



Unraveling Corruption in South Asia: The Role of Human Capital, Foreign Direct Investment and Economic Growth

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ABSTRACT

This study examines the degree of corruption in relation to human capital, foreign direct investment (FDI), and economic growth in the context of five selected South Asian economies; Pakistan, India, Bangladesh, Sri Lanka, and Nepal. The study data covers the time span of twenty-five years, from 1999 to 2023. Panel data analysis is employed to examine the relationship between corruption, human capital, foreign direct investment, and economic growth. For the empirical analysis, the Pooled Mean Group (PMG) estimator issued. The study findings reveal that enhanced human capital and economic expansion significantly elevate the level of corruption in these countries. In addition, the negative coefficient values of FDI exhibits a mitigating effect on corruption, indicating its potential role as a deterrent in the South Asian region, particularly in the selected countries. Resultantly, this study recommends that these developing economies raise the volume of FDI to address the issue of rampant corruption in their geographical region. Moreover, authorities in these countries ought to devise strategies and design policies to mitigate the level of corruption associated with human capital, FDI influx, and economic growth.

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1. Introduction

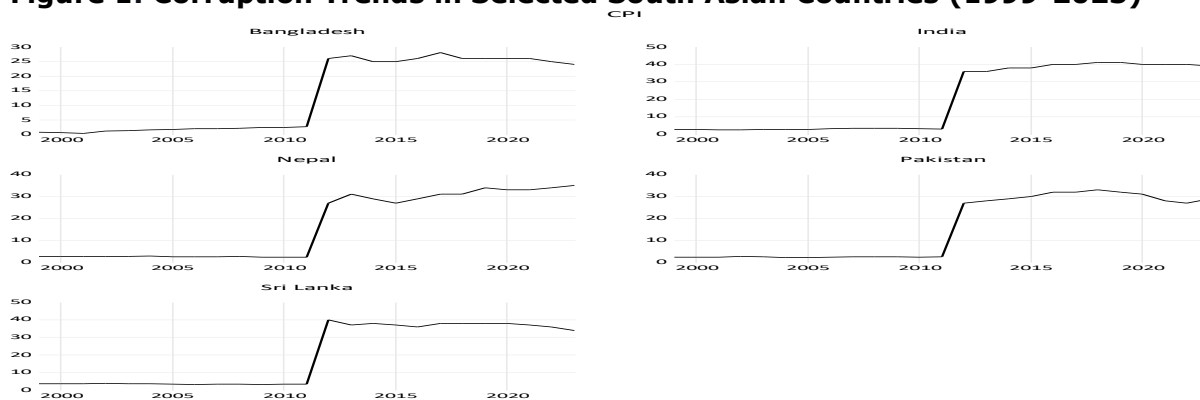
According to (Glynn, Kobrin, & Naim, 1997), corruption has affected every nation and every region. Corruption is an invasive issue predominantly in the developing regions such as South Asia (Transparency International, 2023). Amundsen (1999) asserts that major corruption scandals, particularly in the South Asian region that are having economic difficulties, are similar to cancer and have demonstrated how corruption erodes the society's cultural, political, and economic fabric as well as undermines the credibility of its core institutions. Considering the gravity of the issue major global institutions such as The World Bank (WB), World Trade Organization (WTO), and International Monetary Fund (IMF), Organization for Economic Cooperation and Development (OECD), and Transparency International (TI) have prioritized corruption in the light of these scandals. The Transparency International (2022) indicates that South Asia consistently ranks among the regions with the highest score of corruption, adversely affecting governance and economic performance. Similarly, Jain (2001) explores that in the South Asia, corruption is frequently fueled by weak institutional frameworks, insufficient accountability, and widespread socio-economic disparities. Although, Becker (1989) contends that human capital, which includes education, skills, and health, is essential for improving productivity and fostering innovation, however, Shleifer and Vishny (1993) claim that visible corruption hinders

upswing of the economy. In addition, Borensztein, De Gregorio and Lee (1998) suggest that overseas investment frequently catalyzes economic path, bringing in capital, technological advancement, and managerial proficiency. The interplay between these factors and corruption is complex, with each potentially influencing the other in multifaceted ways (Egger & Winner, 2006). Advancing the scope of study therefore enriches the discourse regarding the latest interactions among corruption, human capital, foreign direct investment, and economic growth in the region.

1.1. What is corruption?

Despite the existence of numerous definitions, there is no universally accepted comprehensive definition of "corruption". The World Bank defines it as "the abuse of public power for private gain," based on a study conducted in 2000 (p. 137). It is unanimously agreed by Transparency International (2022), Johnston (2005), and Philp (2016) that corruption relates to "the abuse of entrusted power for private gain". Conventional explanation of corruption, as stated by Nye (1967)(416) is "behavior that out of the formal duties of a public role (elective or appointive) because of private regarding (personal, close family, private clique) wealth or stature gains". According to Johnson and Sharma (2004), "Although corruption comes in many ways, shades, and sizes, and with different degrees of tolerability, corruption is always defined by one feature: the inappropriate mix of state and individual gain, as it is corrupt officials to profit personally from public office." There is disagreement over what exactly constitutes corruption. There is disagreement over what exactly constitutes corruption. Numerous studies, like those by Egger and Winner (2006); Habib and Zurawicki (2002); Ketkar, Murtuza and Ketkar (2005); Quazi (2014); Voyer and Beamish (2004); Wei (2000); Zhao, Kim and Du (2003) rely on TI's Corruption Perceptions Index (CPI) due to its focused definition of corruption. In this study, we also applied the CPI as it offers a precise measure of corruption. The CPI was first introduced in 1995 and is used to assess more than 150 nations annually based on the perceived level of civil sector corruption. The range of Score is 0 to 100. Zero represents economies severe corruption, while 100 represents the cleanest economies. It is clear from the trends figure that these countries still face widespread corruption problems.

