capital development measured by HDI				
HBD		(2.151) [0.0293]	(3.3971) ** [1.7512]	(5.8713) *** [4.7272]	(5.0458) *** [4.0589]	(3.8918) *** [2.4529]	
REM	(3.9544) *** [2.5381]		(4.7117) *** [3.5689]	(3.1476) [1.2191]	(5.0975) *** [4.1261]	(3.4496) [1.8239]	
FDI	(4.4939) *** [3.2714]	(1.8826) [−0.3489]		(3.916) ** [2.4831]	(5.5577) *** [4.2808]	(5.363) *** [4.071]	HCD←→REM; HCD←→FDI; GCF←→HCD;
GCF	(10.1308) *** [10.2102]	(7.5511) *** [6.8833]	(2.0155) [−0.2426]		(4.4666) *** [3.2336]	(5.3574) *** [4.0637]	
GEX	(5.3857) *** [4.532]	(3.2144) [1.5075]	(3.6145) ** [2.0525]	(4.3309) [2.7429]		(3.3011) [1.6307]	
FD	(6.6976) *** [6.3579]	(5.403) *** [4.5509]	(2.1767) [0.0596]	(3.9204) ** [2.2147]	(2.3352) [0.2863]		
			Panel B: Human capital development measured by secondary-school enrollment				
HCD		(4.0387) *** [5.7966]	(2.2982) ** [2.3933]	(3.2964) *** [4.3291]	(2.376) ** [2.5456]	(6.3426) *** [9.8773]	
REM	(2.1204) ** [2.0424]		(1.8778) [1.6511]	(3.4374) [4.7796]	(8.6266) *** [14.5227]	(1.0418) [−0.0809]	
FDI	(1.6669) [1.1567]	(1.6759) [1.2439]		(1.9778) [1.853]	(2.5513) *** [3.001]	(0.7826) [−0.5596]	REM←→HCD; FDI→HCD; GCF←→HCD
GCF	(2.6748) *** [3.1159]	(1.404) [0.6897]	(1.1995) [0.2793]		(4.3093) *** [6.5613]	(1.2523) [0.3192]	
GEX	(4.3488) *** [6.41]	(3.0245) *** [3.9645]	(6.371) *** [10.7233]	(2.4034) ** [2.7023]		(4.9874) *** [7.5182]	
FD	(4.0574) *** [5.5736]	(1.3438) [0.5001]	(4.0096) *** [5.635]	(1.833) [1.4335]	(3.7281) [5.0928]		

Note: the values in (W-Stat.) and [Zbar-Stat.]. Note: ***/** denote the level of significance at 1%/5%/10%, respectively.

Referring to asymmetric coefficients of remittances, the study documented that positive (negative) shocks in remittances have positive and statistically significant connections with human capital development in both cases in the long run. It implies that any variations in remittance inflows in the economy can cause human capital development with an increasing or decreasing trend that is persistent, and continual inflows of remittance must be ensured to achieve sustainable human capital development. More precisely, a 10% positive shock in remittances can result in human capital development in the economy by 0.6691% in terms of the Human Capital Development Index and 0.833% in secondary-school enrollment, whereas a 10% reduction in remittance inflows in the economy can adversely affect human capital development by 0.745% in terms of the Human Capital Development Index and by 2.34% in terms of secondary-school enrollment. According to the asymmetric

coefficients' magnitudes, it is manifested that negative shocks in remittance effects on human capital development are more evident compared to positive variations. It suggests that remittance recipient economies have to be cautious in managing and channelizing migrants' remittances so that the inflows of remittances are maintained. The short-run asymmetric effects of remittances on human capital development revealed the model's positive and statistically significant linkage. Specifically, a 10% growth in remittances can increase human capital development by 0.185% in terms of the human capital index and by 0.298% in terms of secondary-school enrollment. On the other hand, a 10% decrease in remittances can decrease human capital development by 0.252% in terms of the human capital index. However, the progress of human capital development can improve by 0.159% in terms of secondary-school enrollment.

