The Impact of OFDI and Institutional Quality on Domestic Capital Formation at the Disaggregated Level: Evidence for Developed and Emerging Countries

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Abstract: In this study, we investigate whether outbound foreign direct investment (OFDI) either augments or impedes domestic public and private investment, incorporating the role of institutional quality into the context of developed and emerging countries. To this end, we apply a cross-sectional-autoregressive-distributed lag (CS-ARDL) approach to analyze panel data from the period 1996–2017. Our empirical findings suggest that OFDI augments private capital formation for developed countries. Institutional quality (IQ) is found to be a driving factor that promotes private capital formation in the established economies of developed countries. However, OFDI has a negative association with the public capital formation in the established economies of developed countries, while IQ has a positive association with it. In the context of emerging economies, OFDI is found to be too insignificant to have an effect on private and public capital formation. Interestingly, IQ has a detrimental effect on both private and public capital formation in emerging economies. Our findings are robust. The empirical findings of this study imply that institutional quality should continue to be improved in developed countries, while it should surpass a certain threshold for emerging economies to promote domestic capital formation.

Keywords: outbound foreign direct investment; institutional quality; domestic capital formation; panel data

1. Introduction

Domestic capital, especially private capital formation, works as a buffer that absorbs economic shocks and facilitates the preserving of economic stability. Private capital is more productive and innovative than public capital formation [1]. Many empirical studies suggest that public investment is an effective tool to spur the economic growth and development process [2]. Prior literature also argues that both inbound foreign direct investment (IFDI) and outbound foreign direct investment (OFDI) promote domestic capital formation by different means. For instance, IFDI stimulates domestic capital by bringing advanced technologies, management skills, and technical knowledge [3–5] from developed countries, while OFDI promotes domestic capital formation by linking local investors to the global chain of production [6–9]. GDP growth is higher for those countries that have a higher investment to GDP ratio [10].

Even though prior literature overwhelmingly highlights the impact of IFDI, the impact of OFDI on domestic capital formation remains unexplored. Primarily, OFDI affects the process of domestic

capital formation through two different channels [11]. Firstly, OFDI contributes to domestic capital if it is financed by the abundant savings and plentiful foreign exchange reserves of a country, whose effect is known as 'firepower' [12]. However, OFDI financing from the domestic capital market in the source country can adversely affect domestic capital formation. Secondly, foreign investment reduces the costs and augments the returns of domestic production by employing the most efficient capital and labor and, thus, paves the way for increased domestic capital formation [8,9]. However, the outcomes of OFDI are conditional to the motives and sources of the OFDI [7,13,14].

Another important aspect that we tackle in this study is the bifurcation of domestic capital into public and private capital formation for developed and emerging economies. The neo-classical and the Keynesian approaches are different regarding the nature of public and private capital formations [15,16]. The neo-classical outlook supports private capital and assumes that private capital is the main force that increases efficiency, stimulates creativity, and promotes diversity. The neo-classical outlook disregards public capital in the promotion of economic growth and, in some cases, blames it for inefficiency [1]. From this, a perception emerges that public and private capital formation generally crowd each other out, therefore clubbing them together can potentially increasing the problem of aggregation bias. However, the Keynesian outlook refutes this argument. It suggests that public capital formation paves the way for effective utilization of private capital and, thus, public and private capital augment one other [1,15,16].

We use empirical economic literature in several ways. Prior studies primarily assess the impact of outbound foreign direct investment (OFDI) on the aggregated domestic capital formation (DFC) using panel time-series data. The current study measures the impact of OFDI and institutional quality (IQ) on DFC by decomposing the public and private capital formation in the context of both developed and emerging countries. Thus, our study bridges the gap in the previous research literature by separately analyzing the impacts of OFDI and IQ on public and private capital formation so as to avoid the aggregation basis of gross domestic capital formation. We also address the neo-classical as well as the Keynesian discourse regarding investment in developed or emerging countries by considering public (PUBI) and private (PRI) capital both as dependent and independent variables. Furthermore, this study further investigates whether public capital formation and private capital formation follow a positive or negative co-movement in the case of developed and emerging countries.

Finally, this study utilizes cross-sectional-autoregressive-distributed lag (CS-ARDL), which is an advanced framework to address cross-sectional dependence and endogeneity in our empirical models. Our findings are plausible as we find that OFDI and IQ promote private capital formation in developed economies. However, our findings are inconclusive when it comes to explaining domestic private capital formation in the context of emerging economies. In addition, our analysis shows that institutional quality has a detrimental effect on private capital formation in emerging economies. We provide several policy implications based on our empirical findings.

The rest of the paper is organized as follows. Section 2 presents a literature review. Section 3 explains the data sources and econometric methodologies. Section 4 reports the results and findings of the paper, and Section 5 concludes it.

2. Literature Review

In general, firms have four motives to invest abroad, including efficiency-seeking, resource-seeking, market-seeking, and strategic asset-seeking [17]. Vertical OFDI complements trade by relocating parts of the production chain from home to the host country without disrupting domestic production [18]. In this case, OFDI stimulates domestic investment by increasing the productivity of local firms and by enhancing the export of intermediate goods to their foreign subsidiaries [14]. OFDI will reduce domestic investment if it displaces exports or if a firm moves its production facilities from home to the host country. In the case of horizontal OFDI, there is a possibility of domestic investment diversion if local firms substitute domestic production with overseas production [8,9]. Away from the discussion of vertical and horizontal outbound investment, the strategic asset-seeking motive of OFDI is supposed to

improve the domestic investment in source countries by bringing in new knowledge and technologies in high spillover sectors [19,20].

Working on aggregate OFDI, there exists a positive long-run unidirectional causal relationship running from OFDI to domestic investment in China. A short-run causal impact of OFDI on domestic investment in China was not found [21]. There is strong evidence of a positive spillover impact of OFDI not only on the country level but also on the inter-regional level [22]. On the contrary, [23] and [8,9] conducted a macroeconomic cross-country analysis and concluded that an increase in outward FDI decreases domestic investment. Result findings are quite similar for the United States, Japan, Germany, and the United Kingdom [24]. A similar analysis was conducted by [25] for the United States and Germany, where they discovered a positive long-run effect of OFDI on domestic investment in the US. However, their finding in the case of Germany were mixed. They found that outward FDI has positive short-run and negative long-run effects on domestic investment. Thus, OFDI contributed to domestic investment in the short run and substituted domestic investment in the long run in the case of Germany.