Figure 1: Corruption Trends in Selected South Asian Countries (1999-2023)



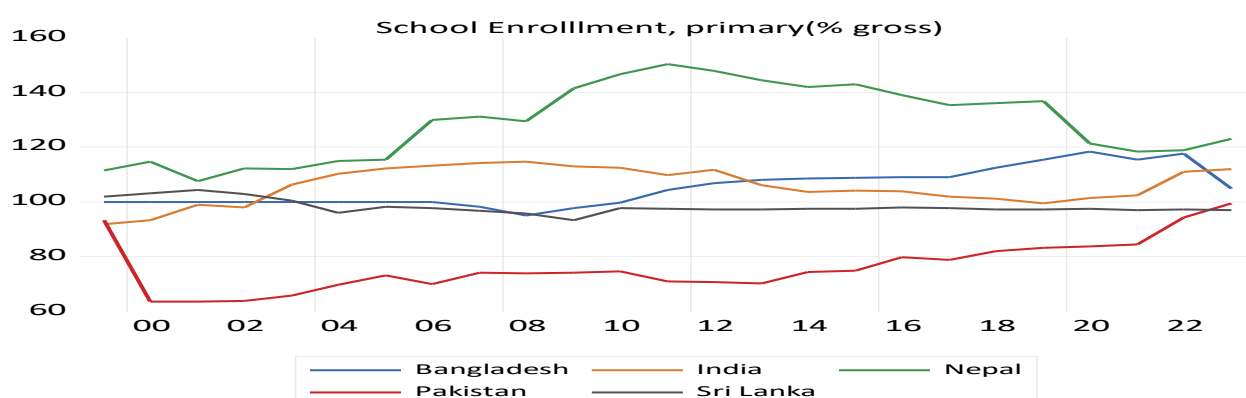
Source: Data from Transparency International

Figure 1 illustrates the region's ongoing corruption problems; fluctuating but generally low scores indicate high levels of perceived corruption. Remarkably, trends indicate intervals of gradual improvement in some countries. In general, the data highlights how important it is for these countries to implement sustained measures to combat corruption. However, the trends in CPI scores from 2012 to 2023 indicating that Bhutan consistently ranks as the cleanest economy according to the source of transparency international, significantly ahead of other South Asian countries. It has remained stable at 68 since 2023, and India has shown minor improvements, peaking at 41 in 2018 and 2019. Conversely, Pakistan, Bangladesh, and Nepal have seen fluctuating and generally low scores, indicating persistent corruption issues. Sri Lanka's score has remained relatively stable, though slightly declining to 34 in 2023. The Maldives intimate fluctuating trend in their CPI continuum over the years. Tailored anti-corruption action strategies to respond the unique socio-economic setting of these nations are crucial to adapt further progress.

1.2. The Role of Human Capital, Foreign Direct Investment and Economic Growth in South Asia

According to Chijioke and Amadi (2019), as economies understood that physical capital alone was insufficient to increase economic maturity, research have identified the role of human capacities. Mankiw maintains that human capital is essential for both slanting angles of neoclassical and endogenous growth paradigms. According to the OECD (2001), as cited in Mba et al. (2013), human resources focuses on knowledge acquisition, skill development, competitiveness, and personal qualities that help build social, economic, and personal development. On the same note, Hanushek and Wößmann (2010) claim that human capital plays an integral part in combating corruption. Education and training can equip individuals with the skills to resist corrupt practices and hold officials accountable. Moreover, Suryadarma et al. (2006) propound educated populace presumable to demand transparency and good governance, creating bottom-up pressure for reform. Enrollment percentages show the percentage of the eligible population in terms of human capital. The following trends provide insightful information on the region's initiatives to reinforce edification to enhance human capital.

Figure 2: Human Capital Formation through Primary Education: Enrollment Trends in South Asia



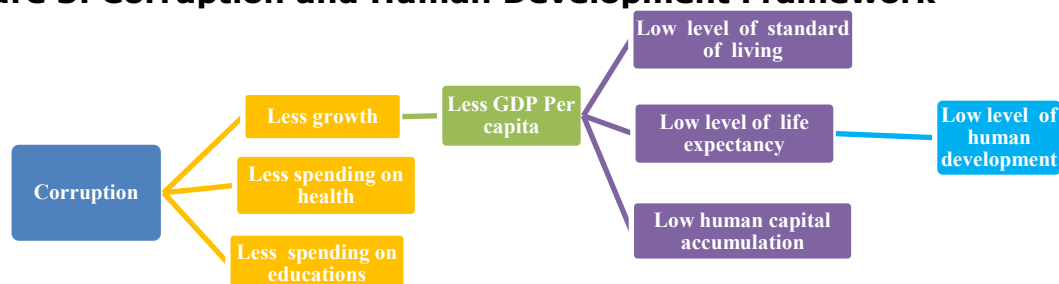
Note: South Asia primary school enrollment sourced from WDI

Figure 2 illustrates Nepal's remarkable weighty enrollment from 1999 to 2014, peak reaching 140%. This sharp rise strengthens the education policies during this period, potentially contributing to enhanced human capital development. However, from 2014 onward, enrollment rates declined significantly, indicating a systematic problem with student retention or a drop in the quality or accessibility of education. On the other hand, Sri Lanka maintained a stable percentage of about 100% throughout that period. This implies that Sri Lanka consistency has achieved a relatively balanced and sustained level of human capital investment in primary education, which may better reflect institutional frameworks and education infrastructure. The enrollment trends of Bangladesh and India were similar, rising steadily from below 100 percent in 1999 to a bit over 110% by 2014. This expansion expresses efforts to improve human capital by specifying better access to education. However, subsequent following 2014, there was a slight decline in both countries, which could be attributed to difficulties such as educational inequality, quality issues, or barriers to reaching marginalized populations. Pakistan has lagged behind its neighbors in the region, beginning in 1999 with the lowest enrollment rate of roughly 70%. Though enrollment rates have steadily improved, reaching nearly 90% by 2015, Pakistan's enrollment rate is lower and more variable, indicating continued challenges with the development of human capital, most likely as a result of social, political conducts, and economic limitations. Nonetheless, the recent fall or stagnation in enrolment rates indicates the necessity of stepping up efforts to maintain and enhance the development of human capital via education.

Akçay (2006) asserts that corruption inhibits economic expansion and lowers social spending on health and education (see figure 3). Regarding corruption, FDI is viewed as a sword with dual blades. Although FDI can provide South Asian economies with valuable capital and skillfulness, if improperly managed, it can also exacerbate corruption (Hellman, Jones, & Kaufmann, 2000). Foreign direct investment (FDI) into South Asian countries has been erratic, according to UNCTAD (2023) reports. Due to the uncertainty surrounding the global economy, FDI inflows totaled \$662 billion in 2022, a decline from the previous year. Based on these values,

stamping out corruption is mandatory for luring long-term foreign investment and fostering economic expansion.

