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Abstract

Foreign Direct Investment (FDI) is widely considered among the most effective instruments for the promotion of economic development. However, not all FDI leads to inclusive economic growth, lifting the welfare of the poorest groups in developing countries. This paper examines the conditions under which FDI can effectively lead to inclusive growth. By using a fixed effects regression with annual data for 68 countries from 1990 to 2015, we find that FDI has the most positive effect on inclusive growth when there is a sufficiently large manufacturing sector and a developed enough infrastructure base in the host country. These not very optimistic results emphasize the critical importance of the host country's absorptive capacity. A smaller technological or knowledge gap with the foreign firms is required for FDI to lead to more linkages and spillovers, and ultimately job creation for the poor. The results cast doubt on development strategies that rely on FDI as a sufficient policy for inclusive growth.

Keywords: FDI, Inclusive Growth, Manufacturing, Infrastructure, Structural Change

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1. Introduction

Foreign direct investment (FDI) is known to positively affect a host country's economy, by creating knowledge, productivity, and technology spillovers and forward and backward linkages with local economic agents that lead to employment growth and local economic growth (Rodriguez-Clare, 1996; Markusen & Venables, 1997; Javorcik, 2004; Ping & Saggi, 2007). Previous studies have shown that the extent of these benefits largely differs based on the nature, density, and depth of the linkages created with local firms, all of which depend on the absorptive capacity of the host country. In turn, additional studies have shown that a country's absorptive capacity increases with the following factors: a small technological gap, the quality of the financial system, the quality of institutions, and higher levels of GDP per capita and education (Hermes & Lensink, 2003; Alfaro et al., 2004; Buchanan et al., 2012; Nunnenkamp and Spatz, 2003).

While these studies have estimated the extent to which FDI can benefit a host country's economic growth based on the host country's economic conditions or characteristics, to date there have been no studies specifically researching the question of how this dynamic may affect inclusive growth, that is, growth benefiting the lowest income groups in society. The main goal of this paper is to fill this gap. We use panel data for 68 countries between 1990-2015 to identify the economic conditions under which FDI leads to inclusive growth. Our results show that FDI leads to inclusive growth only when there are high levels of manufacturing and infrastructure in the host country. These not very optimistic results emphasize the critical importance of the host country's absorptive capacity. A smaller technological or knowledge gap with the foreign firms is required for FDI to lead to more linkages and spillovers, and ultimately more job creation for the poor. Our empirical results are robust to different measures of GDP per capita and adjusted gross fixed capital formation (AGFCF), as well as to the exclusion of different control variables. Overall, our results cast doubt on development strategies that rely on FDI as a sufficient policy for inclusive growth.

The rest of the paper is organized as follows. Section two reviews the literature on inclusive growth and the effectiveness of FDI. Section three develops the theoretical framework. Section four discusses the data and the empirical estimation approach. Section five presents the empirical results. Section six discusses the robustness checks, and section seven concludes.

2. Literature Review

Two strands of the economic development literature are relevant to our research question: first, that studying inclusive growth, and second, that studying the economic conditions under which FDI most benefits a host country's economy.

Inclusive Growth

In the 1990s, the term "inclusive growth" or "pro-poor growth"— i.e. gross domestic product growth that leads to poverty reduction (Habito, 2010) — was formally introduced by a number of studies that researched this question (Kakwani & Pernia, 2000; Ali & Son, 2007; Rauniyar & Kanbur, 2010). Various macroeconomic and policy factors have been discussed as potential determinants of inclusive growth including overall government expenditure, government spending on health and education, (general) economic growth, productive employment, infrastructure, macroeconomic stability, human capital or education level, structural changes, fixed investment, trade openness, and foreign direct investment (FDI) (Benabou, 2000; Saint-Paul & Verdier, 1993; Anand et al., 2013).

