

## *Consequences of Foreign Direct Investment on Inflation*

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### **Cite this paper**

Nhemhafuki, S., KC, S., & Thapa-Parajuli, R. (2023). Consequences of foreign direct investment on inflation. *The Journal of Development and Administrative Studies*, 31(1-2), 55-64.

<https://doi.org/10.3126/jodas.v31i1-2.72235>

### **Abstract**

This paper analyses the relationship between inflation measured in terms of CPI and FDI, GDP, and population. The paper intends to examine the consequences of FDI on inflation. The unbalanced panel data of 88 countries from 1970 to 2021 was employed for the said purpose. The empirical results have been estimated using Pooled OLS, Fixed Effect, and Random Effect Model. Moreover, control variables GDP and Population were introduced to strengthen the causal conclusion. Fixed Effect model was used for the analysis. The pool-ability of the data is tested by the Breusch and Pagan LM test which confirmed that Pooled OLS is not appropriate for the model. The Hausman Specification Test was then conducted to choose between the Fixed Effect or Random Effect model. The Hausman Specification Test for the Model suggests that the fixed effect model is appropriate for data analysis. Thus, fixed effect regression is used to find the consequences of explanatory and the control variables on the dependent variable. FDI as an explanatory variable has a negative relationship with Inflation, even in the case of controlling GDP and Population. The control variable, GDP, displayed a negative association with Inflation, while Population is depicted to have a positive relationship with Inflation.

**Keywords:** Inflation, FDI, GDP, Population, Fixed Effect

## **Introduction**

### ***Inflation***

Inflation is one of the most regularly used lexicon in the field of Economics. Though it is used in the regular basis, it becomes alarming all of a sudden depending on the macroeconomic situation of a country. It is because high and persistent inflation fundamentally undermines public confidence in the economy and in the management of economic policy which results in an adverse effects on risk-taking, investment, and other productive activities because public would be sensitive to the potential risk of the inflation and directing their resources in managing the inflation (Bernanke 2007).

However, inflation in itself isn't a bad idea if it is low and stable. Low and stable inflation brings stability to financial systems and fosters sustainable economic growth over the longer run (Roger W. Ferguson 2005). Mainly developing country wants mild inflation in the economy for the growth and development of the country.

Inflation means a rise in the general price level of goods and services or depreciation of the value of money in an economy over some time (Öner 2012). Inflation thus reduces the purchasing power of money. The process of continuous and appreciable rise in the general price level that decreases the value of money over some time due to many causes is known as inflation (Emeru 2020). In the Economic world, inflation is one of the macroeconomic variables that affect other several variables such as real economics, interest rate, saving, economic growth, GDP, and many more.

Inflation may affect the economy in both positive and negative ways. Negative effects of inflation include an increase in the opportunity cost of holding money, and uncertainty over future inflation which may discourage investment and savings (Mankiw 2011). Positive effects include reducing the real burden of public and private debt, keeping nominal interest rates above zero so that central banks can adjust interest rates to stabilize the economy, and reducing unemployment due to nominal wage rigidity (Grier and Grier 2006).

Recently, inflation has been a hot topic for debate amongst individuals, businesses, governments and scholars. Headlines as “Fears of High Inflation Getting Worse?”; “Consumer Prices Jump”; “Inflation Marks Quickest Pace in More than a Decade” is getting the attention amongst public more than ever. And people can't agree anymore with the news and media reports. It is because Inflation succeeds in touching the lives of the ordinary citizen posing a grave threat to any political system (Ikani 1989). The inflation has been a global phenomenon since many decades and continues to affect the economic activities (Al-Shammari and Al-Sabaey 2012).

There could not be any better time than this to discuss and introduce the topic on the table. It is because the inflationary pressures and a broad price increase is being experienced all across the globe. US, in the wake of the COVID-19 pandemic, inflation reached 8.5%, its highest rate since 1982 (STATISTICS 2022). Similar is the story in the case of UK too. According to ONS (2022) UK experienced Annual of 8.8% CPIH highest since 1991. Germany also has hit the record of highest inflation of 10.4% which is the highest since 1974 (Startseite 2022). All of the abovementioned countries were experiencing stable price level since the decades of 1970s. The 1970 was a decade of inflation and more precisely the “stagflation” (Blinder 1982).