Figure 3: Corruption and Human Development Framework



Source: Akcay, S. (2006)

Figure 4: Regional FDI trends within South Asia



Note: Values are expressed in current US dollars. FDI inflow data for (1999–2023) originated from the World Development Indicators. (The information embraces all five of South Asia's nations)

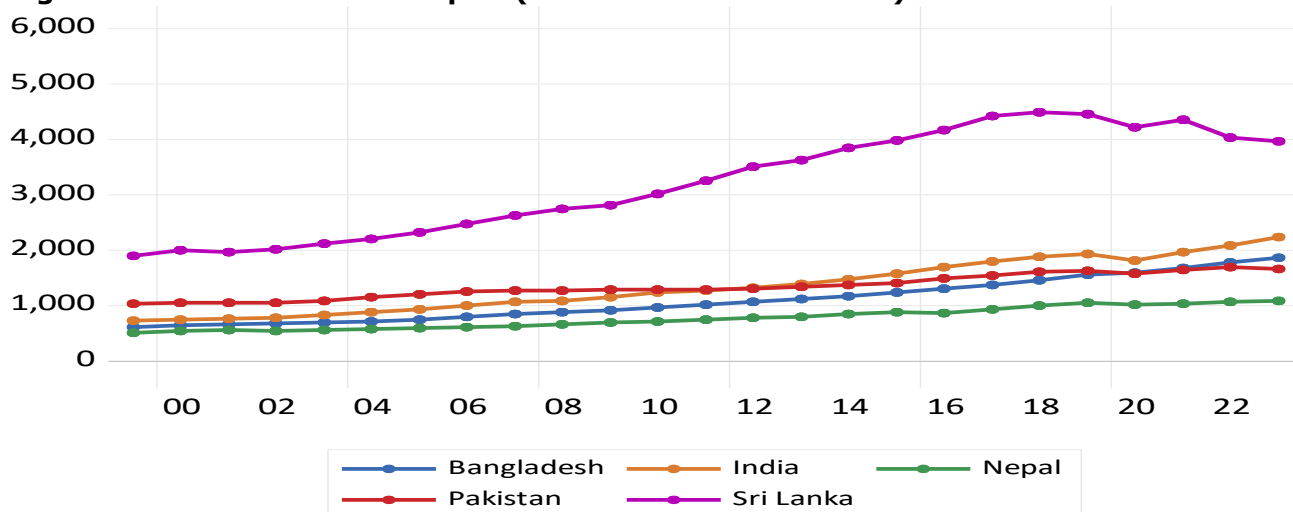
Habib and Zurawicki (2001) argue that the effectiveness of local institutions and the regulatory framework determine how FDI affects corruption. Foreign investors may use dishonest tactics to close transactions in nations with weak governance frameworks, which would feed the corruption cycle. Understanding the erratic nature of FDI inflows into South Asian economies and the significant variations has been made easier with the help of this chart. The visualization exhibits the trends in Foreign Direct Investment net receipts as a percentage of GDP across—Bangladesh, India, Nepal, Pakistan, and Sri Lanka—over a concrete period. The X-axis shows time intervals labeled by country and year, while the Y-axis represents the FDI inflows as a percentage of GDP, ranging from 0% to 4%. Overall, displaying divergent capacities of South Asian nations to attract foreign investment, with India and Pakistan distinguished by more notable dissimilitude in FDI as a portion of GDP.

Mauro (1995) asserts that the economic growth is both a victim and a potential remedy for corruption. The debate over whether corruption facilitates or hinders economic growth is continuing (Aidt & Dutta, 2008; Bardhan, 2017), Pande, 2008). Proposed "greasing the wheels" perspective (Huntington, 2006; Leff, 1964; Lui, 1996) deliberates that corruption can stimulate trade that might not otherwise occur and enhance efficiency by allowing fee paying sector agents to avoid cumbersome rules. The rival school of thought predominantly supports "sand the wheels" hypothesis, which suggests that economic growth negatively impacts corruption. This view is supported by several studies (e.g., (Bai et al., 2013; Brown & Shackman, 2007; Kaufmann & Vicente, 2011; Mauro, 1995; Reinikka & Svensson, 2005; Sandholtz & Koetzle, 2000; UNDP, 1997; Wei, 2000), which have found a statistically significant negative relationship between growth and corruption. GDP per capita lens accommodates as a captious tracer of economic performance which to assess the prosperity and living standards of the population. By looking at designator trends, we learn about the causes of economic crookedness and the potency of measures to promote magnification.

This graph lines delineates the per capita income (in constant 2010 US \$) for evolution trends, capturing the nuanced economic narratives of South Asian countries over spans, each

panel illustrates a generally upward course, reflecting economic progression over the observed period. In Bangladesh, there is a consistent increase in GDP per capita, indicating gradual economic improvement. India also exhibits a strong upturn, with notable growth especially after the mid-2000s, indicating an upsurge of GDP expansion during this time era. Nepal shows a steady increase, albeit at a slower pace compared to other countries, confirming a slow pace of economic succession. Pakistan showed relatively modest growth in GDP per capita from 2000 to 2018 followed by stagnation and a slight decline post-2018, reflecting macroeconomic instability and balance of payment pressures during this period. Sri Lanka depicted steady growth until near around 2018, but the trend flattened and slightly declined towards the end, which point out potential setbacks in recent years. The charts, which show the different strides of expansion of these countries based on their respective economic circumstances and obstacles, set forth on the whole economic advancement of the nation.

Figure4: Trend of GDP Per Capita (Constant 2015 US dollar) 1999-2023



Source: World Development Indicator

1.3. Problem Statement

In South Asia, corruption remains a significant barrier to development of economic vitality (Harford, 2022). While, Wei (2000) claims that the literature currently in publication primarily discusses these factors in isolation or spatial geography, leading to a fragmented understanding of their collective impacts. In addition, Ahrend (2002); Heyneman (2004); Lui (1996) highlight a particularly concerning association between human capital and corruption. In structured educational institutions, corruption causes disparities in access to education; those who can pay bribes receive better services, exacerbating social inequality and limiting chances for the poor. On the other hand, Wei (2000) both Freckleton, Wright and Craigwell (2012); Habib and Zurawicki (2002), together with (Freckleton, Wright, & Craigwell, 2012; Hossain, 2016) examine how foreign investments which are crucial source of capital and technological diffusion, are deleteriously impacted by corruption. Massive corruption inflating the cost of doing and handling business, deter investment beyond reason, and eventually slows economic progress. In underdeveloped countries, it culminates in an ongoing loop where corruption thrives because it becomes increasingly difficult to break the link. Furthermore, Mo (2001) and Treisman (2007) have questioned the intricate and nuanced relationship between economic growth and corruption. In addition to corrupt practices distorting entire market mechanisms that can hinder economic growth to the detriment of a robust governance system by compromising investment, corruption aggravates because opulence wealth and novel opportunities foment rentier conduct. The purpose of this study is to examine the presence and patterns of corruption in South Asia, which may be affected by human capital, foreign investment, and economic progress. To better fathom these dynamics, this research study will examine economic growth, foreign investment, and human capital influence corruption's chronicity and trends gravitating across South Asia.

