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AN EMPIRICAL ANALYSIS OF THE DETERMINANTS OF FOREIGN DIRECT INVESTMENT TO G-20 COUNTRIES

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ABSTRACT

Foreign investment has become a powerful tool for acquiring external capital, which has a positive effect on the host country's development. Depending on the kind of foreign direct investment, these financial flows might take the shape of reinvestment of debt, equity, or earnings transactions. This study aimed to demonstrate the significant factors influencing FDI in G-20 developing nations. This research employed a positivist viewpoint. The researcher used a deductive hypothesis methodology for this investigation. In deductive research, the hypothesis undergoes testing. This quantitative study is grounded on a theoretical framework and an extensive literature review. The quantitative method facilitates the systematic measurement of variables and the testing of hypotheses. The data for this research was sourced from G-20 nations. The G-20 countries consist of Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, United States and European Union. There are 580 observations in the dataset that was utilized for this research. This research utilized data spanning from 1994 to 2022. The researchers gathered data about all variables from the World Development Indicators (WDI). The variable of interest, often referred to as the dependent variable in this study, is foreign direct investment (FDI). The independent variables for this research study include economic growth (GDP), inflation, exchange rate, interest rate, and technological innovation. Employing various empirical methodologies, including descriptive statistics, correlation matric, variance inflation factor, and GMM the results of the study are following. Exchange rates, interest rates, and GDP generally have a positive influence on foreign direct investment (FDI). Conversely, the impacts of inflation are negative.

Key words: *G-20; GDP; inflation; exchange rate; interest rate; technological innovation.*

1.1 INTRODUCTION

Significant regional economic cooperation organizations have emerged as a result of the rise in global international activity, which is a sign of economic globalization and integration Chen et al., (2021). The foreign direct investment (FDI) are not insignificant in the process of creating an open economy. For example, foreign direct investment (FDI) makes a significant contribution to a country's sustainable growth by fostering the development of green technologies, raising labor productivity, and reducing carbon emissions Tadeus et al., (2021). G20 nations are the top attractor for foreign direct investment (FDI) among diverse participants in global agreements. As to the World Investment Report, the G20 nations captive 6.24 trillion US dollars of foreign direct investment FDI) in 2020, which accounted for 59.0% of the global FDI. This was due to the COVID-19 pandemic. As a result, investigating in the variables influencing FDI for a particular economic cooperation region has gained popularity in the realm of global commerce Hou et al., (2021).

Significant research on the institutional elements influencing FDI has coincided with the growth of neo-institutional economics. North (1989) described an institution as, in general, the collection of laws and regulations that influence incentives and economic behavior, both of which are important factors in determining the course of economic growth. The host nation's institutional quality may have a variety of effects on economic activity, which in turn may have an impact on the development of a globally open economy. Establishing sustainable economic operations, such as upgrading one's place in the global value chain, encouraging regional economic development, and improving the business climate, requires favorable economic institutions and strong institutional quality, Corradini, (2021). Over half of the top 30 countries in the global institutional quality rating are G20 nations, according to the World Bank WDI database. Unfortunately, the link between determinants of FDI has not yet been adequately examined, which fails to give empirical evidence for strengthening institutional quality to attract FDI, even though G20 nations exhibit the characteristics of high FDI.

The purpose of this research is to look at the relationship between various factors that affect foreign direct investment to G20 nations. This research is helpful in three ways. To provide a thorough knowledge of FDI, this research first investigates the determinants that influence FDI. To the best of our knowledge, no prior research has addressed this particular area. Second, this research also includes analysis to look at whether relationships between other determinants such as macroeconomic stability, and technological innovation affect the FDI in different G20 countries. With more useful implications, this research will help policymakers create policies that are suitable for various populations. Lastly, the sample used in this research includes the G20 nations, which has great practical application since their combined GDPs represent over 90% of the global GDP and draw over 60% of foreign direct investment. It is among the biggest cooperative groups in the universe. Using the G20 as a sample to check FDI concerns has a lot of consequences, therefore current research overlooks these determinants.

The history of foreign direct investment (FDI), often associated with foreign investments made by multinational businesses (MNEs), dates back to the 1950s when money was transferred between industrialized nations. Scholars paid little attention to this route of capital transfer until it saw a massive increase in the 1980s as a result of a change in foreign direct investment (FDI) flows from developed to developing nations.

Globally, FDIs are distributed in a rather unequal way. Over the last three decades, developed nations have received the majority of foreign direct investment (FDI), with developing countries receiving just one-third of this amount. Despite having a large population, an abundance of natural resources, cheap labor, and various incentives including tax-free imports, tax breaks, and other subsidies, developing nations are still unable to draw in enough foreign direct investment (FDI) (Vidriza et al., 2023).