### ***Foreign Direct Investment (FDI)***

An investment made by the foreign nationals in the said country is referred to as Foreign Direct Investment. OECD (2008) defines FDI as a category of cross-border investment made by a resident in one economy (the direct investor) with the objective of establishing a lasting interest in an enterprise (the direct investment enterprise) that is resident in an economy other than that of the direct investor. FDI helps in increasing capital inflow as the additional sources of financing in the economy (Qin and Ozturk 2021). Domar (1950) focuses on the dual role of investment. One hand, new investment generates income and effective demand. On the other, it increases productivity capacity of the economy by expanding capital stock. The FDI plays a crucial role of internationalizing economic activity and it is a primary source of technology transfer and economic growth (Lenka and Sharma 2014).

FDI fosters and maintains economic growth, in both the recipient country and the country making the investment. In Developing countries, FDI helps in financing the construction of new infrastructure and the create jobs for their local workers while multinational companies expand their footprints into international markets. KUTAN and VUKS'IC' (2007) finds that FDI inflows contributed to higher supply capacity which ultimately led to more exports. FDI improves the export capacity of domestic firms. The linkage between the indigenous suppliers, foreign direct investment, and domestic sources has a spillover effect through backward connection. Agrawal (2015), Sengupta and Puri (2018), Verma (2020) conform the positive association amongst the FDI and Economic growths in the economies of concerns in all of the studies.

Along with Economic growth and development, FDI also plays its part in influencing the socio-economic development of the economies, mainly the host economies. Sattar, Hassan et al. (2022) found the long-run relationship between FDI and Socio-economic development by analyzing FDI's impact on poverty reduction, human capital development, social safety in the economies under consideration. FDI strongly influences poverty reduction in poorer countries. Poverty reduction can be attained through the realization of the FDI inflows in the poorer regions (Ganic 2019).

But, the effectiveness of the FDI depends on the volume of the FDI as well as the level and the quality of the human capital, physical infrastructures and institutions of the host country. Basnet and Pradhan (2014) suggests that the countries at initial phase of the development may lack the absorptive capacities required to exert a perceptible effect on economic growth. Kaushal (2022) recommends prioritizing improved governance based on the finding that Countries with strong institutions, good governance, and transparent and stable legal regimes are the preferred investment destinations.

### ***Population***

In every theory of production function, role of Population, particularly the share of labor in the total population, is pivotal. Labor is an essential input to produce goods and services. In all the classical, neoclassical theories of economic growth from (Smith 1776), (Ricardo 1904), (Harrod 1939), (Domar 1946), (Lewis 1954), (Rostow 1959) stress the importance of labor and its dynamics in the economic growth and the development. Also in the Endogenous growth theory by (Lucas 1988), (Rivera-Batiz and Romer 1991) emphasizes on labor mobility which will enhance the productivity as well as enhance growth. The Modern Economic theory by Stiglitz (1969) explains the role of innovation and entrepreneurship in driving economic growth. The author believes that policies that encourage innovation and entrepreneurship can lead to sustained economic growth.

The population is, in fact, a naturally endowed resource for economic development in all the economies. DAM (1976) argues that population growth can lead to economic development with proper policy management. However, the author also argues that it also could have negative impacts, such as environmental degradation and social unrest, if the management of the population policies. The long-term economic development of a country is essentially dependent on the quality of its institutions and the human capital of its citizens (Acemoglu, Gallego et al. 2014). Nevertheless, in low-income countries, rapid population growth is not always favourable in the short and medium term. But, in the longer run, population growth is an important factor in producing overall economic growth and contributes to increased growth in per capita output (Peterson 2017). A higher population means higher demand for goods and services. Population indicates the market size of any given economy. Also, a higher fraction of young and productive people denotes the labor force of the economy of concern.