1.4. Research Gap

Although research concerning the level of corruption in South Asian region is maturing incessantly, unsettled questions remain moot point about the convoluted interconnection betwixt injection of foreign investment, human capital, and economic escalation growth. There is a significant information gap about the idiosyncrasies that exist throughout South Asia because

prior study focused on these components independently in larger regions or distinct countries, ignoring their connection. Similarly, Gupta, Davoodi and Tiongson (2001) maintain that prior research studies have principally skipped over the momentousness of human capital and instead concentrated on the direct effects of corruption on economic growth or exogenous investment. Mauro (1995) provides a representative case of the detrimental consequence of corruption on economic growth, while Tanzi (1998) put forth that corruption can destabilize investment. Although corruption is acknowledged as one of the most important determinants for predicting economic growth, the precise relationship between corruption and human capital in South Asia remains unclear. Furthermore, there is disagreement regarding how foreign investment affects grading of corruption in South Asian countries, with conflicting conclusion and a lack of research on the subject (Freckleton, Wright, & Craigwell, 2012). In addition, whereas the linkage between corruption and economic expansion has been thoroughly studied, the opposite relationship has received less consideration. Notably, there is significantly insufficient research evidence on the influencing effects of human capital and foreign investment on this relationship (Bai et al., 2013; Freckleton, Wright, & Craigwell, 2012; Khamfula, 2007; Mudassar & ur Rehman, 2019). This study aims to permeates gaps by applying recent data, which will deepen the cognizant of the perplexing insidious corruption in this geographic region.

1.5. Research Question

The following inquiry is the primary subject of this study:

Is there a relationship between human capital, foreign direct investment, economic growth, and corruption?

1.6. Research Objectives

The primary goal of this research work is specifically to evaluate the impact of human capital, foreign direct investment, and economic growth on the degree of corruption in South Asia.

1.7. Significance of the Study

The research conducted matters for a range of reasons in Asia's southern region, where factors such as poverty, inequality, unemployment, inflation, and a lax rule of law are closely linked to corruption, resulting in a loop of corruption that prevents infiltration into the nations (UNDP, 1997). Likewise, Haque and Kneller (2008) further assert that the embezzlement of funds allocated for education and healthcare, along with favoritism in employment and promotions stifles human capital formation, leading to a less skilled workforce and consequently, slower economic progress. According to Wei (2000), corruption heightens the risks and costs associated with business, which can dissuade foreign investors and result in reduced investment inflows. This decline in foreign investment restricts economic growth and impedes the transfer of technology and innovation, which are essential for regional growth (Javorcik & Wei, 2009). Furthermore, Leff (1964) suggests that certain corrupt practices could "Grease the wheels" of economic activity by enabling companies to effectively navigate the obstacles put up by government agencies in dishonest situations. Conforming to Tanzi (1998), corruption can hinder a country's economic growth because it can cause market processes to malfunction, insufficient exchange of assets, and foster the likelihood of behaviors that gain profits. However, it will contribute to the global effort to combat corruption and promote good governance and sustainable development.

2. Literature Review

Past studies predominantly assessed national and institutional levels, looking at the impacts of political, interpersonal, and cultural contexts. Scholars split corruption components into macro, meso, and micro categories. One of the significant research studies by Quazi, Langley and Till (2013) examine how corruption practices migrate from one country to its neighboring countries. An analysis of 16 emerging South Asian and East Asian countries revealed that corruption contagion decreases with geographical distance, with East Asian countries showing less pronounced effects. This research suggests that corruption is shaped by a country's business culture and shared by neighboring countries. In underdeveloped nations, corruption usually more prevalent in the public than in the non-civic sector (Alt & Lassen, 2003). Developing the insights from these early studies, Rehman (2007) look into the factors that influence corruption and their relationship with economic growth, taking data from the International Transparency organization

corruption index from 1995 till 2005. The study explores various critical factors that have an impact on corruption. The results reveal that corruption levels are highly influenced by real GDP per capita, secondary school admittance, public education spending, foreign direct investment (FDI), and the inactivity rate. Within their seminal work, Shleifer and Vishny (1993) delineate two distinct forms of corruption. The first is termed 'corruption with theft, which arises when investors benefit from corrupt state machinery, and 'corruption without theft', where officials extract extra payments from clients. The debate on corruption's effect has produced two diametrically opposed strands: efficiency-reducing and efficiency-enhancing.

2.1. Human Capital and Corruption

According to earlier research (Delavallade, 2006; Mauro, 1998; Shleifer & Vishny, 1993), corrupt officials allocate reduced spending on safety and security, medical care, and educational programs, while allocating greater budgetary objectives to sectors such as fuel, defense, and infrastructure. This pattern arises from the ability of these officials to embezzle significant sums of money. Bringing together the lines of discussion, Gupta, Davoodi and Tiongson (2001) demonstrate that corruption has a negative influence on the primary net rate of registration while increasing reiteration, abandonment of studies, and ignorance. Moreover, a noteworthy study conducted by Mo (2001) establishes a negative relationship between corruption and human capital, as measured by the average number of years of schooling. While human capital is widely recognized as a crucial impetus of economic progress, it is an intertwined concept. In nations where corruption is rife and unchecked, it is customary routine for educational institutions to enroll amateurish students and faculty members. This often results in high enrollment rates but poor educational quality (Heyneman, 2004). On the contrary, some other research studies also indicate that corruption has no effect on pupils 'attendance ratio in school or the enrolled individuals (Dreher & Herzfeld, 2005; Pellegrini, 2011). Ehrlich and Lui (1999) assert that increasing education and skillfulness reduce corruption, promote moral behavior, and strengthen the framework for excellent systemic governance. Additionally, ameliorating human capital can fortify institutions and lessen the risk of corrupt activities (Reinikka & Svensson, 2005).