Moreover, the proportion of foreign direct investment (FDI) to developing countries rose and fell for developed nations at the beginning of 1990. The percentage of foreign direct investment (FDI) to developing nations rose from 37% to 57.7% between 1994 and 2022, exceeding the percentage to developed nations. Since 1994, more and more foreign direct investment (FDI) has been going to emerging countries. This shows that these areas are becoming more important for business and investment, which is why the data analysis is focused on this time period. In recent years, this transition has continued with less fluctuation. The issue behind this change in the distribution of FDI is raised by this shift (Alharthi et al., 2024).

Many studies have been conducted on the factors that influence foreign direct investment (FDI), but relatively few have examined the G-20's FDI and/or its drivers. This research stands out for looking at a variety of pertinent characteristics that were new in the literature on foreign direct investment (FDI), including GDP, inflation, exchange rate, interest rate, and technological innovation.

The goal of the research is to identify the factors influencing foreign direct investment (FDI) to the G-20 nations. Since foreign direct investment (FDI) has varying effects on nations, this research measures the amount of FDI in various G-20 countries. The

analysis in this research study is based on a greater number of countries, and the data used contain the most current information.

In terms of relevance of estimates, the analysis period of 1994–2022 offers the following advantages: first, it analyzes the period when FDI flows began to become significant; second, it uses two periods that differ significantly in terms of their economic conditions (a period of prosperity up until 2007 and a period of global financial crisis after 2008 and the recovery period thereafter). This significant change in the distribution of FDI toward developing countries, particularly since 1994, requires a comprehensive examination of the factors that are influencing these evolving FDI patterns. The major goal of this paper is to investigate the determinants of FDI in G20 countries by utilizing a sophisticated, reliable panel data model of a two-step generalized method of moment (GMM). The results of the study propose that determinants of FDI enhance the FDI in G20 countries. Policymakers can create more effective strategies to attract and leverage FDI for sustainable economic growth by identifying these factors.

The document is organized in the following manner: The literature review analyses previous research on the relationship of determinants of FDI in G20 countries. The methodology section provides details of the data, approach, and analytical methods used. Empirical results are presented, accompanied by a discussion of the findings in connection to prior research. The conclusion summarizes the key findings and provides suggestions for more research.

2 LITERATURE REVIEW

2.1 Theoretical Framework

Dunning's 1980 Eclectic Paradigm (OLI Framework), which holds that companies should locate in locations seeing fast economic growth to enhance efficiency and increase their market reach, offers more help for this. A pull element for foreign direct investment (FDI) is economic growth since MNCs give top priority to entering nations with fast economic development to maximize their returns.

Using the ideas of Purchasing Power Parity (PPP) and Interest Rate Parity (IRP) helps us to understand better how inflation and actual interest rates influence FDI flows. Excessive inflation increases uncertainty and reduces population purchasing power, therefore discouraging foreign investment in a host country (Edison et al., 2002). Stable macroeconomic conditions and consistent inflation rates help to promote foreign direct investment (FDI) since they show expected investment returns.

Conversely, depending on Frenkel's Monetary Approach (1976) to Exchange Rate Determination and other Exchange Rate Theories, a declining exchange rate might make a country more attractive to foreign direct investment (FDI). This is so because foreign investors may afford to buy assets and resources at less expense. Because of the higher risk and uncertainty foreign direct investment (FDI) carries, too volatile exchange rates could deter it. Blonigen (1997) claims that the reasons behind investor investments determine whether or not changes in exchange rates affect foreign direct investment (FDI). For people who are market-oriented and cost-conscious, for instance, a lower currency could appeal more.

The theory of Neoclassical growth holds that technological innovation and capital accumulation are the two major forces behind economic development. Solow's (1956) study forms the main source of this idea. Strong development prospects give more possibilities for expansion and profitability. Therefore, they raise the possibility that foreign direct investment (FDI) would enter a nation.

2.2 Hypothesis Development

2.2.1 Economic Growth and Foreign Direct Investment (FDI) to G-20 countries:

Recent studies show that foreign direct investment (FDI) is rather significant in developing market economies. Banga (2022) claims that FDIs help GDP development in various ways, including encouraging knowledge transfer, raising productivity, and generating jobs. Countries, including Brazil and India, have employed foreign direct investment (FDI) to improve global competitiveness and support continuous economic development per Hailu and Ayele (2023). This supports their position.

Furthermore, as Javorcik (2023) pointed out, foreign investment helps develop the infrastructure necessary to preserve economic growth. More foreign investment from improved infrastructure

generates a more significant local economy (Javorcik, 2023), producing a positive feedback loop. Growing an economy attracts foreign direct investment (FDI). A developing economy helps investors by enhancing the business climate and creating new markets. Research by Tadeus and Mendonca (2023 shows that strong economies attract significant foreign direct investment (FDI), mainly in the IT and service industries. Good economic data boosts investor confidence, motivating local and foreign investment (Gupta & Kaur, 2024).

Still, even the usually favorable link between FDI and GDP development presents difficulties. According to Harris and Hoekman (2023), several FDI forms could have negative consequences, including environmental damage and widening income inequalities. Whether foreign direct investment (FDI) is an acquisition or a greenfield project dramatically affects the general impact on host economies.