### ***Gross Domestic Product (GDP)***

GDP (Gross Domestic Product) measures the monetary value of final goods and services—that is, those bought by the final user—produced in a country in a given period (say, a quarter or a year). It counts all the output generated within the borders of a country. GDP is composed of goods and services produced for sale in the market and also includes some nonmarket production, such as defence or education services provided by the government (Callen 2008). GDP is, even though not thoroughly, considered as a measure of social welfare (Bergh 2007). It is used as a major macroeconomic indicator of any economy and used as a proxy for measuring the size and depth of the economy. GDP is the single most important measure of the health of the macroeconomic situation in every developed economy and has been the most widely reported statistic (Mankiw 2014).

There is growing disagreement among scientists and experts on GDP being used as a proxy measure for prosperity and well-being. Regardless, it is still being widely used as an economic metric and an assessment tool for society's performance (Fioramonti 2014). A study by Hill, Cheung et al. (2019) finds societies where individuals report greater life engagements tend to have higher GDP suggesting that individuals who report a greater sense of purpose in life tend to fare better economically, which may be expected to extend to the societal-level, in terms of higher GDP.

This paper intends to establish the relationship between the level of inflation and the amount of FDI received in the selected countries. The inflow of FDI is hypothesized to reduce the price level because FDI leads to an increase in goods and services and competition. FDI also increases productivity and efficiency, as suggested by the existing literature, thus leading to a reduction in production costs and keeping the price stable. So, it is hypothesized that with the FDI inflowing, there is a decrease in the price level. An awareness of the implications of such a relationship, if any, is essential for the relevant authorities, in terms of both macroeconomic policy and decision-making.

The remaining part of the paper is organized as follows: The second section discusses various existing literature on the relationship between Inflation and FDI. The third section describes the data and variables used in the study. The fourth section explains model specification and methodology. The fifth section includes the study's findings and results. Finally, the sixth and last section concludes the paper with recommendations.

### **Literature Review**

There are various literatures on FDI and its relationship with GDP, Investment, Domestic Capital, Productivity and Efficiency, economic growth and development, Poverty reduction, energy consumption, inflation, etc. This section of the paper will discuss some of them.

By analyzing the association between FDI and GDP, Sengupta and Puri (2018) finds FDI a significant contributor to GDP. The author states that FDI plays a vital role by acting as a source of capital and increasing the competitiveness of the domestic economy. Similar conclusions have been drawn in other studies. Verma (2020), Asghar et al. (2012) suggests that there is strong relationship between FDI and GDP in the countries of concern.

On part of economic growth, Agrawal (2015) indicates that FDI has a positive long-run association with Economic growth. Author recommends encouraging the potential sources of economic development which would simulate and enhance foreign investments. Although the coefficients are in negative for short-run estimates, there is a positive relationship between FDI and Economic growth (COBAN and YUSSIF 2019). Similarly, Zekarias (2016) conforms the positive and marginally significant effect of FDI on economic growth suggesting FDI as a key driver of economic growth and catalyst to economic conditional convergence in Eastern Africa.

However, studies have shown that there exists none as well as negative relationship among FDI and Economic growth. Kaur (2013) concludes that FDI inflows do not have positive relationship with growth indicators. By examining the effectiveness of FDI on Economic growth in the sample countries, the study finds that there exists ineffectual role of FDI in promoting Economic growth (Basnet and Pradhan 2014). The authors suggest that countries

at initial phase of the development may lack the absorptive capacities required to exert a perceptible effect on economic growth. Also, the author points out to importance of the size of the FDI inflow in the host country.

Studies have found that FDI also influences the productivity and efficiency of the factors of the host country. Papaioannou and Dimelis (2019) suggest that FDI exerts important influence on total factor productivity growth. The authors suggest that with lower regulation in upstream industries the competition enhances thus ensuring a higher level of efficiency through the reallocation of markets shares to most productive businesses. Authors recommend introducing policies that reduce entry barriers to new firms and ensure a lower level of government intervention through lower price controls and less state presence.

FDI tends to have spillover effects in the technical efficiency from the foreign firms to domestic firms. The spillover benefits accrue to the Domestic Firms primarily through demonstration effect. Sur and Nandy (2018) finds that MNCs are the prime transmitters of advanced technology as their operations have significant spillover effects to Domestic Firms and demonstration effect proves to be an important channel and source of technological externalities to the local firms in the Indian automobile sector.