The selection of an appropriate model for empirical analysis in panel data is vital for retrieving unbiased estimators. A correct model produces efficient and consistent results while an incorrect model provides a wrong conclusion. For example, until recently, most of the cross-country studies in economics literature wrongly assumed that errors are independently distributed across cross-sections; while in reality, variables in cross-country studies count on each other, particularly in the long run. Therefore, the recent econometric literature recommends applying the CS-ARDL approach to analyze long heterogeneous data in the presence of common correlation effects over panel dynamic OLS [26], panel fully modified OLS approach [27] and panel pooled and mean group approaches [28–33]. These models not only address the issue of cross-country dependence, but they also solve the problems of heteroscedasticity and serial correlation in the panel data. For example, the use of inappropriate techniques report no impact of foreign remittances inflows on labor productivity [34]; however, as soon they addressed the issue of cross country dependence and used an appropriate model, they found a strong and significant impact of foreign remittances on labor productivity [34]. The influence of numerous factors on the location of FDI was investigated under the gravity model in the context of multinational enterprises (MNEs) of USA. The share of US FDI, defined by five different measures, is rising rapidly in lagged FDI shares, transport costs, trade barriers, and the population as well as FDI openness, and falling in competition posed by other countries and corporate taxes. Thus, country-specific locational factors are very significant determinants of the US FDI [35]. By applying a competing-destinations gravity model to the analysis of trade in intermediate goods, the authors of [36] revealed that the demand for intermediate goods is augmenting in import-oriented countries.

3. Methodology and Data

Our study comprises of a panel of 28 developed and 23 emerging economies over the years from 1996 to 2017. Our sample is more than 20 in terms of cross-section and the number of years, hence the presence of potential cross-sectional dependency (CD) is high. We assume our sample countries are interconnected through trade and financial integration, which creates a common correlation effect bias. Developed countries are closely connected in policy orientation, culture, and economic activities. They depend on each other in many ways, and therefore the possibility of cross-sectional dependence in the developed countries, especially in the case of institutional quality, FDI inflows and outflows cannot be ruled out. Similarly, emerging economies are closely connected in policy orientation and economic structure, and they depend on each other in many ways. Thus, the possibility of cross-sectional dependence cannot be ruled out both for developed and emerging economies. Cross-correlation occurs very frequently due to spatial spillover effects, omitted common factor and interactions within a socioeconomic network [37]. Hence, in this study, we use cross-sectional-ARDL (CS-ARDL) panel tests to tackle the possible issue of cross-sectional dependency and endogeneity in empirical estimation. To test for cross-sectional dependence in panel data, we formulate the following null hypothesis of

cross-sectional independence against the alternative hypothesis of cross-sectional dependence, and this study uses the following methodology of [38]:

$$CD = \left(\frac{TN(N-1)}{2}\right)^{1/2} \overline{P} \tag{1}$$

where $\overline{\rho} = \left(\frac{2}{N(N-1)}\right)\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}$ and $\hat{\rho}_{ij}$ indicate the pair-wise, cross-sectional correlation coefficient of the residuals obtained from the Augmented Dicky-Fuller (ADF) regression. *N* and *T* indicate the cross-section and time dimensions, respectively.

Panel-based studies normally use ARDL or Generalized Methods of Moments (GMM) approaches. The panel GMM techniques address the issue of endogeneity, but it does not work efficiently in the presence of cross-sectional dependency and structural breaks. The GMM system also has limitations in studies based on large N (cross-section) and large T (Time dimension). On the contrary, panel CS-ARDL not only takes care of the endogeneity problem, but it also addresses the issue of cross-sectional dependence and captures the long and short-run impacts of the variables. Within panel CS-ARDL, our selection of pooled mean group (PMG) and mean group (MG) is determined by the specification test. Our baseline regression equations are:

$$PRI_{it} = \alpha_i + \beta1_i\,OFDI_{it} + \beta2_i INST_{it} + \varepsilon_{it} \tag{2}$$

$$PUBI_{it} = \alpha_i + \beta1_i\,OFDI_{it} + \beta2_i INST_{it} + \varepsilon_{it} \tag{3}$$

where *i* stands for cross-sectional dimension; *i* = 1 … … .*i* and time period *t* = 1 … … .*t*, and α_i represents country-specific effects. Note that $\boldsymbol{\alpha_i}$ is related to the coefficient of respective independent variables such as $\boldsymbol{\beta_{i1} = \alpha_{i1}/1 - \alpha_{i1}}$, $\boldsymbol{\beta_{i2} = \alpha_{i2}/1 - \alpha_{i1}}$, and $\boldsymbol{\beta_{i3} = \alpha_{i3}/1 - \alpha_{i1}}$. *PRI* in Equation (2) and *PUBI* in Equation (3) represent the private capital formation (*PRI*) and public capital formation (*PUBI*), respectively. The variable of prime interest in our analysis in Equation (2) and Equation (3) is the direction and magnitude of the coefficients of OFDI, but we are also interested to know the effect of *IQ (institutional quality)* on private capital formation (*PRI*) and public capital formation (*PUBI*) separately by categorizing into developed and emerging economies. The expected outcome of *OFDI* and *IQ (institutional quality)* are discussed in detail in the later sections. In order to better capture the impact of *OFDI* on private capital formation *(PRI)* and public capital formation *(PUBI)*, we also add a set of control variables to Equation (2) and Equation (3). The addition of the control variables is based on existing empirical literature and is denoted by '*x*'. The extended model is reported as:

$$PRI_{it} = \alpha_i + \beta1_i\,OFDI_{it} + \beta2_i INST_{it} + \beta3_i X_{it} + \varepsilon_{it} \tag{4}$$

$$PUBI_{it} = \alpha_i + \beta1_i\,OFDI_{it} + \beta2_i INST_{it} + \beta3_i X_{it} + \varepsilon_{it} \tag{5}$$

The error term and coefficients in Equation (4) and Equation (5) follow similar characteristics of the error terms and coefficients in Equation (2) and Equation (3), respectively. However, as we proceed we will increase the number of explanatory variables, such as private capital formation *(PRI)* or public capital formation *(PUBI)* and inflation rate *(INFLATION)* in Equation (4) and Equation (5), respectively. The inclusion of control variables will not only better reflect the economic condition of the developed and emerging countries, but will also contribute to the robustness check of the critical results. Equation (4) and Equation (5) capture the impact of *OFDI, IQ (institutions)* and other control variables on the private capital formation (*PRI*) and public capital formation (*PUBI*) by categorizing into developed and emerging economies.