Referring to asymmetric effects of foreign direct investment on human capital development, the study documented a positive and statistically significant linkage in Model 1 (a coefficient of 0.017507 for positive innovation and a coefficient of 0.019953 for negative innovation in FDI) and a negative statistically significant tie in Model 2 (a coefficient of −0.0689 for positive shocks and a coefficient of −0.24766 for negative shocks, respectively). According to coefficient magnitudes and their signs, it is obvious that FDI's role in human capital development is not conclusive; that is, the effects of FDI differ with the selection of human capital measurement in empirical assessment. Referring to short-run assessment, positive shocks in FDI have been revealed to be positive and statistically significant in Model 1 (a coefficient of 0.02671) and Model 2 (a coefficient of 0.06299). The negative shocks of FDI have exposed negative and statistically significant ties in Model 1 (a coefficient of −0.00257) and Model 2 (a coefficient of −0.02447). Study findings suggest that FDI inflows are critical in human capital accumulation even though the role is not yet conclusive; thus, economics must concentrate more on FDI movement in the economy channelized into more industrialization and productive area.

Capital adequacy is the prerequisite for sustainable economic progress as is true for other macro-agents. Referring to the asymmetric effects of gross capital formation (GCF^+; GCF^-) on human capital development, in the long run, the study documented that asymmetric shocks in GCF are negative and statistically significant at a 1% level. GCF has exposed the positive shocks with a coefficient of −0.09682, and the negative shocks have a coefficient of −0.10296 whereas, in Model 2, the asymmetric coefficients have been revealed as positive and statistically significant at 1%; that is, the positive shocks of GCF established with a coefficient of 0.15531 and the negative shocks in GCF revealed with a coefficient of 0.2088, respectively. According to coefficient magnitudes, gross capital formation has augmented human capital development through accelerating secondary-school enrollment. In contrast, the effects of positive shocks in GCF on the Human Capital Development Index are adverse, but the negative shocks in GCF have produced beneficial effects in human capital development. The effects of GCF have produced diversified output with the different measurement of human capital in the empirical equation.

The error correction term (ECT) coefficient is negative and statistically significant, suggesting the long-run convergences due to short-run disequilibrium at a speed of 0.097 in Model 1 and 0.1546 in the Model 2, respectively. Furthermore, the short-run symmetry test results revealed the rejection of the null hypothesis in all cases, validating the asymmetric linkage between remittances, FDI, gross capital formation, and human capital development. For the control variables' effects, government expenditure has been exposed as having a positive and statistically significant linkage with human capital development in both models in the long run. In contrast, the role of financial development has been documented as negative and statistically significant with human capital development measured by HDI, but positive and statistically significant with secondary-school enrollment as a measure of human capital development.

5. Discussion of the Findings

The role of remittances in economic sustainability has been extensively investigated with a diversified macro agent; moreover, the importance of human capital development has also been tested in the empirical literature as a key factor of economic development. However, the interconnection, precisely the effects of remittances on human capital development, has yet to be extensively explored in the literature. The present study has initiated for the first time an investigation into the role of remittances on human capital accumulation, especially in the top 10 remittance-recipient nations. The study considered the Human Capital Development Index and secondary-school enrollment as measures for human capital development in the empirical assessment under the symmetry and asymmetry assumptions.

Remittances are one of the most obvious side effects of the worldwide migration problem in migrant-sending nations. This inflow of funds has had the greatest immediate influence on migrant families' income, which has risen considerably. These changes may influence the monetary resources allocated to certain spending categories, particularly those involving physical and human capital investments. The study documented the positive and statistically significant association between remittances and human capital development, measured by the Human Capital Development Index and secondary-school enrollment. The study findings support the existing literature, such as Azizi [85] and Azam and Raza [15]. A variety of elements contribute to the growth of national economic development systems and the living standards of individuals; migrant remittances to developing nations are one of the most important elements in this respect. Every nation strives to promote the well-being of its citizens by using a variety of tactics and resources. In this respect, the importance of migrant remittances cannot be overstated since they have been shown to contribute significantly to economic growth and development. As a result, remittances are an effective and constructive tool for poverty reduction, as they help build the human capital of developing countries.

The study of Ustubici and Irdam [61] advocated that remittance recipient households spend a significant portion of income on health expenditures and education that improve human life like a hood. That is, the indirect effects on human capital development have been documented. Furthermore, the household's expenditure on health and education contributes to economic aggregation and productive development. Remittance inflows contribute significantly to economic growth by raising aggregate spending and expanding access to critical social infrastructures, such as education and health care, contributing to an overall improvement in the quality of life in developing countries.