The previous literature has well established that (general) growth that is broadly based is necessary for inclusive growth (for example, Ali and Zhuang 2007; Klasen 2010). Other studies have focused on how various government expenditures and fiscal policies may affect inclusive growth. For example, Benabou (2000) and Saint-Paul and Verdier (1993) suggest that fiscal policies such as health and education spending can benefit the poor and enhance growth at the same time by improving human capital. Tella and Alimi (2016) use a fixed effects model for a panel of 14 African countries from 1995 to 2012 to also show that government spending focused on health financing was the key to improving rates of inclusive growth. Complementarily, Whajah et al. (2019) use a panel of 54 African countries from 2000 to 2016 and principal

component analysis (PCA) to generate a measure of inclusive growth and find that the size of government positively affects inclusive growth while public debt has a negative effect. For upper-middle and high income countries, Muinelo-Gallo and Roca-Sagales' (2011), using an unbalanced panel of 43 countries between 1972-2006, find that increases in both government current expenditures and direct taxes reduce inequality but also negatively impact economic growth, while public investment is the only government policy that reduces inequality without harming output growth.

Several studies support the positive effect of infrastructure on inclusive growth, especially in developing countries, which are generally characterized by low stocks of public infrastructure (Easterly and Rebelo, 1993; Vellala et al., 2014)). Using a panel of 100 countries from 1960 to 2005, Calderón and Servén (2010) find that the quantity and quality of telephones, roads, and electricity have a significant positive effect on growth and inequality, and specifically that the access of the poor to infrastructure was important for the positive effects on inequality. Similar findings are reported by Estache and Fay (2007) and López (2003).

In addition, several studies have analyzed the effects of macroeconomic factors such as FDI, trade openness, inflation, and financial globalization on inclusive growth. Based on time series data for Nigeria from 1981 to 2014 and employing GDP per person employed as a measurement of inclusive growth, Oluseye and Gabriel (2017) use time series analysis to find that FDI and inflation have a positive effect on inclusive growth. In the long run, FDI still has a positive effect while government consumption, education expenditure, and inflation have a negative effect.[1] Anand et al. (2013) find that macroeconomic stability, gross fixed capital formation, education, trade openness, human capital, and FDI are the foundations for inducing inclusive growth. Similarly, Ayinde and Yinusa (2016) focus on how government spending to achieve financial widening, financial development, greater trade openness, and capital

[1] In this regard, several other studies have found that spending on higher education that is disproportionate to basic education spending can also lead to higher income inequality. See, for example, Lustig (2016) and Inchauste and Lustig (2017).

investment may be conducive to inclusive growth. Aoyagi and Ganelli (2015) using a panel of 31 countries between 1992 and 2011, find that fiscal redistribution, trade openness, and productivity positively impact inclusive growth, while inflation, GDP volatility, and unemployment have a negative effect.

A smaller number of studies have analyzed investment by sector to determine which industrial sectors' enhancement may lead to inclusive growth. For example, Ogbu (2012), observing the poverty problem in Nigeria, suggests how industrial policies focused on improving the manufacturing sector, in addition to government expenditure that is targeted at infrastructure investment and transforming the agriculture sector, may support inclusive growth. Balakrishnan et al. (2013), based on a sample of developing countries, find that besides expenditure on education and financial reform, increased employment in mining and quarrying, manufacturing, construction, and public utilities leads to increases in inclusive growth.

Finally, there is a diversity of approaches in the literature for how to measure inclusive economic growth. For example, Aoyagi and Ganelli (2015) develop a proxy for inclusive growth that is the weighted average of growth in average income and the change in an equity index accounting for income distribution. Whajah et al. (2019) uses principal component analysis to generate a measure for inclusive growth based on data obtained for various indicators such as infrastructure, education, health, and unemployment. Anand et al. (2013) generate a proxy that is the weighted average of growth in average income and of the change in an equity index. Dollar & Kraay (2002) use the average income of the lowest 20% income quantile to study the effect of economic growth on poverty reduction, which was extended in their later study (Dollar, Kleineberg, & Kraay, 2016) to observe policies and institutions that are "pro-poor." In this paper, we adopt Dollar & Kraay's approach.