3.1. Cross-Sectional Dependence Panel CS-ARDL and Unit Root Test

The time series element of our panel data demands the stationary check of the variables. In recent years, research in the field of panel unit root test reported new techniques to improve the quality of

the results. For instance, the first-generation panel unit root test approaches assumed cross-sectional independence across units [39–41]. However, the subsequent second-generation unit root test approaches not only addressed the issue of cross-sectional dependence across units, but also address the issue of structural breaks in the panel unit root test [42–46]. For cross-sectional dependency (CD) in the series, we estimate the following regression by applying cross-sectional augmented Dickey–Fuller (CADF) Panel unit root test as:

$$\Delta y_{it} = \alpha_i + K_i t_i + \beta_i y_{it-1} + \gamma_i \overline{y}_{t-1} + \phi_i \Delta \overline{y}_t + \varepsilon_{it} \tag{6}$$

where $t = 1, \ldots, T$, $i = 1, \ldots, N$ and $\overline{y}_t$ indicates the cross-sectional mean of y_{it}, which is derived from $\overline{y}_t = N^{-1} \sum_{i=1}^{N} y_{it}$. The null hypothesis of Equation (6) is $H_0 : \beta_i = 0$ for all i and the alternative hypothesis is $H_a : \beta_i < 0$ for some i. The cross-sectional augmented panel unit root (CIPS) test statistic is provided by [45] as follows:

$$CIPS(N,T) = N^{-1} \sum_{i=1}^{N} t_i(N,T) \tag{7}$$

$t_i(N,T)$ in Equation (7) indicates the t-statistic for β_i. We have applied the cross-sectional dependency (CD) test to check CD in the variables. We report the results obtained from Cross-sectional augmented panel unit root (CIPS) in the result section for developed and emerging countries, respectively. The CIPS test results show that variables are integrated into mix order. Few of the variables are stationary at levels; on the contrary, all of the variables are stationary at first difference. Right now, it is feasible and appropriate to apply the cross-sectional augmented-autoregressive distributed lags (CS-ARDL) approach for this research study.

$$\Delta Y_{it} = \mu_i + \varphi_i(Y_{it-1} - \beta_i X_{it-1} - \phi_{1i}\overline{Y}_{t-1} - \phi_{2i}\overline{X}_{t-1}) + \sum_{j=1}^{p-1} \lambda_{ij}\Delta Y_{it-j} + \sum_{j=0}^{q-1} \zeta_{ij}\Delta X_{it-j}$$
$$+ \eta_{1i}\Delta \overline{Y}_t + \eta_{2i}\Delta \overline{X}_t + \varepsilon_{it} \tag{8}$$

Y_{it} *(PRI or PUBI)* is the dependent variable, μ_i is the intercept, β_{it} is the slope coefficients of independent variables and lagged dependent variable. X_{it}(*OFDI, IQ, PRI or PUBI and INFLATION*) is a vector of independent variables. Where φ_i, which is the error correction term (ECM), indicates an adjustment of short-run disequilibrium towards long-run equilibrium after an economic shock. $\overline{Y}_{t-1}$ and $\overline{X}_{t-1}$ provide a proxy for the unobserved factor in the long run, while $\Delta \overline{Y}_t$ and $\Delta \overline{X}_t$ provide a proxy for the unobserved factor in the short run in Equation (8).

3.2. Data Description and Source

This study considers private capital formation (PRI) and public capital formation (PUBI) as a percentage of GDP in the developed and emerging countries as a dependent variable while the rest of the variables in Table 1 are independent variables. The institutional quality indicators, such as: government stability; democratic accountability; law and order; bureaucracy quality; and military in politics were downloaded from the ICRG (International Country Risk Guide (2018)) database. In our analysis, we have used different institutional quality indicators to represent "*Institutions*": *Government stability; Democratic accountability; Law and order; Bureaucracy quality, Socio-economic conditions and Corruption.*

There may be good reasons to have positive correlations between the variables; however, from an econometric point of view, a high correlation between the variables can cause multicollinearity and might reduce the extent to which the relevance of each individual governance indicator can be measured [47]. The standard solution is to group the variables into one aggregate component that captures similar dimensions [48]. Hence, we follow [48,49] by extracting the first principal component of institutional indicators using principal component analysis (PCA) methodology.

Table 1. Description and data sources of the variables.

Variable	Description	Theoretical Justification	Source
OFDI	Outbound Foreign Direct Investment	OFDI increases the productivity of firms in source countries by giving them access to technology, resources, skills, international brand names, and global markets [50].	WDI (World Development Indicators, World Bank Website)
PRI	Private Capital Formation	Just like Gross Capital Formation (GCF), PRI increases the productivity, helps achieve technical progress and promotes economic activities in a country [1].	IMF Fiscal Affairs Department
PUBI	Public Capital Formation	Classical economists consider that public capital adversely affects economic activities [15], while Keynesians consider that it contributes to economic activities [51].	IMF Fiscal Affairs Department
INFLATION	GDP Deflator (% annual)	Inflation stimulates economic growth and investment in a country [52].	WDI
IQ	Institutional Quality	Quality institutions protect the property rights and provide business with a conducive environment to flourish [53].	Calculated from ICRG data using the methodology (2018)

Data availability on request: the data that support the findings of this study are available from the corresponding author upon reasonable request.