2.2. Foreign Direct Investment (FDI) and Corruption

Pervasive corruption deters FDI by increasing known predictable costs, while arbitrary corruption increases uncertainty. Investors prefer arbitrary corruption over pervasive corruption in transition economies. Building on this, Habib and Zurawicki (2002) explore another facet of this study. Initially, it analyzes the extent to which the host nation is corrupt. Subsequently, it considers absolute variability in corruption between the hosting and home republics. The findings support the negative effects of both factors, indicating that foreign investors typically avoid corrupt environments due to ethical concerns and potential operational inefficiencies. Other research has indicated corruption negatively impacts inflows of FDI (Al-Sadig, 2009; AZAM KHAN, 2013; Castro & Nunes, 2013; Epaphra & Massawe, 2017; Quazi, 2014; Udenze, 2014; Wei, 2000). This suggests that nations implementing clean-up measures could experience increased FDI inflows. In contrast, some studies suggest corruption does not significantly deter FDI inflow (Biglaiser & DeRouen, 2006; Pla Gutierrez, 2015). To elucidate the reasons behind these conflicting results, some scholars have approached corruption as a multiple-faceted issue (Bhargava, 2005; Kolnes, 2016; Rontos, Syrmali, & Vavouras, 2015).

2.3. Economic Growth and Corruption

The academic community has extensively addressed the connection amidst economic growth and corruption. Particularly in countries with small levels of investment and inadequate leadership (Aidt & Dutta, 2008; d'Agostino, Dunne, & Pieroni, 2016; Hodge et al., 2011; Huang, 2016; Leite et al., 1999; Mauro, 1995; Méon & Sekkat, 2005; Mo, 2001; Swaleheen, 2011). Furthermore, Méon and Sekkat (2005) investigated the relationship between corruption's effects on growth, investment, and the level of governance services in 63-71 countries between 1970 and 1998. Based on the results, misconduct corruption has a detrimental effect on Growth and Financial investment. The impacts of these issues vary depending on the magnitude of governance. The indication of governance tends to deteriorate, leading to worsening conditions. The "sand the wheels" perspective sees corruption as hindering progress, while the "grease the wheels" view suggests it can offset poor governance by facilitating processes. According to the "grease the wheels" theory, some conditions indicate that corruption scenarios could actually benefit a thriving economy (Acemoglu & Verdier, 2000; Leff, 1964). Supporting this notion, Paksha Paul (2010) exposed a good relationship between growth in economy and corruption in Bangladesh. Notably, this line of thinking aligns with the work of other scholars who have argued

for the potential boon of corruption in specific contexts (Colombatto, 2003; Huntington, 2006; Swaleheen, 2011). Nonetheless, this claim continues to be controversial because of perplexing findings from other researchers (Brunetti, Kisunko, & Weder, 1998)(pp. 23, 25).

3. Theoretical Frameworks

Hyperbolically, theories elucidate corruption's interaction with human capital, foreign investment, and economic upswing. The proposed theoretical framework divulges these models. Jensen and Meckling (2019) came up with the theory of principal-agent, which delineated to address inconsistent viewpoints surrounded by principals (e.g., governments or citizens) and agents (e.g., public officials or politicians). From other perspective, Groenendijk (1997) proposes a principal-agent model of corruption involving two principals (one acting as the corrupter) and an agent who becomes corrupted. It is employed to curb occurrences of political corruption in democratic systems, debunking the widely held notion that it is only suited to standardized configurations. Collectively, this theoretical skeleton provides a foundation for briefly analyzing human capital, foreign investment directly, and economic growth in the context of corruption.

3.1. Data Source

This investigation adopts quantitative research; featuring secondary data of five (5) countries, encircling Nepal, India, Pakistan, Bangladesh, and Sri Lanka. Data utilized for this study is drawn from several reputable international organizations, ensuring a robust foundation for analysis. This study's data set covers 25 years, from 1999 to 2023. Corruption data was collected from Transparency International's Corruption Perceptions Index (CPI). The CPI measures and ranks 180 sovereign countries according to estimated amounts of public sector corruption, as decided by opinion polls along professional evaluations. Notably, in cross-national examination, it serves as frequently used identifiers of corruption (Transparency International, 2023). Economic indicators extracted from the WDI consist of the country's GDP, openness to trade, inflation, and human capital. WB data on foreign direct investment (FDI) offers comprehensive information on FDI flows, which is essential for comprehending how foreign investment contributes to economic prosperity (World Bank, 2023). However, according to the World Development Indicator (2023), human capital is measured by a substitute variable (primary schooling enrollment) to compute the expected working capacity of talented job applicants, accounting for aspects like academic achievement and health care provision.

Table 3: Variables, Measurements, data Sources and Definitions

Variable	Measurement	Source	Definition
Corruption Perceptions Index (CPI)	Scale ranges from 0 (highly corrupt) to 100 (very clean)	Transparency International	Measures the perceived levels of corruption in public sectors.
Human Capital (HC)	Primary school Enrollment	World Bank	Represent expected productivity of the next generation of workers through education outcomes. Higher values economically indicate better human capital.
Foreign Direct Investment (FDI)	Foreign Direct Investment, net influx (% of GDP)	World Bank	Measures the net incursion of foreign investment ingressing into a country.
Economic Growth	Annual growth rate of GDP at constant prices	World Bank	Showing the rate of a country's GDP grows annually by measurement.
Trade Openness	Total Sum of exports and imports volume as a percentage of GDP	World Bank	Indicates the extent of a country's involvement in international trade relative to its economic output. Higher values denote greater openness
Inflation	Per annum % change in the consumer price index	World Bank	A rate where the general price level of goods and services in an economy is soaring, impacting purchasing means.

3.2. Methodology of the Study

This study uses panel data analysis to examine the link between corruption, human capital, foreign direct investment, and economic growth in South Asia. Panel data offers competitive edge over cross-sectional and time-series analyses, including augmented freedom, decreased collinearity, and enhanced forecasting efficiency. It examines multiple countries over a specified period, capturing temporal and spatial dimensions (Gujarati, 2012). The panel longitudinal data model can be expressed as:

$$Y_{it} = \alpha + \beta X_{it} + \epsilon_{it} \quad (1)$$

Where Y_{it} represents the dependent variable (e.g., CPI) for nation i at time t , X_{it} symbolized the independent variables (e.g., HC, FDI, GDP), α is the intercept, β is the coefficient of the independent variable, and ϵ_{it} is the error inaccuracy term. The general form of the model is specified as:

$$CPI_{it} = \beta_0 + \beta_1 HC_{it} + \beta_2 FDI_{it} + \beta_3 GDP_{it} + \beta_4 Tradeopenness + \beta_5 Inflationrate + u_i + \epsilon_{it} \quad (2)$$

Where CPI_{it} indicates the Corruption Perceptions Index for realm i and time t , and the other variables include Human Capital (HC_{it}), Foreign Direct Investment (FDI_{it}), Gross Domestic Product (GDP_{it}), Trade Openness, Inflation Rate, respectively. β_0 used as an intercept. $\beta_1, \beta_2, \beta_3$ and β_5 , are the coefficients of explanatory variable. u_i reflects the undetected country-specific impact and ϵ_{it} is the error term. By taking the natural log, the coefficients in the regression models might demonstrate elasticities, providing a more intuitive understanding of how much a percentage changing in one variable affects second one.

$$\text{Log}(\text{Variable}) = \ln(\text{Variable})$$

This transformation permits for interpreting the coefficients as elasticities, indicating the proportion of the dependent variable changed for every 1% change in the independent variable.