Foreign Direct Investment

Studies that have explored the effect of FDI on host country's growth have shown in general inconclusive results (Ram & Zhang, 2002; Carkovic & Levine, 2002). On the other hand,

a growing number of studies have argued that this may be because FDI's effect on growth depends on the characteristics of the host country that affect the nature and/or amount of linkages and spillovers created by the foreign firms behind those investments (Borensztein et al., 1998; Nunnenkamp, 2004; Meyer, 2004;Meyer & Sinani, 2009). According to this literature, the spillovers and linkages are maximized when there is less of a gap between the home and host country in terms of technology, knowledge, various institutions, economic development etc., which enables the host country to have sufficient absorptive capacity. From this perspective, it is important to know the conditions of the local economy that help minimize obstacles for the interaction between foreign firms and local economic agents. For example, Rodriguez-Clare (1996) investigates the economic impact of multinationals in developing countries, by developing a two-country model and studying the generation of backward and forward linkages. One result from his model is that, other things equal, the linkage effect is higher when the host country is more economically developed and thus similar to the home country.

Empirically, in this regard, Blomstrom et al. (1992) find that FDI's impact on economic growth is positive only in higher-income developing countries, and de Mello (1997) suggests that a larger technological gap between the host and home country leads to a smaller impact of FDI on economic growth. Amendolagine et al. (2013) studied the factors determining the backward linkages of foreign manufacturing firms in 19 Sub-Saharan African countries, highlighting the micro and macro level factors that may lead to higher interactions between foreign subsidiaries and local firms. These authors find that foreign firms that have a knowledge base that is too developed compared to the absorptive capacity of the local economy are less likely to interact with domestic economic agents. Again, this implies that the host country needs to have a certain level of technological and knowledge base in order to benefit from FDI, instead of just merely attracting highly technologically sophisticated firms. These authors also find that the local economy's institutional characteristics, such as a reliable legal system, are necessary for enhancing foreign companies' linkages with domestic firms. Similarly, Borensztein et al. (1998)

examine the role of FDI in technology diffusion and economic growth in developing countries by utilizing cross-country data. While they find that FDI is a vehicle for technology transfer and thus contributes to growth, the effect of FDI on economic growth depends on the level of human capital in the host country. Further, other studies have shown that a developed financial system is important for spillovers and linkages from FDI to materialize (Hermes and Lensink, 2003; Alfaro et al., 2004).

Other host country characteristics also appear to matter. Nunnenkamp and Spatz (2003) find that the relationship between FDI and growth critically depends on a local economy's characteristics, such as GDP per capita, level of education, and openness to trade. In analyzing the factors behind the backward linkages created by Japanese electronics manufacturing affiliates in 24 countries, Belderbos et al. (2001) find that good quality infrastructure and a large manufacturing sector positively affect the creation of local linkages.

In summary, the combination of the factors or conditions found in the previous literature affecting inclusive growth and the impact of FDI on (general) growth point to a rather strict set of conditions that may be needed for FDI to lead to inclusive economic growth. In the next section we explore theoretically what those linkages may be, which we then test empirically in the following sections.

3. Theoretical Framework

The review of the literature shows that the effects of FDI on a host country's economy are optimized under certain economic and industrial conditions, namely a diversified industrial base and a developed infrastructure, among others. An important mechanism that is created under these conditions is the enhanced knowledge or technological compatibility between the local and foreign firms, i.e. more linkages are created and local economic agents have the absorptive capacity to benefit from the technological and knowledge spillovers brought by FDI. The review of the literature on inclusive growth also indicates largely the same economic conditions — a diversified industrial base and a developed infrastructure — for inclusive growth

to take place. Therefore, we hypothesize that FDI will benefit the host country not only through (general) economic growth, but also inclusive growth when the host country has a certain level of diversified industrial base and a developed infrastructure. Inclusive growth would take place through the channels of technology and knowledge transfer, enhanced productivity and work force skills, and newly generated businesses and jobs. More specifically, the hypothesis we will test is that the positive effects of FDI on inclusive growth will increase when there is a large manufacturing sector and a developed infrastructure base in the host country.