4. Results and Discussion

4.1. Descriptive Statistics for Developed Countries

We start our discussion on empirical findings with reporting descriptive statistics in Table 2. For the entire panel, the average level of outward foreign direct investment *(OFDI)* as a percentage of GDP is 5.24, while the average level of private capital formation *(PRI)* as a percentage of GDP is 21.27. Moreover, the average level of public capital formation *(PUBI)* as a percentage of GDP in the developed countries is 4.41, while the level of institutional quality index assumes values within range of −4.72 to 2.64 in developed economies. The average level of inflation rate (% annual) is 4.74. The standard deviation of inflation rate (% annual) is highest across the data series.

Table 2. Descriptive statistics for developed countries.

Variable	Obs	Mean	Std. Dev.	Min	Max
OFDI	616	5.24	21.75	−89.62	219.83
IQ	616	5.796	0.745	3.811	7.1733
PRI	616	21.27	7.75	0.99	61.58
PUBI	616	4.41	2.13	0.07	13
INFLATION	616	4.74	39.38	−5.20	958.50

4.2. Descriptive Statistics for Emerging Countries

Regarding the emerging countries, we highlight the descriptive statistics in Table 3. For the entire panel, the average level of outward foreign direct investment *(OFDI)* as a percentage of GDP is 1.56, while the average level of private capital formation *(PRI)* as a percentage of GDP is 29.69. Moreover, the average level of public capital formation *(PUBI)* as a percentage of GDP in the emerging countries is 10.21, while the level of institutional quality index assumes values within range of −3.75 to 4.35 in the emerging economies. The average level of inflation rate (% annual) is 7.58. The standard deviation of the inflation rate (% annual) is highest across the data series.

Table 3. Descriptive statistics for emerging countries.

Variable	Obs	Mean	Std. Dev.	Min	Max
OFDI	506	1.56	2.98	−10.35	22.59
IQ	506	5.796	0.745	3.811	7.1733
PRI	506	29.69	15.36	1.12	85.12
PUBI	506	10.21	9.17	0.24	57.85
INFLATION	506	7.58	11.99	−25.95	143.69

4.3. Cross-Sectional Dependence and Panel Unit Root Testing

Before conducting a unit root test on our panel data, we need to check for possible cross-sectional dependence in the errors. The unit root test that assumes cross-sectional independence can have a low power if estimated on data that have cross-sectional dependence [54]. We used [38] for a cross-sectional dependency (CD) test to investigate contemporaneous correlation across countries. The CD test for [38] is based on the average of the pairwise correlations of the OLS residuals from the individual regressions in the panel. This test produces unbiased estimators as the numbers of cross-sectional units increase and reach to infinity. Our null hypothesis in the CD test is cross-sectional independence against the alternative hypothesis of the presence of cross-sectional dependence among the separate panels of developed and emerging countries, respectively. The results of the CD test in Tables 4 and 5 clearly show that each series in the panel exhibits cross-sectional dependence in developed and emerging economies. Correlation ($\hat{\rho}$) across the variables is also high, as reported in Tables 4 and 5, respectively. Therefore, to allow for cross-sectional dependence, this study used Pesaran's (2007) cross-sectionally augmented panel unit root CIPS and Z(t-bar). These tests were estimated with a constant term at the level and first difference. The results reported in Tables 4 and 5 show that few of the variables are stationary at levels while at the first difference, all the variables turned stationary.

Table 4. CD test and second-generation panel unit root for developed countries.

Variable	$\hat{\rho}$	CD	Levels CIPS	First Differences CIPS
OFDI	0.260	14.56 ***	0.104	−14.319 ***
IQ	0.406	20.83 ***	−1.875 **	−7.500 ***
PRI	0.609	50.31 ***	1.375	−7.480 ***
PUBI	0.426	24.96 ***	2.196	−7.638 ***
INFLATION	0.316	15.65 ***	−4.166 ***	−12.076 ***

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively. CIPS: cross-sectional augmented panel unit root.

Table 5. CD test and second-generation panel unit root for emerging countries.

Variable	$\hat{\rho}$	CD	CIPS (Level)	CIPS (1st Differences)
OFDI	0.277	15.99 ***	−4.040 ***	−10.984 ***
IQ	0.348	4.63 ***	−1.320 *	−7.838 ***
PRI	0.605	25.56 ***	−1.255	−6.492 ***
PUBI	0.501	13.23 ***	3.273	−6.583 ***
INFLATION	0.270	9.68 ***	−5.541 ***	−15.140 ***

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

We conduct pairwise correlation test to comprehend the magnitude of correlations among the indicators of institutional quality to justify whether we can create index or not to reduce the multi-collinearity issue. Tables 6 and 7 report the result. Our analysis clearly shows that all indicators of IQ are correlated each other which allows us to make the index variable of IQ.

Table 6. Correlation matrix of institutional indicators in the model for developed countries.

	Bureaucracy Quality	Corruption	Democratic Accountability	Law and Order	Government Stability	Socio-Economic-Conditions
Bureaucracy quality	1.0000					
Corruption	0.6816	1.0000				
Democratic Accountability	0.1434	0.2376	1.0000			
Law and order	0.7166	0.7230	0.0939	1.0000		
Government stability	0.2069	0.2602	−0.0418	0.2068	1.0000	
Socio-economic-conditions	0.7038	0.5194	0.1584	0.5738	0.1929	1.0000

Table 7. Correlation matrix of institutional indicators in the model for emerging countries.

	Bureaucracy Quality	Corruption	Democratic Accountability	Law and Order	Government Stability	Socio-Economic-Conditions
Bureaucracy quality	1.0000					
Corruption	0.5791	1.0000				
Democratic Accountability	0.4033	0.2391	1.0000			
Law and order	0.0248	0.2558	−0.4200	1.0000		
Government stability	0.0496	0.1083	−0.3723	0.3439	1.0000	
Socio-economic-conditions	0.5334	0.4182	−0.0167	0.3203	0.1924	1.0000

4.4. Cross-Sectional Dependence Autoregressive Distributed Lag Model (CS-ARDL) Results

In this study, we address the problem of cross-sectional dependency in our panel time-series dataset by applying cross-sectional augmented-autoregressive distributed lags (CS-ARDL). Based on the Hausman specification test, we report only CS-ARDL (PMG) results. Under PMG, the long-run coefficients assume homogeneity while error correction adjustment and short-run coefficients follow heterogeneity.