The study showed a dynamic and constantly shifting link between FDIs and economic growth. Apart from financial development, human capital, and geographical features, empirical studies have revealed that these elements contribute to the argument on how FDI shapes GDP growth. First, theoretical models clarified the interactions among these elements and their greater understanding. Particularly among the recently constituted G-20 nations, recent studies have revealed that this link is self-reinforcing and cyclical. This study has shown that maximizing the advantages that foreign direct investment (FDI) may offer and supporting long-term economic development depends on a friendly business climate for development and institutions helping it.

H1: Economic growth positively impact Foreign Direct Investment (FDI) to G-20

2.2.2 Inflation and Exchange Rate, and Foreign Direct Investment (FDI) to G-20 countries:

Inflation is one major factor affecting choices on foreign direct investment. Usually, high inflation rates discourage foreign investors because of the linked uncertainty and the risk of declining profit margins. The higher operational risk FDI companies confront stems from the economic volatility of inflation. Ghosh and Ghosh (2022) say inflation reduces FDI flows. Their results imply that developing countries of the G-20 with price stability are more likely to attract foreign direct investment (FDI). Why come? Knowing what to expect is crucial for investors deciding where to allocate their money in the long term.

Little inflation could indicate economic development, drawing foreign direct investment and refuting this. Al Mamun and Hossain (2023) advise international investors, for example, to grab development possibilities in circumstances when inflation is under control since it may imply increasing demand. Maintaining pricing and economic stability is vital from this analytical vantage point.

Long the subject of economic research on the interactions between several factors, including FDI flows, currency rates, and inflation, the dynamic emerging nations of the G-20 have long been This analysis of the literature seeks to clarify the link between inflation and currency rate volatility and how these factors affect foreign direct investment (FDI) into emerging countries.

Early economic theory maintained that inflation might affect foreign direct investment (FDI) due to its probable effects on economic stability and profitability. According to Mundell (1968), high inflation tells potential investors that outside of the economy is unstable. This lessens the attraction of foreign investment. Investing in a nation with high inflation runs the danger of loss since future income and expenditure are erratic. Recent studies, such as those by Kogid et al. (2010), show that FDI falls as inflation rates rise in developing nations, raising the risk of doing business there. The research results back up this point of view. Investors worry about high rates of inflation based on their research since investment earnings are erratic and lead to significant structural expenses.

H2: Inflation negatively influences Foreign Direct Investment (FDI) to G-20 countries

2.2.3 Exchange Rate, and Foreign Direct Investment (FDI) to G-20 countries:

Attracting foreign direct investment (FDI) depends mainly on the stability of a country's currency exchange rate. Attracting foreign investors who are ready to commit to long-term initiatives depends on

keeping a steady exchange rate. This is so because it increases investors' trust in the investment and reduces the possibility of losing money due to changes in the value of money. Developing G-20 countries with stable currencies usually attract more significant degrees of foreign direct investment (FDI) (Zhang et al., 2023).

However, as a dropping value of the currency makes local assets more reasonable for outside investors, it can also draw foreign capital. Research by Nascimento and de Lima (2024) shows that some investors view declining currencies as a strategic opportunity to invest in locations with less expenditure. Still, its success depends on the strong foundations of the economy.

Foreign direct investment (FDI) is strongly influenced by the intricate interaction between inflation and exchange rates. If investors are worried about more instability, a devaluation of currency resulting from excessive inflation can deter foreign direct investment (FDI). According to Smith and Khan (2023), high inflation rates and unstable currencies compromise the investing environment and hence reduce the volume of foreign direct investment (FDI) obtained.

When inflation and exchange rate stability are under control, creating an atmosphere fit for investing is possible. Torres and Rojas (2024) claim that developing nations of the G-20 with solid monetary policies to control inflation and stabilize exchange rates are more likely to have a consistent foreign direct investment (FDI), supporting long-term economic development.

Foreign direct investment (FDI) and currency exchange rates show an interesting link. Since they affect the predictability of investment returns, stable currency rates are essential to draw in foreign direct investment (FDI). Research by Froot and Stein (1991) suggests that exchange rate volatility could deter foreign investment because of the higher possibility of adverse currency movements. These would affect the results of investments. Their studies show that stable exchange rates support foreign direct investment (FDI) since they lower the possibility of unanticipated monetary losses. Developing nations can attract foreign direct investment (FDI) when their currency rates are stable, according to Ahmed and Tang (2017). The data so supports this strategy. Two benefits of stable exchange rates are that they boost investor confidence and help reduce the possibility of fluctuating currency value.

H3: The exchange rate positively influences Foreign Direct Investment (FDI) to G-20 countries.

2.2.4 Real Interest rate and Foreign Direct Investment (FDI) to G-20 countries:

One of the most critical factors international investors consider while deciding whether or not to make a country investment is actual interest rates. Because they encourage borrowing, which raises the possibility of significant investments, actual interest rates are low. Fuchs and Vasilyeva (2023) predict that G-20 developing nations with lower real interest rates would have more FDI. Reduced finance costs enable companies to undertake more ambitious initiatives.