Inflation erodes the purchasing power of individuals, creating distortions in the net returns of investment and labor. Foregone utility in period  $t$  reflects the cost of investing that period. Whereas the benefit is reflected in increased consumption. During this period inflation erodes the purchasing power of earnings before they are converted into consumption; thus, the net benefit of investing falls as inflation rises. This mechanism captures the direct negative effect of foreign domestic inflation on foreign domestic investment (Sayek 2009).

Sayek (1999) finds that increase in inflation reduces the FDI inflow in the economies of concern. Other literatures Valli and Masih (2014) by analyzing the time-series data from 1970-2012 establishes the long-run relationship between the level of inflation and the FDI receipt of South Africa. Similar conclusion has been drawn in the case of Ghana. The high inflation in the Ghanaian economy deters the foreign direct investment (COBAN and YUSSIF 2019).

After the extensive review of the existing literatures, the need for assessing the consequence of FDI inflow on the inflation was felt. There is dearth of literature on this respect. Hossain (2018) attempted to test the role of FDI in decreasing the level of inflation of Bangladesh by applying the ARDL and NARDL with the help of time-series data from 1973-2017. But, analysis on more diverse characteristics country with a little higher number of observation would help to establish more robust causality among the variables of concern.

This paper attempts to fulfill that gap by including more number of observation over the long period of time with diverse characteristics country. So, the longitudinal/cross-country time-series data was prepared for the purpose of the analysis.

## Data and Methodology

The paper studies the relationship across the four different variables; namely, Inflation, FDI, GDP and the Population. The data are sourced from the World Bank. The data were log-transformed for the purpose of the analysis. STATA 17.0 was used for the data analysis. The list of countries selected for the analysis is attached in *Appendix A*.

### Summary Statistics

The Summary Statistics of observations, mean, minimum, maximum, standard deviation, skewness and kurtosis explains the synopsis about the distribution, variability and central tendency of the variables.

**Table 1: Summary Statistics of the variables**

Variable	Mean	Std. dev.	Min	Max	Observations
INF overall	1.701	1.213	-4.791	9.372	N = 3627
between		0.592	0.801	2.865	n = 52
within		1.066	-3.894	8.893	T-bar = 69.75
FDI overall	19.929	2.93	6.908	27.322	N = 3627
between		1.51	17.251	21.802	n = 52
within		2.529	7.219	26.163	T-bar = 69.75
GDP overall	24.376	2.278	17.346	30.78	N = 3627
between		0.809	22.592	25.658	n = 52
within		2.14	18.337	30.046	T-bar = 69.75
POP overall	16.382	1.64	11.471	21.065	N = 3627
between		0.208	16.017	16.908	n = 52
within		1.628	11.185	20.892	T-bar = 69.75

**Correlation Matrix**

The correlation matrix of Table 3 shows that there is a negative correlation between the Inflation and the FDI and GDP. While Inflation is directly affected by Population.

**Table 2: Correlation matrix of the variables**

	GDP	FDI	POP	INF
GDP	1.000			
FDI	0.830***	1.000		
POP	0.698***	0.439***	1.000	
INF	-0.246***	-0.345***	0.063**	1.000

**Model Specification**

This paper aims to explore the causality between the inflation with FDI, controlling for GDP and the Population. Inflation is the dependent variable explained by FDI. GDP and Population is employed as the control variables. Aiming for the objective, it has employed the following functional model based on the different Panel data literature.

The specified model is as follows:

$$Inf = f(FDI, GDP, Popn) \dots\dots\dots (1)$$

Where,

- Inf = Inflation (measured in terms of CPI)
- FDI = Foreign Direct Investment
- GDP = Gross Domestic Product
- Popn = Population

The functional form explains that Inflation is dependent on or influenced by FDI, GDP and the Popn.