4.4.1. The Impact of Outward Foreign Direct Investment and Institutional quality on Private Capital Formation in the Developed Countries

Table 8 shows that OFDI positively and significantly contributes to private capital formation in the developed countries both in the short run as well as in the long run. In the baseline model, the coefficient of OFDI in the short run is 0.1719, while the OFDI coefficient, in the long run, is 0.5447. This shows that OFDI significantly increases private capital formation both in the long as well as in the short run. Still, the contribution of the OFDI to private capital formation is higher in the long run. This shows that OFDI is the right policy approach in developed countries to promote private capital formation. The positive link of OFDI with private capital formation also confirms that the OFDI in the developed economies is not only financed from the private capital market, but it also has abundant foreign exchange reserves. Similarly, it also shows that OFDI in developed economies strongly connect them to the global supply chain and have increased the productivity of local firms. Other variables, such as PUBI and INFLATION, do not affect private capital formation in the long run. In the short run, PUBI and INFLATION contribute positively and significantly to private capital formation.

Table 8. Cross-sectional-autoregressive-distributed lag (CS-ARDL) results for private capital formation (developed countries).

Private Capital Formation	CS-ARDL	CS-ARDL	CS-ARDL	CS-ARDL
Short Run Estimates				
Error Correction	−0.0600 ***	−0.0866 ***	−0.0695 ***	−0.2320 ***
	(−7.96)	(−6.83)	(−6.67)	(−4.00)
Δ. OFDI	0.1719 *	0.1067 *	0.1218 *	−8.0461
	(1.74)	(1.72)	(1.82)	(−1.20)
Δ. IQ	1.3599 ***	1.0967 ***	1.0406 ***	0.7982
	(3.51)	(2.98))	(3.07)	(0.98)
Δ. PUBI		1.3871 ***	1.4066***	1.5080 ***
		(4.43)	(4.51)	(4.12)
Δ. INFLATION			0.3295 ***	0.3556 ***
			(3.70)	(3.53)
Δ. OFDI*IQ				1.8235
				(1.18)
Long run Estimates				
OFDI	0.5447 **	0.4089 ***	0.4697 **	1.1460 ***
	(2.10)	(2.89)	(2.47)	(6.87)
IQ	11.1866 **	3.9625 **	4.9085 **	4.2799 ***
	(2.43)	(2.29)	(2.18)	(5.63)
PUBI		0.8539	1.2313	0.9387 ***
		(1.41)	(1.58)	(4.64)
INFLATION			0.0255	−0.0040
			(0.25)	(−0.31)
OFDI*IQ				0.2064 ***
				(7.08)
Constant	8.6944 ***	6.6665 ***	7.0700 ***	−16.3923 ***
	(7.16)	(6.24)	(6.21)	(−3.74)
Observations	588	588	588	588
Country	28	28	28	28

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

The consistent and highly significant impact of OFDI on private capital formation in baseline and extended models once again confirms that outbound investment is a good policy tool to promote private capital formation in developed economies. The consistent and highly significant impact of institutional quality both in the short and long run on private capital formation in baseline and extended models again reconfirm that strong institutional quality is a good policy tool to promote private capital formation in developed countries. Strong institutions facilitate private capital formation by bringing stability to the system and by reducing the transaction costs. Thus, institutional quality promotes private capital formation. A one-unit increase in institutions increases private capital by 11.18 units in our baseline model. The negative and significant error correction coefficient in baseline and extended models in Table 8 suggests a long-run relation between private capital formation and the variables of our interest. The error correction coefficient in the baseline model reported in Table 8 shows that economic shocks in the short run are reverted to long-run equilibrium by 6 per cent per annum. In the second and third models, the disequilibrium adjustment rate is a bit high, i.e., 8.66% and 6.95%, respectively.

4.4.2. The Impact of Outward Foreign Direct Investment and Institutional quality on Public Capital Formation in the Developed Countries

Table 9 reports the short-run and long-run impacts of *OFDI* and other variables of interest on public capital formation. In the baseline model and extended models, the results show that *OFDI* increase significantly decreases public capital formation in the developed countries in the long run.

The positive impact of *OFDI* on the private capital formation (Table 9) and the negative influence of *OFDI* on public capital (Table 9) exhibit that private capital markets are stronger in developed countries and major sectors of the economic are weakly controlled by the government by some extent. The short-run coefficient of our baseline and the extended model show that OFDI does not contribute to PUBI in the developed countries. Other variables, such as private capital formation *(PRI)* positively and significantly contribute to the public capital formation *(PUBI)* in the short run. Thus, *PRI* crowds in public capital formation *(PUBI)* in short-run as well as the long run in developed economies. *INFLATION* negatively affects public capital formation in the developed economies in the long run as well as the short run. Among the other variables, only institutions exhibit a positive and significant short-run impact on public capital formation in the developed countries. Quality institutions are believed to reduce the cost of doing business in a country and thus increase public capital formation. Quality institutions also protect the property rights of a firm, which increases the confidence of the investors in the system. The negative and significant error correction coefficient in baseline and extended models in Table 9 suggests a long-run relation between aggregate public capital formation and the variables of our interest. The error correction coefficient in the baseline model (Table 9) shows that economic shocks in the short run revert to long-run equilibrium by 27.48 per cent per annum. In the extended model, the disequilibrium adjustment rate is a bit high, i.e., 31.26% and 30.39% in the second and third models, respectively. The negative and significant coefficient of error correction terms suggests a quick adjustment to the equilibrium on one hand, while on the other hand it suggests a plausible long-run impact of explanatory variables on the public capital formation.

Table 9. CS-ARDL results for public capital formation (developed countries).