3.3. Model Estimation and Explanation

The estimation procedure for this swotting entails the enactment of the pooled mean group. Unit root scrutiny are carried out to guarantee the stationarity of the input prior to estimating the PMG paradigm. Before performing additional analysis, it is imperative to confirm stationarity because non-stationary data can produce erroneous regression results (Harris & Sollis, 2003). The PMG technique is particularly appropriate for (Pesaran, Shin, & Smith, 1999) because it may be utilized with underlying variables categorized as strictly stable ($I(0)$), mixed ($I(1)$), or integrated of order one ($I(0)$). When different economic situations, institutional setups, or policy environments lead to different short-run dynamics and velocities of adjustment, the estimate of the PMG is especially helpful. In these scenarios, the end long equilibrium relationship between mutable variables is presumed consistent to cover all entities. The PMG model is put forth in the following manner:

$$\Delta Y_{it} = \alpha_i + \sum_{j=1}^p \lambda_{ij} Y_{it-j} + \theta(Y_{it-1} - \beta'X_{it-1}) + \epsilon_{it} \quad (3)$$

Where ΔY_{it} represents the first-difference of the dependent variable, α_i is the nation-specific intercept, λ_{ij} captures the transient responses of the explanatory variables, θ is the speed of adjustment parameter, indicating how quickly variables return to equilibrium after a shock, $(Y_{it-1} - \beta'X_{it-1})$ representing the abiding interactivity between the dependent and independent literal number, ϵ_{it} is the lapse correction term. Moreover, addressing diagnostic issues improves the credibility of the results, supporting the reliability of conclusions drawn from the study (Baltagi, 2008). Therefore, conducting these diagnostic tests of Autocorrelation, heteroscedasticity, and multicollinearity is integral to maintain the integrity of the empirical analysis.

4. Results

This section provides the study's concrete evidences through central tendencies and dispersion of the data statistics in the selected nations with regard to openness of trade, inflation rate, GDP, FDI, HC, CPI, and growth of the economy. Before moving on venture of econometric super analysis, it is imperative to decipher the foundational grok properties of the dataset.

Table 4: Descriptive Statistics

Variable	Obs.	Mean	Median	Std. dev	Min	Max
CPI	125	2.129256	1.280934	1.33150	-0.916291	3.713572
HC	125	4.616109	4.609906	0.18911	4.150587	5.012993
FDI	125	-0.375896	-0.225287	0.96432	-4.836830	1.286619
GDP	125	7.191319	7.156323	0.55053	6.261268	8.410879
TO	125	3.689901	3.737709	0.30168	3.066189	4.484543
INF	125	1.859715	1.896968	0.54462	0.696728	3.906429

Source: Authors' computation

According to the data of table 4, each geographic country has an average Corruption Perception Index (CPI) score of 2.129, indicating a significant amount of corruption. The average Human Capital (HC) value for these nations is 4.616, indicating a moderate level of human capital development. The negative mean FDI value (-0.376) shows a downward dropping trend in foreign forthright investment, which could cause concern for economic upturn rise and its impact on corruption. GDP has a high mean of 7.191, showing overall economic metamorphosis in developing nations of region. However, trade openness (TO) and inflation (INF) also exhibit significant variation, reflecting differences in trade policies protocols and inflation rates amongst the countries.

4.1. Unit Root Tests Results

Prior to conducting an insightful PMG analysis, an assessment for detecting unit roots was performed to determine the stationarity of the elements and ensure the data's resilience. These checks serve to trigger variable integration order, guaranteeing that no one in the series integrates with order pair (I (2)), which would invalidate the PMG approach (Pesaran, Shin, & Smith, 1999). Table 5 presents the results of the Im-Pesaran-Shin (IPS), ADF-Fisher Chi-Square, and PP-Fisher Chi-Square tests at both the level and first difference.

Tables 5: Unit Root Test Results (With Individual Effect and Trend)

Variable		Im- Shin	Pesaran and	ADF-Fisher	Chi-	PP-Fisher	Chi-Square
		t-Statistic	p-value	t-Statistic	p-value	t-Statistic	p-value
ln(CPI)	Level	0.41695	0.6616	5.69589	0.8401	6.05100	0.8110
ln(HC)		-1.58411	0.0566	24.2990	0.0068	19.9336	0.02999
ln(FDI)		-2.54042	0.0055	24.5547	0.0063	10.1765	0.4252
ln(GDP pc)		-0.06386	0.4745	16.8279	0.0783	16.6755	0.0819
ln(TO)		-0.99587	0.1597	14.1956	0.1643	8.61710	0.5688
ln(INF)		-0.91082	0.1812	13.3502	0.2047	13.1110	0.2175
ln(CPI)	First Difference	-6.54741	0.0000	51.5228	0.0000	51.9006	0.0000
ln(HC)		-3.93181	0.0000	51.3198	0.0000	84.3388	0.0000
ln(FDI)		-4.85691	0.0000	43.8538	0.0000	74.0198	0.0000
ln(GDP pc)		-2.50215	0.0062	27.5918	0.0021	33.7876	0.0002
ln(TO)		-7.79542	0.0000	63.4965	0.0000	91.5714	0.0000
ln(INF)		-6.25160	0.0000	52.4032	0.0000	325.189	0.0000

Source: Estimated by the authors

Table 5 shows that at the level, most variables, including ln(CPI), ln(GDP), Log(TO), and ln(INF), are non-stationary as indicated by high p-values (greater than 0.05), suggesting that it is not viable to repudiate the unit root zero base hypothesis. For instance, ln (CPI) displays p-values of 0.6616, 0.8401, and 0.8110 across the IPS, ADF, and PP tests, respectively, confirming its non-stationarity at the level with individual effects and trends. However, ln(HC) and ln(FDI) are notable exceptions as they show p-values near or below conventional significance levels, indicating partial stationarity. Specifically, ln(FDI) is cogent at the one percent level in the IPS test (t-statistic = -2.54042, p-value = 0.0055), but the PP test (p-value = 0.4252) fails to reject the null hypothesis. All variables become stationary after first differencing, as flaunted by the highly significant p-values ($p < 0.05$) in every test. For instance, stationarity at the first difference is evidenced by the first difference of Log (CPI), which displays p-values of 0.0000 for each of the three tests. Given that approaches such as PMG can manage a mi blended integration order between I(0) and I(1) without compromising the integrity of the regression schema, it is justified to use them for further analysis. As reported by Pesaran, Shin and Smith (1999), this result highlights the fact that the components are embodied into ordain one, or I (1).