The model is presented as follows:

$$Inf_{i,t} = \alpha_0 + \beta_1 FDI_{i,t} + \beta_2 GDP_{i,t} + \beta_3 Popn_{i,t} + \mu_{i,t} \dots\dots\dots (2)$$

Where,

- $\alpha_0$  = intercept ( $\alpha_0 > 0$ ),
- $\beta_1$  is the coefficient of Foreign Direct Investment
- $\beta_2$  is the coefficient of Gross Domestic Product
- $\beta_3$  is the coefficient of Population
- $\mu_{it}$  is the error term
- i is the country index
- t = time period

**Description of the Variables**

The detail of the entire variables used in the formulation of equation (1) and (2) and other associated variables in the study are presented in the below:

**Table 3: Variable Details**

Variable	Variable Details
Inf	Inflation (measured in terms of CPI)
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
Popn	Population

**Methodology**

The data were analyzed with the help of Stata. Breusch-Pagan Lagrange multiplier (LM) test (Breusch and Pagan 1980) was used to choose between the Random effects model and OLS model. Hausman Specification Test (Hausman 1978) was employed to select between the fixed effect model or random effect model.

**Breusch and Pagan Lagrangian multiplier test**

The pool-ability test confirms if the cross-sectional unit in the panel has the same intercept or a different intercept. Also, it should have different slopes. After employing the Breusch and Pagan Lagrangian multiplier test to test the pool ability of data, it was confirmed that the Panel data was not Pool-able. So, Pooled OLS is not appropriate for the model.

The result of the Breusch and Pagan Lagrange Multiplier test is in *Appendix B*.

Since the result indicates that  $\text{Prob} > \chi^2 = 0.0000$  and we conclude that the Pooled OLS model is not appropriate.

### The Hausman Specification test

To choose among the fixed effect model and random effect model, the Hausman Specification test was conducted. The Hausman Specification Test for our model suggests that the fixed effect model is appropriate for our data. The corresponding chi-square value of the Hausman test was 121.781, and the adjoint probability was much less than 0.05.

The result obtained for the Hausman Specification test is in the *Appendix C*

Here, the null hypothesis is that the Random effect is suitable. But since the difference in coefficients is not systematic. Also the p-value is very less we reject the null hypothesis. So, we prefer the fixed effect model over the random effect model.

## Results and Discussion

The paper employs the Fixed Effect model to assess the relationship between the inflation and the explanatory and the control variables in the selected countries. The model investigates the association between the Inflation, FDI, GDP and the Population. Inflation was taken as the dependent variable and FDI was taken as the independent variable while GDP and Population was controlled for. The regression result in the Table 4 shows that the Inflation is negatively related to FDI.

**Table 4: Pooled OLS, Fixed Effect and Random Effect Models**

Models & VARIABLES	Pooled OLS Model		Fixed Effect Model		Random Effect Model	
	(1)	(2)	(3)	(4)	(5)	(6)
FDI	-0.143*** (0.00646)	-0.115*** (0.0118)	-0.0843*** (0.00691)	-0.0156 (0.0120)	-0.0933*** (0.00681)	-0.0412*** (0.0119)
GDP		-0.150*** (0.0191)		-0.228*** (0.0179)		-0.209*** (0.0181)
Popn		0.283*** (0.0165)		0.307*** (0.0152)		0.302*** (0.0154)
Constant	4.544*** (0.130)	3.027*** (0.211)	3.382*** (0.139)	2.549*** (0.197)	3.579*** (0.144)	2.689*** (0.202)
Observations	3,627	3,627	3,627	3,627	3,627	3,627
R-squared	0.119	0.190	0.119	0.172	0.119	0.181
Number of year	52	52	52	52	52	52

*Note: The statistical test values are in parentheses. \*\*, \*\*\* indicate significance at the 5%, 1% levels, respectively.*

FDI was found to have negative relationship with Inflation. As shown in Columns (1), (3) and (5), FDI had a negative effect on inflation for all 3 models. Columns (2), (4), and (6) show the regression result after introducing the control variables (i.e. GDP and Population). Based on the results, the conclusion did not change after the control variables being introduced.

This analysis starts from a parsimonious model that considers only one variable and gradually considers additional control variables. The result conforms the hypothesized expected negative signs, even after controlling for control variables. But, the outcome variable loses its significance after the control variables were considered in the Fixed Effect model (4) in Table 4. It is likely due to the annual nature of the unbalanced panel data.

The control variables in (2), (4) and (6) have high level of significance with the Inflation. GDP was negatively associated with the inflation, implying that the increase in GDP will decrease the price level. Another control variable Population is positive and significantly related to the Inflation, suggesting that the more the population, the rising price level.