Public Capital Formation	CS-ARDL	CS-ARDL	CS-ARDL	CS-ARDL
Short Run Estimates				
Error Correction	−0.2748 ***	−0.3126 ***	−0.3039 ***	−0.3451 ***
	(−6.23)	(−5.84)	(−6.08)	(−5.83)
Δ. OFDI	0.0322	0.0203	0.0183	−0.8579
	(0.38)	(0.26)	(0.21)	(−1.60)
Δ. IQ	0.2834 **	0.1497	0.1288	0.1659
	(2.32)	(0.90)	(0.94)	(0.84)
Δ. PRI		0.0922 ***	0.1247 ***	0.1132 ***
		(4.88)	(6.70)	(6.16)
Δ. INFLATION			−0.0716 ***	−0.0434 **
			(−3.31)	(−2.16)
Δ. OFDI*IQ				0.1928
				(1.55)
Long run Estimates				
OFDI	−0.0046	−0.0111 ***	−0.0093 ***	−0.0131
	(−1.17)	(−3.31)	(−2.89)	(−0.22)
IQ	1.1757 ***	0.4918 ***	0.5858 ***	0.4201 ***
	(8.50)	(3.75)	(4.27)	(3.59)
PRI		0.1139 ***	0.1366 ***	0.1078 ***
		(7.53)	(6.72)	(6.12)
INFLATION			−0.1427 ***	0.0017
			(−4.45)	(0.15)
OFDI*IQ				0.0007
				(0.07)
Constant	1.8437 ***	1.1499 ***	0.6562 ***	−1.4224 ***
	(5.28)	(5.45)	(4.24)	(−4.63)
Observations	588	588	588	588
Country	28	28	28	28

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

4.4.3. The Impact of Outward Foreign Direct Investment and Institutional Quality on Private Capital Formation in the Emerging Countries

Table 10 shows that OFDI does not affect private capital formation in the emerging countries both in the short run as well as in the long run. In the baseline model and extended models, the coefficient of OFDI in the short run and the long run is insignificant. This finding shows that OFDI insignificantly affects private capital formation both in the long run and short run. This shows that OFDI does not promote private capital formation because of the lack of private capital accumulation and underprivileged local industry in the emerging economies. Thus, poor domestic capital savings obstruct foreign direct investment outflows. The higher the level of private capital accumulation in an economy, the higher will the level of foreign direct investment outflows be in an economy. The insignificant impact of OFDI on private capital formation also confirms that OFDI in the emerging economies is not very high due to underprivileged local industry as well as poor foreign exchange reserves. Similarly, it also shows that OFDI in emerging economies does not strongly connect to the global supply chain and these economies have a scarcity of productivity of local firms. Other variables such as public capital formation *(PUBI)* positively and significantly contribute to the private capital formation *(PRI)*. Thus, PUBI crowds in private capital formation *(PRI)* in the short run as well as the long run in emerging economies. INFLATION does not affect private capital formation in the long run, but it positively contributes to private capital formation *(PRI)* in the short run.

Table 10. CS-ARDL results for private capital formation (emerging countries).

Private Capital Formation	CS-ARDL	CS-ARDL	CS-ARDL	CS-ARDL
Short Run Estimates				
Error Correction	−0.1774 ***	−0.2297 ***	−0.2169 ***	−0.2213 ***
	(−3.77)	(−4.05)	(−3.76)	(−5.06)
Δ. OFDI	0.4954	0.3515	0.5209	0.9985
	(0.92)	(0.99)	(1.45)	(0.14)
Δ. IQ	0.2645	0.0597	0.5551	−0.2265
	(0.39)	(0.08)	(0.71)	(−0.15)
Δ. PUBI		0.7882 ***	0.7052 ***	0.5576 **
		(3.37)	(3.38)	(2.47)
Δ. INFLATION			0.1597 ***	0.1822 ***
			(2.69)	(3.27)
Δ. OFDI*IQ				−0.4874
				(−0.33)
Long Run Estimates				
OFDI	0.2585	−0.1022	0.1121	−9.5201 ***
	(1.16)	(−0.95)	(1.14)	(−5.09)
IQ	0.9346	−1.5948 ***	−1.2439 ***	−7.6861 ***
	(0.98)	(−2.87)	(−2.72)	(−5.32)
PUBI		3.2409 ***	3.4124 ***	0.3794 ***
		(13.12)	(13.93)	(3.86)
INFLATION			0.0250	0.0919 **
			(0.80)	(2.12)
OFDI*IQ				1.8662 ***
				(5.15)
Constant	6.1967 ***	3.4193 ***	4.4416 ***	30.4333 ***
	(4.57)	(2.69)	(3.10)	(5.17)
Observations	483	483	483	483
Country	23	23	23	23

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

The consistent and insignificant impact of *OFDI* on private capital formation in baseline and extended models once again confirms that outbound investment does not contribute to emerging economies. The consistent and highly significant and negative impact of *IQ* (institutions or institutional quality) on private capital formation in baseline and extended models once again confirms that poor institutional quality is a big hurdle that discourages private capital formation in emerging countries. Consequently, poor institutions hamper capital formation by bringing instability to the system and by increasing the transaction costs. Therefore, institutional quality obstructs private capital formation. Our baseline model results show that *IQ* (institutions or institutional quality) does not affect private capital formation. With the addition of control variables in extended models, our results show that one unit increase in institutional quality impedes private capital formation in our extended model. The negative and significant error correction coefficient in the baseline and extended models in Table 10 suggests a long-run relation between private capital formation and the variables of our interest. The error correction coefficient in the baseline model (Table 10) shows that economic shocks in the short run revert back to the long run equilibrium by 17.74 percent per annum. In the extended model, the disequilibrium adjustment rate is a bit high, i.e., 22.97% and 21.69% in the second and third models, respectively.

4.4.4. The Impact of Outward Foreign Direct Investment and Institutional Quality on Public Capital Formation in the Emerging Countries

Results reported in Table 11 show that *OFDI* does not affect public capital formation in the emerging countries both in the short run as well as in the long run. In the baseline model and extended models, the coefficient of *OFDI* in the short run and long run is insignificant. This shows that *OFDI* does not affect public capital formation both in the long as well as in the short run. This shows that *OFDI* does not promote public capital formation because of lack of public capital reserves and an underprivileged public industry due to inappropriate government policies in the emerging economies. Consequently, the poor structure of local public industry obstructs foreign direct investment outflows. A strong structure of public industry produces higher level of public capital accumulation and as a result encourages *OFDI* in an economy. In the emerging and developing economies, the local public industry is underdeveloped and consequently, it scares away public capital reserves and obstructs *OFDI* in emerging economies. The insignificant impact of *OFDI* on public capital formation in the extended models again reconfirms that the *OFDI* in the emerging economies is not very high due to weak public market structure and underprivileged local industry that scarce away foreign reserves. Other variables such as private capital formation *(PUBI)* positively and significantly contribute to public capital formation *(PUBI)*. *PRI* crowds in public capital formation (PRI) in the short run as well as the long run in emerging economies. *INFLATION* does not affect private capital formation in the short run, but it contributes negatively to *PUBI* in the long run.