Conversely, high real interest rates make investments more costly to fund and can deter foreign direct investment (FDI). Kaur and Gupta (2023) claim that finance expenses usually rise in line with real interest rates, which would discourage foreign investors from funding new projects. Real interest rates are high for these and other reasons. Their studies indicate that a low and steady real interest rate promotes an environment fit for investments.

Real interest rate policy affects foreign direct investment (FDI) in many ways depending on the developing country. Moderation of this relationship mostly depends on market capacity, economic stability, and inflation rates. Zhao et al. (2024), for example, assert that since they are concerned about the stability of the economy, investors in foreign direct investment (FDI) would be reluctant to invest in a country with high inflation rates. This is true regardless of whether or not the actual interest rates of these nations are low. Therefore, real interest rates significantly influence the volume of FDI acquired, yet this effect is more dependent on the general state of the economy.

Furthermore, diligent monitoring of the relationships between actual interest rates and other monetary factors, including GDP growth and exchange rates, is crucial. According to Mendoza and Fernandez's (2023) research, in order to understand their impact

on foreign direct investment (FDI), one should consider real interest rates in addition to other elements. Their studies revealed that patterns of foreign direct investment could be explained only by a better knowledge of the economic surroundings.

Though they can be overcome by market potential, economic stability, and pro-investment policies (FDI), high accurate interest rates have a deterrent effect on financing costs. This is so because every nation in the G-20 has a unique economic climate. These results align with those of Borensztein et al. (1998) and Kose et al. (2009), who argue that considering the economic situation of these countries would help one better evaluate how actual interest rates influence foreign direct investment.

The literature review points to Hypothesis H4—that actual interest rates affect foreign direct investment —as the most likely accurate. Nevertheless, other contextual factors must be considered in the G-20 developing nations since the direction and intensity of this influence could change. Their interaction emphasizes the complicated link between actual interest rates and other elements affecting foreign direct investment (FDI), suggesting that a multifarious strategy is needed for a whole knowledge of its dynamics.

H4: Real Interest rate positively influences Foreign Direct Investment (FDI) to G-20 countries.

2.2.5 Technological innovation and Foreign Direct Investment (FDI) to G-20 countries:

Technological innovation is the development and implementation of new technologies meant to enhance several aspects, including productivity, competitive advantage, and efficiency, including those of manufacturing, efficiency, and competitiveness. In many respects, technical innovation can significantly influence foreign direct investment (FDI). First, countries that actively promote technological innovation usually draw many investors from worldwide. Usually, these countries achieve this with modern infrastructure, a trained workforce, and innovative R&D resources (Helpman, 1998). These components create an environment suitable for investments and attract high-level foreign direct investment in sectors primarily dependent on technology.

Studies have shown a favorable relationship between technical innovation and foreign direct investment. According to Zhang's (2017) studies, countries with more technical innovation rates will probably draw more foreign direct investment (FDI). This is so because international companies are drawn to sites that can adapt to the changes as technology develops. Li and Li (2012) have shown that technical innovation raises a country's desirability for high-tech investments, attracting more foreign direct investment (FDI). In G-20 developing countries, foreign direct investment (FDI) and technological innovation patterns are strongly linked. Attractiveness to foreign investors directly relates to a nation's technological ability and innovation ecosystems. Due to their fast technical improvement, China and India have seen rising foreign direct investment (FDI) in their technology-intensive sectors. Zhang and Xu (2016) assert that the significant increase in foreign direct investment (FDI) into China's industrial and high-tech sectors results from the nation's present R&D concentration. According to hypothesis H11, technical innovation and foreign direct investment (FDI) flows to underdeveloped nations members of the G-20 are thought to be related. The literature study supports this concept by demonstrating that technical innovation usually positively affects FDIs. Improving infrastructure, broadening markets, and giving businesses a competitive advantage help create an environment that welcomes international investment (Helpman, 1998; Zhang, 2017).

Finally, the research proposes Hypothesis H5, which holds that technological innovation facilitates the receipt of larger FDI by developing G-20 countries. Technology development and foreign direct investment (FDI) have a complex relationship depending on many factors; hence, it is essential to build an environment for the complete use of technological developments.

H5: Technological innovation positively influences Foreign Direct Investment (FDI) to G-20 countries

2.3 Conceptual Framework

The purpose of this research is to find out determinants of FDI in G20 countries. This research takes into account the GDP, inflation rate, interest rate, currency exchange rate, and technological innovation as independent variables. The FDI serves as the dependent variable. In Figure 2.1, the conceptual framework is shown visually.