In all 3 models, we accept the result from the Fixed Effect Model, i.e. (3) for the relationship without the control variables and (4) for controlling GDP and the Population.

## Conclusion

This examines the consequences of FDI on inflation. For this purpose, the unbalanced panel data of 88 countries from 1970 to 2021 was employed. The empirical results have been estimated using Pooled OLS, Fixed Effect, and Random Effect Models. Moreover, control variables GDP and Population were introduced to strengthen the causal conclusion.

The empirical result confirms the expected negative association between FDI inflow and Inflation. In all the models (Pooled OLS, Fixed Effect and Random Effect) employed for regression, with and without control variables, there is a negative effect on the Inflation explained by the FDI inflow. The result implies that when there is increase in the FDI inflow, the price level decreases. Using this result, we conform with the earlier proposition in the paper that with an increase in the FDI, there is a reduction in the price levels because FDI leads to an increase in goods and services and competition. It was also hypothesized that FDI by increasing productivity and efficiency reduce the production costs and keep the price stable. So, with the FDI inflowing, there is decrease in the price level.

The econometric model (2), (4) and (6) controls for GDP and Population to further enhance the presence of causality of FDI in the inflation. However, introducing the control variables did not change the conclusion in all 3 models employed. The relationship between the control variable GDP suggests that when the GDP increases, the inflation lowers. Since, GDP is a measure of the goods and service produced, the increase in supply of the goods/s leads to decrease in the price.

Another control variable population however depicted positive association with inflation, meaning that when population increases, the inflation also increases. Demographic change directly alters the size of the labor force, consumption and savings patterns and labor productivity, having an important impact on real economic variables. The population plays a demand side role in an economy, it is evident that when the demand increases, the price level also increases.

Thus, the findings of the paper correspond to the basic microeconomic foundations of the economic theories which establish the relationship between the inflation and the FDI. So, it becomes crucial to draft the policies keeping the variables of concern in the center and analyzing the potential consequences the policies could have on the concerned variables. It is inconceivable to ignore the FDI and its consequences on the real sector of the host country as well as home country. So, policymakers, while drafting the Fiscal and Monetary policy, should bring the matter of FDI into the discussion and create space in the policies to accommodate its effects and vice-versa.

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**Appendices**

**Appendix A**

Algeria	Burundi	Denmark	Guatemala	Jamaica	Morocco	Peru	Sweden
Australia	Cambodia	Dominican Republic	Guinea-Bissau	Japan	Nepal	Portugal	Thailand
Austria	Cameroon	Ecuador	Honduras	Kenya	Netherlan ds	Rwanda	Togo
Bangladesh	Canada	Egypt, Arab Rep.	Hong Kong SAR, China	Korea, Rep.	New Zealand	Saudi Arabia	Tonga
Barbados	Chad	El Salvador	Iceland	Lesotho	Nicaragua	Senegal	Tunisia
Belgium	Chile	Finland	India	Madagascar	Niger	Sierra Leone	Turkiye
Benin	Colombia	France	Indonesia	Malaysia	Nigeria	Singapore	Uganda
Bolivia	Congo, Rep.	Gambia, The	Iran, Islamic Rep.	Mali	Norway	South Africa	United Kingdom
Botswana	Costa Rica	Germany	Iraq	Malta	Oman	Spain	United States
Brazil	Cote d'Ivoire	Ghana	Ireland	Mauritania	Pakistan	Sri Lanka	Uruguay
Brunei Darussalam	Cyprus	Greece	Italy	Mexico	Paraguay	Sudan	Zimbabwe

*Appendix B****Breusch and Pagan Lagrangian multiplier test for random effects***

$$\text{Inf}[c\_Country,t] = Xb + u[c\_Country] + e[c\_Country,t]$$

Estimated results:

Var	SD = sqrt(Var)	
Inf	1.471149	1.212909
e	.8110948	.900608
u	.3628193	.6023448

Test:  $\text{Var}(u) = 0$

chibar2(01) = 5739.32

Prob > chibar2 = 0.0000

*Appendix C***Hausman (1978) specification test**

	Coef.
Chi-square test value	121.781
P-value	0