The consistent and insignificant impact of OFDI on public capital formation in the baseline and extended models again reconfirms that outbound FDI does not significantly affect public capital formation in emerging economies. The consistent and highly significant and negative impact of institutional quality on public capital formation in the baseline and extended models once again confirms that poor institutional quality is a big hurdle to discourage public capital formation in emerging countries. Thus, weak institutions hamper capital formation by bringing instability to the system and by increasing the transaction costs. Hence, institutional quality obstructs both public and private capital formation. Our baseline model results show that institutions do not affect public capital formation. With the addition of control variables in extended models, our results show that one unit increase in institutional quality reduces public capital formation in our extended model. The negative and significant error correction coefficient in the baseline and extended models in Table 11 suggests a long-run relation between private capital formation and the variables of our interest. The error correction coefficient in the baseline model (Table 11) shows that economic shocks in the short run

revert to long-run equilibrium by 8.93 per cent per annum. In the extended model, the disequilibrium adjustment rate is a bit high, i.e., 25.54% and 26.93% in the second and third models, respectively.

Table 11. CS-ARDL results for public capital formation (emerging countries).

Public Capital Formation	CS-ADRL	CS-ADRL	CS-ADRL	CS-ADRL
Short Run Estimates				
Error Correction	−0.0893 **	−0.2554 ***	−0.2693 ***	−0.3353 ***
	(−2.36)	(−4.46)	(−5.06)	(−4.23)
Δ. OFDI	0.0654	−0.2500	−0.2681 *	2.1008
	(0.26)	(−1.22)	(−1.72)	(0.52)
Δ. IQ	0.3115	−0.2491	−0.3418	0.1853
	(0.67)	(−0.73)	(−0.99)	(0.25)
Δ. PRI		0.0287	0.0400	0.0564
		(0.61)	(0.80)	(1.23)
Δ. INFLATION			−0.0263	−0.0177
			(−1.21)	(−0.64)
Δ. OFDI*IQ				−0.4832
				(−0.50)
Long Run Estimates				
OFDI	−0.2771	0.0027	−0.0203	0.6712 ***
	(−1.04)	(0.02)	(−0.22)	(2.96)
IQ	5.7180 ***	−1.2357 ***	1.5065 ***	0.1965
	(7.89)	(−5.93)	(−6.30)	(1.60)
PRI		0.0551 ***	0.0731 ***	0.2500 ***
		(2.86)	(3.55)	(32.57)
INFLATION			−0.0421 ***	−0.0519 ***
			(−3.17)	(−4.37)
OFDI*IQ				−0.1152 **
				(−2.20)
Constant	3.1665 **	1.7655 ***	1.3096 ***	3.3990 ***
	(2.54)	(3.59)	(2.91)	(4.49)
Observations	483	483	483	483
Country	23	23	23	23

Note: ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

5. Robustness Check

Robustness Check 1: Dumitrescue–Hurlin Panel Causality Tests

Since we assume the existence of potential reverse causality among the variables of interest, we apply the Granger Causality test introduced by [55] under the presence of cross-sectional dependency. In addition, policymakers need to explore the direction of causal relationships among variables to formulate appropriate policies. This test is suitable for both heterogeneous and unbalanced panels as well as in cases where T > N or T < N. This test can also be applied for panel data with cross-sectional dependence, and it resolves the homogeneity assumption drawbacks of the standard Granger causality test. The robustness of test statistics was indicated by [55] using Monte-Carlo simulations with a small dataset using cross-sectional dependence. The following linear heterogeneous model has been considered for this test:

$$Y_{i,t} = \alpha_i + \sum_{i=1}^{k} \gamma_i^{(k)} Y_{i,t-k} + \sum_{i=1}^{k} \beta_i^{(k)} X_{i,t-k} + \varepsilon_{i,t}$$

where $K\varepsilon N^+$ is a constant term, $K\varepsilon N^*$ is a parameter of lag, and $(\beta_1^i, \ldots \ldots \beta_i^k), \alpha_i, \gamma_i^k$, and β_i^k indicate slope of coefficient. The null hypothesis of the test is that there is no presence of homogenous Granger causality among all cross-sectional units. The alternative hypothesis is based on the existence of at

least one Granger causal association in the panel data. The null and alternative hypotheses of the tests are as follows:

$$H_1 = \begin{cases} \beta_{i=0} \, \forall_i = 1, 2, \ldots \ldots N \\ \beta_{i\neq0} \forall = N_1 + 1, N_2 + 2, \ldots \ldots, N \end{cases}$$

Tables 12 and 13 report the results obtained from the Dumitrescu–Hurlin–Granger test. They illustrate that there are unidirectional causal relationships between OFDI, PUBI or PRI, IQ, and OFDI*IQ with private capital formation (PRI) or public capital formation (PUBI) for developed countries. These findings are in line with previous studies such as [56–58], as well as [59].

Table 12. Dumitrescue–Hurlin panel causality tests (developed economies).

Hypothesis	W-stat	Z-stat	Prob.	Result	Conclusion
OFDI →PRI	0.9741	−0.0968	0.9228	No	OFDI does not cause PRI
PUBI→ PRI	2.6293	6.0963	0.0000	Yes	PUBI causes PRI
IQ→ PRI	2.8922	7.0799	0.0000	Yes	IQ causes PRI
INFLATION→ PRI	2.2222	4.5729	0.0000	Yes	INFLATION causes PRI
OFDI*IQ→PRI	0.9306	−0.2597	0.7951	Yes	OFDI*IQ does not cause PRI

Note: ***, **, * denote the statistical significance at the 99% level, 95% level, and 90% level, respectively.