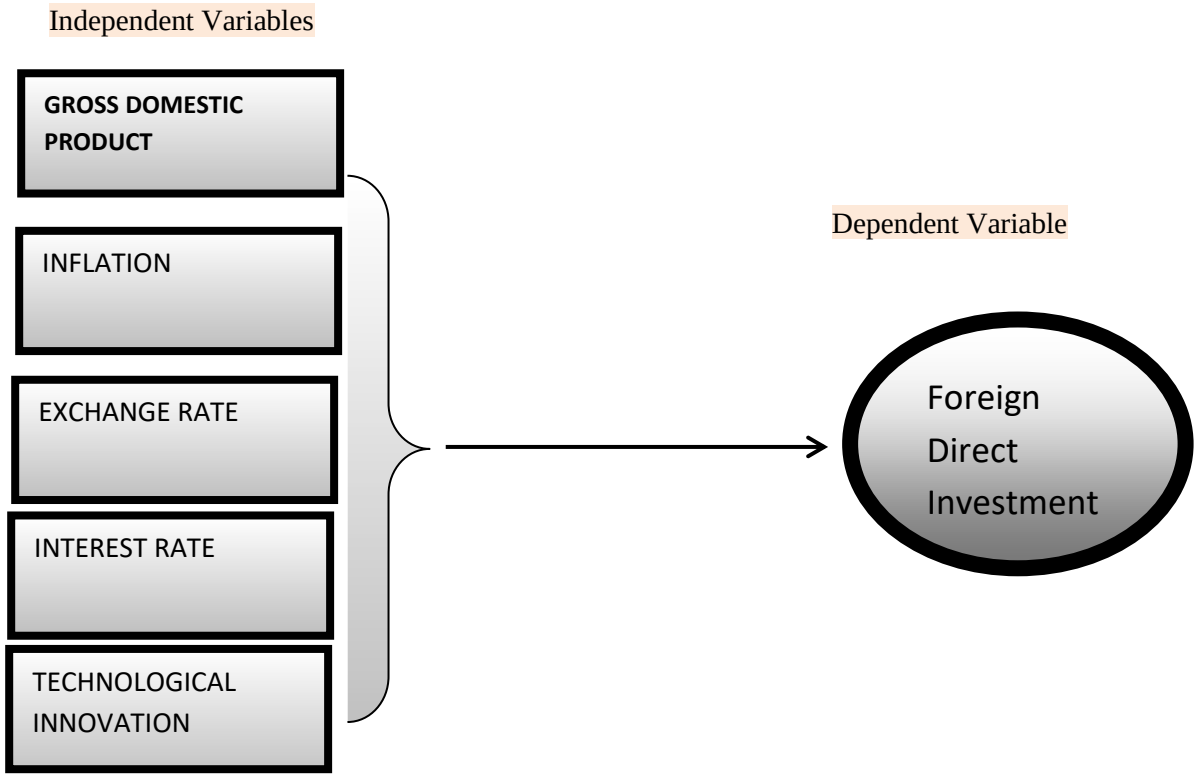

Figure 1: Showing the association between determinants of FDI to G20 countries.

3. Research Methodology

3.1 Data

The present research is quantitative due to the extensive review and discussion of the literature. The researchers make use of the Panel data type. Panel data was gathered across a variety of time periods from many firms.

The sample refers to the entire group of persons, events, as well as subjects of inquiry that researchers want to investigate, as noted by Banerjee and Chaudhury (2010). The data for the present study was obtained from G-20 countries. The study's sample included all countries of the G20, which consists of 20 members. The members of the G-20 are Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the U.K. and the U.S., as well as the European Union, represented by the rotating council presidency and the European Central Bank. The sample of this investigation comprises 580 observations. This analysis used data covering from 1994 to 2022. In terms of relevance of estimates, the analysis period of 1994–2022 offers the following advantages: first, it analyzes the period when FDI flows began to become significant; second, it uses

two periods that differ significantly in terms of their economic conditions (a period of prosperity until 2007 and a period of global financial crisis after 2008 and the recovery period thereafter).

3.2 Data Source

Using yearly data for G-20 economies from 1994 to 2022 the researcher collected the data from WDI (World Development Indicator). The figures and information are obtained from various sources, including WDI, "World Bank Development Indicators, on May 2, 2024."

3.3 Explanation of Variables

The dependent and independent variables were selected based on numerous theories and motivations of foreign direct investment (FDI), as well as a comprehensive study of empirical research.

3.3.1 Dependent Variable

The variable of interest also called the dependent variable of this research is foreign direct investment. Foreign direct investment includes the initial operation that creates by a country situated in some other country, either by a company in a target country or by expanding operations of an existent business in that country. FDI create link between the stockholder as well as the business, also with any future capital transactions involving associated firms of a country, either incorporated or not incorporated. In this research study, FDI is calculated from the percentage of GDP (Williams (2015); Shahmoradi & Baghbanyan (2011); Krifa-Schneider & Matei (2010).

3.3.2 Independent Variables

The independent variables for this research study are Economic growth, Inflation, Exchange rate, Interest rate, and Technological innovation.