4.2. PMG Model Estimation Results

Pooled Mean Group approach is a method for estimating short-term as well as longer-dynamics among variables throughout time that span multiple units, such countries or firms.

Table 6: PMG Long-Run Results

Variable	Coefficient	Std. Error	t-Statistic	p-Value
LOGHC	4.99333	7.769877	0.6426485	0.0001
LOGFDI	-2.365117	0.900652	-2.626005	0.0109
LOGGDP	4.907263	0.886410	5.536110	0.0000
LOGTO	-0.507030	1.061772	-0.477532	0.6347
LOGINF	0.264712	0.374123	0.707554	0.4820

Source: Computed by author

The empirical results of the estimation provide subtle insights into the relationships between various elements and the corruption revealed during the interrogation. To be more precise, the human capital (lnHC) coefficient of 4.9933 means that addendum of one unit in human capital translates into a 4.9933% increase in corruption. In codicil, a one-step up unit in FDI causes a 2.3651% diminution in the CPI, according to the Foreign Direct Investment (FDI) coefficient of -2.3651. The strong association pro rata emphasizes the significant correlation between a decline in corrupt practices and an increase in human adroitness, such as better academic achievement and larger skill sets. The argument shielded by Hanushek and Wößmann (2010), which embellished that a population with higher levels of competence and education could encourage highly regarded institutions, curtail misconducts, and boost economy monetary growth, is supported by this finding. In a study by Wei (2000), FDI may occasionally cause corruption where regulatory control is lax because foreign businesses may outrageously exploit regulatory vulnerabilities. On the other hand, the CPI increases by 4.9073% for every unit increase in economic growth, according to the lnGDP coefficient of 4.9073. This positive correlation implies that economic growth, as Mauro (1995) suggests, may contribute to the drop in corruption by boosting government funding and enhancing the effectiveness of anti-corruption initiatives.

Analogically, Trade Openness (lnTO) has a coefficient of -0.5070; nevertheless, its long-term impact on corruption is not statistically momentous, as stipulated by the p-value of 0.6347. Given its increased exposure to outside influences and propensity for rent-seeking, this finding raises the possibility that trade openness may have contradictory impacts, either increasing corruption or fostering better governance (Ades & Di Tella, 1999). The final statistic shows that there is a positive link between inflation and the CPI: the coefficient for lnINF is 0.2647. The CPI grows by approximately 0.265% for every one unit of inflation. However, the p-value of 0.4820 suggests that this relationship is insignificant arithmetically at standard thresholds, indicating that inflation may not have a meaningful impact on corruption in the model (Wooldridge, 2016).

Table 7: PMG Short-Run Results

Variable	Coefficient	Std. Error	t-Stat.	p-Value
COINTEQ01	-0.414921	0.099975	-4.150257	0.0001
D(lnHC)	-3.021605	2.393956	-1.262181	0.2118
D(lnHC(-1))	-1.938735	2.966824	-0.653471	0.5159
D(lnFDI)	-0.181625	0.090789	-2.000511	0.0500
D(lnFDI(-1))	0.155654	0.264868	0.587665	0.5590
D(lnGDP)	-2.116954	1.888359	-1.121055	0.2667
D(lnGDP(-1))	2.003360	5.099010	0.392892	0.6958
D(lnTO)	0.537324	0.309254	1.737485	0.0874
D(lnTO(-1))	-0.673451	1.438964	-0.468011	0.6415
D(lnINF)	-0.255320	0.154654	-1.650911	0.1040
D(lnINF(-1))	-0.222957	0.429057	-0.519644	0.6052
C	-32.36579	23.04510	-1.404454	0.1653

Source: Author's calculation

The short-run oscillations are summarized in Table 4.5. These coefficients capture the immediate effect of a 1 unit alter in each element on the CPI, also calibration mechanism toward longer-run equilibrium. The ECT (COINTEQ01) is 1% threshold value of statistical significance (p-value = 0.0001), indicating a robust adjusting speed over a long period equilibrium when deviations occur. The negative sign of the ECT (-0.414921) confirms that approximately 41.5% of the equality swing from the previous spell is revised each year, suggesting that any short-

term shocks or deviations from the long-time correlation between the regressor and regressand are adjusted relatively quickly, restoring equilibrium within a reasonable timeframe. For the Human Capital ($D(\ln HC)$), the coefficient of -3.0216 infer that 1 unit go up in human capital brings 3.0216% decrease in CPI in the fleeting run. Whilst this result is not satisfactorily exceptional, it suggests a potentially beneficial impact of increasing human capital on reducing corruption (Becker, 1989). Regarding Foreign Direct Investment ($D(\ln FDI)$), the coefficient of -0.1816 indicates that a 1 unit rise in FDI induce 0.1816% decline in CPI in the short duration. This result is 5% limit for significance in statistics, reinforcing the long-run finding that increased FDI might be associated with higher corruption (Wei, 2000).

A one-segment escalate in economic growth is thought to be linked to a 2.1170% short-term reduction in corrupt activities, according to the Economic Growth coefficient ($D(\ln GDP)$) of -2.1170. It is less evident how economic growth will affect corruption in the short term, though, as this result does not seem statistically significant (Mauro, 1995). Although this result is only marginally significant, Trade Openness ($D(\ln TO)$) has a coefficient of 0.5373, which advocates 1 unit raise in trade candor is coupled with a 0.5373% expand in CPI. According to this research, trade openness may, in the near term, have a beneficial but ambiguous effect on corruption. Finally, the coefficient for inflation ($D(\ln INF)$) is -0.2553, meaning that a unit added to inflation causes a 0.2553% fall in the CPI. But this result is not statistically significant, indicating that inflation has no immediate and meaningful effect on levels of corruption (Gupta, Davoodi, & Tiongson, 2001). Succinctly, the PMG analysis declare economic growth and human capital are important factors in the prolong time when it pertains to plunge corruption; the straight effect of foreign investment on corruption appears interesting because it underscoring the intricacy of the corruption-investment link in brief periods.