Table 13. Dumitrescue–Hurlin panel causality tests (developed economies).

Hypothesis	W-stat	Z-stat	Prob.	Result	Conclusion
OFDI →PUBI	1.8592	3.2147	0.0013	Yes	OFDI causes PUBI
PRI→ PUBI	2.9649	7.3519	0.0000	Yes	PRI causes PUBI
IQ→ PUBI	2.7502	6.5485	0.0000	Yes	IQ causes PUBI
INFLATION→PUBI	1.2945	1.1019	0.2705	No	INFLATION does not cause PUBI
OFDI*IQ→PUBI	1.7826	2.9283	0.0034	Yes	OFDI*IQ causes PUBI

Note: ***, **, * denote the statistical significance at the 99% level, 95% level, and 90% level, respectively.

For the first robustness check, this study applied the Dumitrescue–Hurlin–Granger causality test, which provides unbiased results in the case of both heterogeneous and unbalanced panel data. Tables 12 and 13 affirm that the findings obtained from the causality test are consistent with the findings from the panel PMG estimator. The null hypothesis of the Dumitrescue–Hurlin causality test states that each individual determinant (e.g., OFDI, PUBI or PRI, IQ, INFLATION, and OFDI*IQ) does not Granger cause private capital formation (PRI) or public capital formation (PUBI) for developed as well as emerging countries.

For developed countries, W-stat and Z-stat in Table 12 are significant for PUBI, IQ, and INFLATION, implying a rejection of the null hypotheses and implying that variables such as PUBI, IQ, and INFLATION Granger cause private capital formation (PRI). Additionally for developed countries, W-stat and Z-stat in Table 13 are significant for OFDI, PRI, IQ, and OFDI*IQ, implying a rejection of the null hypotheses, implying that variables such as OFDI, PRI, IQ, and OFDI*IQ Granger cause public capital formation (PRI). Importantly, this study also found no bidirectional causality, which endorses that the estimation of this study is also robust in terms of the endogeneity bias.

For emerging countries, W-stat and Z-stat in Table 14 are significant for OFDI, PUBI, IQ, INFLATION, and OFDI*IQ, implying a rejection of the null hypotheses and implying that all variables Granger cause private capital formation (PRI). Additionally for emerging countries, W-stat and Z-stat in Table 15 are significant for OFDI, PRI, IQ, and OFDI*IQ, implying a rejection of the null hypotheses, implying that variables such as OFDI, PRI, IQ, and OFDI*IQ Granger cause public capital formation (PRI). Importantly, this study also found no bidirectional causality, which endorses that the estimation of this study is also robust in term of the endogeneity bias.

Table 14. Dumitrescue–Hurlin panel causality tests (emerging economies).

Hypothesis	W-stat	Z-stat	Prob.	Result	Conclusion
OFDI →PRI	2.0120	3.4319	0.0006	Yes	OFDI causes PRI
PUBI→ PRI	2.4674	4.9760	0.000	Yes	PUBI causes PRI
IQ→ PRI	2.2089	3.2147	0.000	Yes	IQ causes PRI
INFLATION→ PRI	1.6793	2.3035	0.0213	Yes	INFLATION causes PRI
OFDI*IQ→PRI	1.9790	3.3200	0.0009	Yes	OFDI*IQ causes PRI

Note: ***, **, * denote the statistical significance at the 99% level, 95% level, and 90% level, respectively.

Table 15. Dumitrescue–Hurlin panel causality tests (emerging economies).

Hypothesis	W-stat	Z-stat	Prob.	Result	Conclusion
OFDI →PUBI	2.0160	3.4453	0.0006	Yes	OFDI causes PUBI
PRI→ PUBI	4.1342	10.6284	0.0000	Yes	PRI causes PUBI
IQ→ PUBI	1.3678	1.2472	0.2123	No	IQ does not cause PUBI
INFLATION→ PUBI	0.8158	−0.6245	0.5323	No	INFLATION does not cause PUBI
OFDI*IQ→PUBI	2.0160	3.4453	0.0006	Yes	OFDI*IQ causes PUBI

Note: ***, **, * denote the statistical significance at the 99% level, 95% level, and 90% level, respectively.

6. Conclusions and Policy Implication

We investigated the short and the long-run impact of outbound FDI and institutional quality on the domestic private capital formation (both public and private) in the sample of developed and emerging economies. Due to the strong presence of cross-sectional dependency and unit root in our series, we applied a cross-sectional augmented-autoregressive distributed lags (CS-ARDL) approach. Our empirical analysis shows a positive and significant impact of OFDI and institutional quality on private capital formation for developed economies. By contrast, our analysis found an inconclusive impact of OFDI on domestic private capital formation in the context of emerging economies. Furthermore, institutional quality was found to be detrimental to private capital formation for emerging economies as anecdotal evidence shows that poor institutional quality often hinders the investment process. Poor institutions hamper capital formation by bringing instability to the system and by increasing the transaction costs. OFDI and institutional quality also positively contribute to public capital formation for developed countries in the long run. Our findings imply that foreign direct investment and domestic investment follow a complementary relation rather than a substitute. OFDI in developed countries has connected local business to a global chain of production and promotes competitiveness in the local market to a global perspective. Interestingly, OFDI significantly decreases public capital formation in the developed countries in the long run. The positive impact of OFDI on the private capital formation (Table 8) and the negative influence of OFDI on public capital (Table 9) exhibit that capital markets are stronger in developed countries and major sectors of the economy are weakly controlled by the government to some extent. Institutions exhibit positive and significant short-run and long-run impacts on the public capital formation in developed countries. Quality institutions reduce the cost of doing business in a country and thus increase domestic investment. Contrarily, institutional quality does not contribute to capital formation and obstructs public and private capital formation in emerging economies. Bad institutions discourage private and public capital formation in emerging countries. Poor institutions hamper capital formation by bringing instability to the system and by increasing the transaction costs. The results on the sectoral level show that OFDI strongly increases private capital and public capital in developed countries. Furthermore, private capital formation crowds in public capital formation and vice versa. By contrast, public capital formation crowds in PRI and PRI crowds out PUBI for emerging economies due to different economic structure and economic policies in developed and emerging economies.

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