The Economic growth (GDP) is calculated as the annual percentage of GDP growth, Zafar et al., (2023). Higher GDP growth may imply significant economies of scale, Endoza, & Fernandez, (2023); Dhakal et al., (2007), although raised GDP per capita possibly will signify a substantial market size, Walsh & Yu (2010), together these factors equally appeal to foreign direct investment (FDI). Inflation (INF) is calculated as (annual %) increase in consumer prices, Smith & Kahn (2023); Majocchi & Strange (2007); Jiménez (2011); Ranjan & Agrawal (2011). The exchange rate (ER) is quantified as the approved exchange rate in local currency units (LCU) per US dollar for an average time. Nascimento & De Lima (2024); Williams (2015); Shahmoradi & Baghbanyan (2011). Technology Innovation (TI) is calculated from the percentage of GDP used for domestic attributes to the private sector, Dhrifi, (2015).

3.4 Econometric model

The Generalized Method of Moments (GMM), a dynamic panel data estimator, is used in this research work to handle autocorrelation, fixed effects, and endogeneity, among other econometric concerns. GMM is commonly used in panel data analysis. For situations with "small T and large N" panels—which indicate a small number of periods and a high number of observations—this wide estimator is meant to be used. It is also used for linear functional connections. In this study, a 2-step GMM estimator is used for all estimations since one-step estimates may lead to heteroscedasticity.

This study's regression model looks like this:

$$\mathbf{FDI_{i,t} = \alpha + \delta_0 FDI_{i,t-1} + \delta_1 GDP_{i,t} + \delta_2 INF_{i,t} + \delta_3 EXCHRATE_{i,t} + \delta_4 IRATE_{i,t} + \delta_5 TI_{i,t} + \varepsilon_{i,t}}$$

Eq-1

Where:

$\mathbf{FDI_{i,t}}$ = Foreign Direct Investment in country iii at time ttt.

$\boldsymbol{\alpha}$ = Constant term or intercept.

$\boldsymbol{\delta_0}$ = Coefficient for lagged FDI ($\boldsymbol{\delta_0 FDI_{i,t-1}}$), accounting for past FDI as a predictor of current FDI.

$\boldsymbol{\delta_1}$ = Coefficient for Gross Domestic Product ($\mathbf{GDP_{i,t}}$), which measures the economic size and output of country i at time t.

$\boldsymbol{\delta_2}$ = Coefficient for inflation ($\mathbf{INF_{i,t}}$), which represents the rate of inflation in country i at time t.

$\boldsymbol{\delta_3}$ = Coefficient for the exchange rate $\mathbf{EXCHRATE_{i,t}}$, which captures the value of the country's currency relative to others.

$\boldsymbol{\delta_4}$ = Coefficient for interest rate ($\mathbf{IRATE_{i,t}}$), which measures the interest rate in country i at time t.

$\boldsymbol{\delta_5}$ = Coefficient for technological innovation ($\mathbf{TI_{i,t}}$), which measures the level of technological innovation in country i at time t.

$\varepsilon_{i,t}$ = Error term, capturing the influence of unobserved factors on FDI in country i at time t.

Lagged FDI ($FDI_{i,t-1}$) suggests that past FDI levels affect current FDI inflows, accounting for persistence in investment behavior.

The **coefficients** $\delta_{0\ to}\ \delta_5$ reflect how changes in GDP, inflation, exchange rate, interest rate, and technological innovation influence FDI.

Error term $\varepsilon_{i,t}$ captures the impact of unobserved factors and random shocks.

The relationship between FDI, GDP, inflation, interest rates, exchange rate, and technological innovation is shown in Equation (1). The intercept is represented by α, the coefficient by δ(1-δ0), and the error term is denoted by ε.

4. Analysis

4.1 Descriptive Analysis

Descriptive statistics provide a thorough and clear representation of the data. Important components of descriptive statistics are observation, mean, standard deviation, and minimum and maximum values. The variables' essential aspects are succinctly summarized in Table 1's descriptive statistics.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI	580	2.075	1.827	-3.607	12.732
GDP	580	2.931	3.75	-13.127	14.231
INF	580	4.842	9.45	-24.6	77.617
EXCRATE	580	.845	.708	-1.854	3.959
IRATE	580	8.394	5.048	.726	20.47
TI	580	1209.363	2664.945	4.76	15856.63

The descriptive statistics are included in the table. FDI for foreign direct investment. The dependent variable is FDI. The terms "gross domestic product," "inflation," "exchange rate," "interest rate," and "technological innovation" (TI) all refer to independent variables.

4.2 Correlation Matrix

The current study uses a correlation matrix to examine the collinearity between variables. The correlation matrix is shown in Table 2. Every variable has correlations that are less than 70% (Greene & Hensher, 2003; Gujarati & Porter, 2010; Khan et al., 2022). This does not constitute an issue with multicollinearity.