On the other hand, some research corroborates the favorable influence of emigrant remittances, while others disagree with the function of the workers mentioned above. Remittance recipients, according to Ambrosius and Cuecuecha [86] (2010), spend more on investments, including education and housing, than nonremittance households do on consumption (food and consumer goods). The long-term economic prospects of emerging nations are expected to be increasingly relevant in this regard.

Referring to secondary-school enrollment as a measure of human capital development, according to the symmetry assessment, the study revealed a positive and statistically significant tie between them, suggesting that remittance inflows accelerate human capital accumulation through the education channel. Our findings are in line with the existing literature, such as Ngoma and Ismail [13], Mansour, et al. [87], Amuedo-Dorantes and Pozo [88], and Gul, et al. [89]. According to the findings of De and Ratha [32], remittances improve children's well-being through promoting human-capital-building in the areas of health and educational opportunities. Using survey data from Colombia, Medina and Cardona [90] revealed that remittance revenues increase the percentage of education expenditure by the government by 10%. Individuals between the ages of 5 and 30 years old, on the other hand, did not show any evidence of a negative influence on school attendance. Other research has looked at how unanticipated remittance shocks affect the prevalence of child labor, children's engagement in school, and educational expenditures in developing

countries. Among other things, the researchers Alcaraz, et al. [91] discovered that the loss in remittance revenues during the current financial crisis in the United States is connected with an increase in child labor and a decrease in school retention rates in Mexico. Yang [92] found that positive shocks to remittance revenues through the exchange rate during the 1997 Asian financial crisis increased the amount of money invested and spent on child education in the Philippines, according to his research. Foreign migration, money transfers, and education are all likely to be decided at the same time. The choice to send a child to school may coincide with the family's oldest man's desire to work abroad. Families with school-aged children are more likely to send family members to work abroad to help pay for their children's education. The study of Contreras [93] documented that migration possibilities for the home economy induce human capital development; that is, migrant recipients indulged in significant deployment in education, which allows human capital accumulation in a society. Furthermore, studying investment in education supports sustainable economic development.

The impact of FDIs on human capital development, technological transfer, and, ultimately, economic growth has received much attention. According to economic theory, FDI, directly and indirectly, influences the macroeconomic component. Direct consequences include funding infrastructure development, establishing new companies, generating jobs, and investing in portfolios. At the same time, indirect benefits come from improved technical knowledge, managerial skill transfer, and other technological spillovers that promote capital accumulation by encouraging domestic demand for products and services. The interaction between inbound FDI and recipient countries' human capital is one economic element of FDI that has received scholarly attention. Human capital is described as the information and abilities acquired via education and training and the outcome of purposeful investment that produces returns. Human capital is a key predictor of organizational success and economic development [94]. Although developing and strengthening human capital is a complex process, there are a variety of approaches available, including formal schooling, company-provided training, vocational and technical training, and informal on-the-job learning. The role of foreign direct investment has been documented as positive and statistically significant with human capital development in symmetric assessment, supporting the existing literature, such as Baghirzade [95], Colen, et al. [96] Furthermore, the mixed-effects revealed in asymmetric evaluation are a positive tie with the Human Capital Development Index and a negative statistically significant linkage with secondary school enrollment as a measure of human capital development in the equation, which is in line with Kaulihowa and Adjasi [47]. According to neoclassical growth theories, inflows of FDI potentially increase technological progress, thus accelerating the economy's human capital translation. Moreover, FDI and human capital development are modeled in an endogenous manner, eliminating the possibility of linear relationships between the two. It is predicated on the assumption that foreign direct investment (FDI) fosters knowledge transfer, which progressively results in human capital growth. The model further relaxes the assumption that human capital development yields a constant rate of return across time. Over time, it is projected that foreign direct investment would boost human capital, resulting in increased investment in educational opportunities. Khafidzin [97] argues that skill development is a time-varying parameter. Investigating the underlying relationship is necessary to account for non-linear effects that would be ignored under the typical neoclassical assumptions.