4.3. Diagnostic Tests for Model Validity

Authenticating the paradigm of inquiry that underpins empirical research is crucial for corroborated and reliable results. The diagnostic procedure opt to evaluate the panel-data pattern used in the current research's validity are presented in this chapter. The Breusch-Pagan-Godfrey test for heteroscedasticity, the Breusch-Godfrey LM test for an autocorrelation and the VIF (variance inflation factor) test for multicollinearity are the core diagnostic tests that are discussed. In particular, heteroscedasticity is susceptible to biased test statistics and inefficient Ordinary Least Squares (OLS) estimates (Wooldridge, 2016). Owing fact standard errors of the synergistic conceivably skewed, heteroscedasticity can result in ineffective estimates and untrustworthy probability assessments (Gujarati, 2012).

Table 8: HeteroscedasticityTest

Test	Statistic	Prob.
Breusch-Pagan-Godfrey test	0.360945	0.8743

Source: Authors' estimations

The Breusch-Pagan-Godfrey test statistic is 0.360945 with a p-value of 0.8743. Since the p-value is significantly higher than the typical alpha threshold needed of 0.05, we are unable to rule out the null hypothesis of homoscedasticity. This result indicates no significant evidence of heteroscedasticity in the model. Locate if autocorrelation exists in a regression modeling residuum, apply the Breusch-Godfrey LM (Lagrange multiplier) test conditions. Unlike the D-W test, which is only applicable for detecting initial order autocorrelation and the Breusch-Godfrey inspection can detect higher-order auto-correlation (Breusch & Godfrey, 1986).

Table 9: Godfrey Serial Correlation LM Test

Test	F-statistic	P-value
Breusch-Godfrey LM Test	118.8782	0.0813

Source: Authors' evaluated

Table 9 shows the Breusch-Godfrey LM test statistic of 118.8782 and a p-value of 0.0813, indicating that we failed to reject the null hypothesis at the 5% significance level. Summary of findings, the model's residuals do not show any discernible signs of self-correlation. This finding implies that the residuals are approximately independent of each other, meeting the model's assumption of no autocorrelation and thus supporting the validity of parameter reckonings. On

the other hand, VIF quantifies the whereunto variance factor regression coefficient is expatiated due to multicollinearity with other predictor entity in the theory.

Table 10: VIF Multicollinearity Diagnostic Test

Variable	VIF	Tolerance 1/VIF
lnHC	1.6703	0.598695
lnFDI	1.4408	0.694059
lnGDP	1.5398	0.649435
lnTO	1.6293	0.613761
lnINF	1.0769	0.928591

Source: Author demonstration

In above table 10, all VIF values are beneath 2, that negating severe multicollinearity among the variables. The VIF for lnHC is 1.6703, indicating a low correlation with other predictors, which does not significantly affect the model's validity. Similarly, lnFDI (VIF = 1.4408), lnGDP (VIF = 1.5398), lnTO (VIF = 1.6293), and lnINF (VIF = 1.0769) all fall within acceptable limits, suggesting that multicollinearity does not pose a serious threat. According to pursuant results, multicollinearity has no negative effects on the prowess of the model, and the guesstimated coefficients for the explained variables are trustworthy (Kutner et al., 2005). The results of the diagnostic detection—Breusch-Pagan-Godfrey for heteroscedasticity, LM for autocorrelation, and VIF for multicollinearity—indicate that the model is sound and that the underlying presumptions of the regression analysis are not violated. The results validity of the model estimates by showing no discernible signs of heteroscedasticity, autocorrelation, or multicollinearity.

5. Conclusion and Policy Recommendation

This study spearheaded to apprehend pioneer roles of human capital, FDI, economic growth, trade openness, and inflation in corruption across South Asian countries. In this aspect, a panel data estimation technique such as PMG was used in the study for five sophisticated, less mature countries from 1999 to 2023. The results decisively stating that humanistic capital and economic growth contribute to increased corruption in the long run. In contrast, foreign direct investment curtailed crime deceit in the long and short run, which means that foreign directive investment (FDI) not simply provides capital but also exerts pressure on receiving nations to implement institutional reforms that improve transparency and diminishes avenues for corruption. However, the effects of trade openness and inflation remain limited, indicating that their influence on corruption is either insignificant or dependent on corruption. This research highlights that corruption imposes significant costs on developing countries of South Asia that's why these economies should not negate the effects of corruption. Therefore, these five developing countries need sophisticated policy solutions tailored to reduce corruption by introducing flexible enactment of laws and severe penalties for the government officials convictive or found involved in corruption and by integrating institutional reforms with economic strategies to create a more transparent and accountable economic environment. It is anticipated that this will greatly help these countries enhance their institutional quality in order to achieve more robust and rapid economic growth, which is critical for Asian economies. On the basis of these viewpoints and conclusions, it has led to the following list of policy recommendations for effective anti-corruption initiatives in developing nations:

- Prioritizing education and skill development will help policymakers yield employment participants that are more knowledgeable and ethically aware. Enhancing human capital fosters a culture of integrity, which is valuable for decreasing the corruption rate and increasing economic productivity (Hanushek & Wößmann, 2010).
- Establishing stable and high-rate economic growth is crucial for combating corruption. Higher incomes reduce illegal practices, while unequal income distribution must be reduced. If growth is not dispersed throughout society, it may not effectively combat corruption.
- To attract and sustain FDI, countries should improve their governance structures, ensuring transparent and anti-corruption environments by making less stringent public policies that impede foreign trade, which reduces economic welfare.
- Future studies, could include other developing regions to compare the special effects by incorporating other variables. It could provide numerous comprehensive acquaintances with factors causing corruption.

5.1. Limitations of the Study

While acknowledging the importance of limits for future research, it does contribute to our understanding of corruption and significant economic indicators, particularly in South Asian countries. Numerous pointing issues face with data availability plagued the study, especially with the Human Capitalization and CPI, which depend on perceptions of corruption and may introduce biases (Treisman, 2007). The years 1999–2023 might not adequately represent current economic shifts, such as the effects of COVID-19. Furthermore, the PMG technicality may ignore corruption-influencing variables that are unique to a given nation by assuming a long-term equilibrium across nations. Taking inflation and trade openness into account, the study focuses mainly on human capital, foreign direct investment, and economic growth as important factors that influence corruption. Data limitations prevented the inclusion of other potential determinants, such as the integrity of institutions, legal framing works, and electoral stability. Inadequacy of certain variables may cause estimates to be biased, which might weaken the analysis's comprehensiveness (Wooldridge, 2016).

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