Table 2. Pearson Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) FDI	1.000					
(2) GDP	0.104***	1.000				
(3) INF	0.093*	-0.076	1.000			
(4) EXCRATE	-0.077	0.140***	0.138***	1.000		
(5) IRATE	0.104**	-0.063	-0.239***	-0.066	1.000	
(6) TI	0.039	0.159***	0.443***	0.228***	-0.548***	1.000

The Pearson correlation coefficients among the variables are shown in Table 2, along with the significance levels of each correlation. Table 1 has a description of the variables. Statistically significant values are represented by the symbols ***, **, and *, with 1%, 5%, and 10% meanings, respectively.

4.3 Variance inflation factor

Furthermore, the current study makes use of a variance inflation factor in order to evaluate the collinearity that exists between individual variables. A representation of the Variance Inflation Factor (VIF) may be seen in Table 3. When the Variance Inflation Factor is less than 10, it suggests that there are no problems with multicollinearity (Gujarati & Porter, 2010; Khan et al., 2018). In light of this, the data may be used for further study.

Table 3. Variance Inflation Factor

	VIF	1/VIF
EXCRATE	5.146	.194
INF	5.049	.198
GDP	1.034	.967
IRATE	1.028	.972
TI	1.001	.999
Mean VIF	2.379	

4.4 Generalized Method of Moments

For estimate, this research makes use of the dynamic panel data estimator, often known as the Generalized Method of Moments (GMM). These findings are shown in Table 4.

Table 4: Estimation Results for G20 Countries

Regressor / variables	Model	Prob: value
L.FDI	.152***	.001
GDP	.065**	0.002
INF	-.03***	0.001
EXCRATE	.027**	0.024
IRATE	.017***	0.000
TI	5.68e-06	0.87
Constant	1.229**	0.046
Year Dummies	NO	
AR(1)	0.029	16.24
AR(2)	0.695	0.357
Hansen	0.14	0.397
No. Of groups	58	-
No. Of instruments	54	-
No of observations	522	-

The table presents the GMM step two results. ***, **and * are significance at 1%, 5% and 10% respectively.

4.5 Empirical Results and Discussion

Table 4 presents the results of the empirical research conducted on FDI in G20 countries. The results of the study provide evidence that the F-statistics for each variable are statistically significant.

According to the results, the GDP is positive and highly significant. Therefore, GDP growth enhanced

the FDI in G-20 countries. Banga (2022) claims that FDI helps GDP development in various ways, including encouraging knowledge transfer, raising productivity, and generating jobs. Research by Tadeus and Mendonca (2023) shows that strong economies attract significant foreign direct investment (FDI). Gupta and Kaur's (2024) research indicates that emerging countries with robust economies and G-20 membership are better suited to attract foreign direct investment over the long run. The results support the first hypothesis that economic growth positively impacts Foreign Direct Investment (FDI) to G-20. Different theories also supported our study results. The theory of Neoclassical growth is aligned with the study results. Solow's (1956) study also emphasis on the economic development. Following these theories, it is recommended that strong development prospects give more possibilities for expansion and profitability. Therefore, GDP will raise the possibility that foreign direct investment (FDI) would enhance the nation's economy.

The impact of inflation shows a negative relation, suggesting that this negative effect diminishes as FDI increases. The results support the second hypothesis that inflation decreases the FDI. Inflation is one major factor affecting choices on foreign direct investment. Usually, high inflation rates discourage foreign investors because of the linked uncertainty and the risk of declining profit margins. Ghosh and Ghosh (2022) say inflation reduces FDI flows. Their results imply that developing countries of the G-20 with price stability are more likely to attract foreign direct investment (FDI). Little inflation could indicate economic development, drawing foreign direct investment and refuting this. Al Mamun and Hossain (2023) advise international investors, for example, to grab development possibilities in circumstances when inflation is under control since it may imply increasing demand. Maintaining pricing and economic stability is vital from this analytical vantage point. The negative relationship between FDI and inflation is also caused by poor infrastructure, outdated technology, and inefficient supply chains can contribute to general underproductivity, creating imbalances between supply and demand, (Munish, 2024; Mustafa, 2019). The results show that the impact of the exchange rate is consistently positive and highly significant for FDI. This indicates that a more favorable or stable exchange rate consistently supports economic growth, though minimal in effect. Li and Li (2021) examined the FDI trends among G-20 growing countries. The results show that the predictability of currency exchange rates influences FDI flow. They reasoned that nations whose governments control monetary values are more likely to draw international capital. Torres and Rojas (2024) claim that developing nations of the G-20 with solid monetary policies to control inflation and stabilize exchange rates are more likely to have a consistent foreign direct investment (FDI), supporting long-term economic development. The results support the third hypothesis that the exchange rate positively impacts the FDI to G-20 countries. According to Frenkel's Monetary Approach (1976) the Exchange Rate Determination and other Exchange Rate Theories, a declining exchange rate might make a country more attractive to foreign direct investment (FDI). This is so because foreign investors may afford to buy assets and resources at less expense.