Despite the generally favorable attitude of the theoretical implications of foreign direct investment on human capital development, some opponents say that the technologies originating from FDI operations are sometimes too complex to be comprehended by the general public. As a result, recipient countries with a poor capacity foundation may not realize the benefits of human capital accumulation. The idea of spillover impacts may also not be realized since the operations of multinational corporations are likely to have a competitive effect. Competitive consequences arise when FDI drives out employment in domestic industries [98]. Spillovers may also result in skill-biased development, increasing inequality and impeding human capital accumulation [99]. Ibarra-Olivo [21] investigated

the impact of FDI on higher education in developing countries and came to the same conclusion. The discovery lends weight to the concept of a detrimental, short-term impact on tertiary education. The negative impact was further reinforced because fewer students were enrolled in secondary schools. In a similar vein, Mughal and Vechiu [100] examined the influence of FDI on human capital development via technology transfer using a sample of 16 East Asian nations. The research findings confirm the existence of a negative association between foreign direct investment and postsecondary education although a positive relationship was discovered for secondary education.

This may be attributed to several factors. The statistically mild effects of FDI may be traced back to the FDI framework's early days. The second point is that FDI has little influence when education does not need a high degree of technical knowledge. According to the authors, MNCs may be hesitant to invest in high-tech businesses since FDI disproportionately influences education. Technological spillovers are now impossible due to a scarcity of human capital. Under these circumstances, it is clear that foreign investors' real contributions fall short of the recipient nations' expectations.

6. Conclusions and Policy Suggestions

The motivation of the study is to evaluate the role of remittances, foreign direct investment, and gross capital formation in human capital development in the top 10 remittance recipients for the period of 1980–2019. The study employed both symmetric and asymmetric empirical frameworks in exploring the elasticity of REN, FDI, and GCF on human capital development. Furthermore, directional causality has been revealed by performing a heterogeneous causality test. The key findings of the study are as follows:

First, the cross-sectional dependency and panel unit root test results revealed that the research units had shared common dynamics. Furthermore, a test of stationary compatible with cross-sectionally dependent units documented stationary variables, either at a level or after the first difference. However, neither has exposed any after the second difference. Furthermore, panel cointegration tests established long-run association between REM, FDI, GCF, and human capital development.

Second, the results of panel ARDL have documented a positive and statistically significant linkage between remittances and human capital development in the top 10 recipient countries. The positive association is valid to both proxies, the Human Capital Development Index and secondary-school enrollment in the economy. Moreover, FDI and gross capital formation revealed a positive tie with human capital development, but FDI has less elasticity compared to gross capital formation. In particular, gross capital formation has produced a more intense impact on human capital development through population inclusion into the formal education system.

Third, according to the standard Wald test, asymmetric effects are run from REM, FDI, and GCF to human capital development in the long and short run. Referring to asymmetric shocks of remittances on human capital development, the study has documented a positive and statistically significant association, both in the long and short runs. In terms of asymmetric elasticity, the long run has more significance than the short run. Moreover, negative shocks have produced higher magnitudes on human capital development than positive innovation, which is valid for HCDI and secondary-school enrollment as a measure of human capital development. The asymmetric effects of FDI were revealed as positive and statistically significant, both in the long run and the short run. Finally, the asymmetric shocks in gross capital formation were revealed as negative and statistically significant for human capital development as measured by the Human Capital Development Index, but as a positive and statistically significant tie with human capital development measured by secondary-school enrollment.

Fourth, the directional causality test results documented bidirectional causality between remittance and HCD and gross capital formation and HCD. In contrast, unidirectional causality runs from foreign direct investment to HCD.

The study ended with the following policy suggestions in accelerating human capital development to sustainability by considering all of the empirical findings. First, excessive money flows from remittances into the economy have to be channelized with efficient financial intermediation. The present contributory role in human capital development has reached maximum potential. Financial institutions should accept migrants' remittances with a clear motivation for economic sustainability: fund accumulation for human development and capital accumulation, especially in remote areas. Second, institutional development with good governance and social equality should be ensured and open the scope for capitalizing social development with available remittances in the economy, which eventually entice migrants to transfer money to their homes from the host economies. Third, foreign direct investment has channelized technical know-how in the economy, thus promoting human capital development by offering technological expertise and supplying skilled human resources. So, it is imperative to have efficient institutional development and good governance practices for fostering the persistent inflows of FDI into the economy.

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