The findings also reveal that interest rates significantly and positively affect FDI. The results support the hypothesis that interest rate positively impact the FDI to G-20 countries. As the economy advances, higher interest rates could support the growth in GDP, either by attracting more investments or dampening inflationary pressures. Empirical studies on the link between actual interest rates and foreign direct investment have been conducted in several countries. Rahman and Sultana (2023) say that if nations perform strategic infrastructure upgrades and maintain consistent accurate interest rates, they should be able to attract more foreign direct investment (FDI). Fuchs and Vasilyeva (2023) predict that G-20 developing nations with lower real interest rates would have more FDI. The results support the hypothesis of interest rate and FDI relation. Using the ideas of Purchasing Power Parity (PPP) and Interest Rate Parity (IRP) helps to understand better how inflation and actual interest rates influence FDI flows. Excessive inflation increases uncertainty and reduces population purchasing power, therefore discouraging foreign investment in a host country (Edison et al., 2002). this theory supports this study's findings. Stable macroeconomic conditions and consistent

inflation rates help to promote foreign direct investment (FDI) since they show expected investment returns.

According to the results, technological innovation does not support the hypothesis that technological innovation positively impacts the FDI to G-20 countries. The results of these studies are supported by Aitken et al., (1997) and Haddad & Harrison, (1993). Lack of a sufficient R&D infrastructure may make it more difficult for less developed nations to compete with more developed countries for high-tech investments (Aitken et al., 1997). Moreover, political unrest, legal challenges, and insufficient intellectual property protection (Haddad & Harrison, 1993) minimize the impact of technological innovation on foreign direct investment (FDI) in these countries.

In addition, Table 4 demonstrates that there is a negative first-order serial correlation (AR(1)) that is accessible, and according to the second-order serial correlation (AR (2)), there was no second-order serial correlation discovered throughout the investigation. Based on the results of the Hansen test, it has been determined that there is no possible link between the error term and the instruments. This suggests that the instruments are valid, and the null hypothesis cannot be rejected for any of the variables. As an additional point of interest, this reveals that there are 54 instruments and 58 groups.

5. Conclusion

This study aimed to demonstrate the significant factors influencing FDI in G-20 developing nations. This research employed a positivist viewpoint. The researcher used a deductive hypothesis methodology for this investigation. In deductive research, the hypothesis undergoes testing. This study is quantitative and grounded on a theoretical framework and an extensive literature review. The quantitative method facilitates the systematic measurement of variables and the testing of hypotheses.

The data for this research was sourced from G-20 nations. The study's sample included all G20 members, including 19 countries (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the U.K. and the U.S.) and the European Union. The dataset used for this study consists of 580 observations. This research used data spanning from 1994 to 2022. The analysis period of 1994–2022 presents several advantages regarding the relevance of estimates: firstly, it encompasses the era when foreign direct investment (FDI) flows became substantial; secondly, it incorporates two markedly distinct periods characterized by divergent economic conditions—an era of prosperity until 2007 and the subsequent global financial crisis followed by a recovery phase post-2008. The researcher gathered data about all variables from the World Development Indicators (WDI).

The variable of interest is foreign direct investment. The independent variables for this research study include economic growth, inflation, exchange rate, interest rate, and technological innovation. Utilizing a range of empirical methodologies—including descriptive statistics, correlation matrix analysis, variance inflation factor (VIF), and the Generalized Method of Moments (GMM), the study found that Exchange rates, interest rates, and GDP generally exert a positive influence on foreign direct investment (FDI), while inflation has a negative impact.

5.2 Policy Implications

The results of this study on the determinants influencing foreign direct investment (FDI) to G20 developing nations have important policy implications that can direct nationwide policies aimed at attracting and keeping FDI.

The relationship between GDP and FDI has been positively and significantly explained, proposing that nations with faster rates of economic growth are more likely to draw in foreign capital. This indicates that by concentrating on industrial development, improving infrastructure, and protecting a stable macroeconomic environment, policymakers should give top priority to fostering an environment that supports economic growth. A negative correlation was shown between inflation and foreign direct investment (FDI), representing that high inflation rates generate uncertainty and discourage foreign investment. Policymakers should take action to address this by enacting fiscal and monetary measures designed to maintain price stability and

reduce inflation. Additionally, the Exchange Rate variable showed a strong and positive correlation with FDI. Governments can boost investor confidence and lower exchange rate risk. Real interest rates and foreign direct investment (FDI) were observed to be positively correlated, demonstrating that higher real interest rates can illustrate in more FDI, particularly in nations with robust financial systems.

5.3 Limitations and Future Research Recommendations

This research concentrated on certain G-20 nations and did not account for possible variations in FDI attractiveness variables in other areas or countries. Consequently, the results may not apply to different locations or nations. This study has limitations that may be rectified in future research.

Moreover, the research mainly examines aggregate FDI at the national level and may neglect disparities among G-20 nations. Future studies may investigate sub-national or sectoral variations in FDI determinants to provide detailed insights into the catalysts of foreign investment.

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