4. Data and Methodology

The empirical analysis covers the period 1990 to 2015, utilizing a panel of 68 countries, consisting of 31 high income, 24 upper middle income, 12 lower middle income, and 1 low income countries, all listed in Table A-1 in the Appendix. It would have been desirable to have additional low income countries in the sample, but there were limitations due to missing data.

The dependent variable, inclusive growth, is defined as the average growth of the bottom 20% quantile of the income distribution. The data for computing the average income of the bottom 20% is retrieved from the World Bank's PovcalNet database, which has the data available converted into constant 2011 purchasing power parity (PPP) dollars. The average income data are from primary household survey data, where roughly half report income and the other half report consumption expenditure.

In order to test our basic hypothesis, we use a fixed effects model with the main part of the model being a three-way interaction of FDI inflows, the manufacturing level, and adjusted gross fixed capital formation (AGFCF) level also in the host country.[2] Here, manufacturing is a proxy for the diversification and AGFCF is a proxy for infrastructure. Our interest is to find at what threshold levels of manufacturing and AGFCF would FDI have a positive effect on inclusive growth. The data for the interaction terms as well as the other controls covariates are from

[2] Note that FDI is subtracted from total gross fixed capital formation (GFCF) to arrive at AGFCF. This is further discussed below.

World Bank's World Development Indicators (WDI), except for corruption, which is from International Country Risk Guide (ICRG). Details of each indicator can be found in Table A-1 of Appendix, and Table 1 shows the summary statistics.

Table 1. Summary Statistics

	Observations	Mean	Std. Dev.	Min	Max
Ln(Avg Income of bottom 20%)	1,512	7.8353	1.1033	4.4429	10.0651
FDI	5,577	3.8887	11.5782	0.0000	451.7160
Manufacturing	5,240	13.5159	6.8242	0.0000	50.6373
Agriculture	5,715	16.5135	13.4759	0.2241	79.0424
Services	5,304	49.7030	11.8416	9.7275	88.7243
AGFCF	5,189	19.7657	7.7922	0.2132	89.0564
Ln(GDPPC)	4,575	8.8445	1.1544	5.8891	11.4913
Δ(Inflation)	5,413	1.1036	19.9528	-223.0357	1076.5350
Corruption	3,674	5.8878	3.5403	0.0000	12.0000
Trade Openness	5,534	77.3467	47.3309	0.0210	442.6200
Unemployment	2,973	8.5990	6.4900	0.0500	57.0000
Tax Revenue	3,437	17.2015	6.9412	0.0216	62.8586
Government Expense	5,108	16.1302	6.5554	0.0000	76.2221

The base estimation model is given by:

$$ln\,(Incb20\%_{i,t+1)} = \beta_0 + \beta_1 FDI_{it} + \beta_2 Agr_{it} + \beta_3 Man_{it} + \beta_4 Ser_{it} + \beta_5 AGFCF_{it} + \beta_6 FDI * Agr_{it} + \beta_7 FDI * Man_{it} + \beta_8 FDI * AGFCF_{it} + \beta_9 Man * AGFCF_{it} + \beta_{10} FDI * Man * AGFCF_{it} + X_{it}\beta + \gamma_i + \delta_t + \varepsilon_{it} \quad (1)$$

The dependent variable ($ln\,(Incb20\%_{i,t+1)}$) is the log of average income of the lowest 20% income quantile. As we saw in the review of the literature above, inclusive growth has been measured in different ways. Among those multiple measures we select the simple form that captures the income growth of the lowest income group in the economy. This measurement as mentioned above was used by Dollar, Kleineberg, and Kraay (2016). FDI is measured as percentage of GDP, as is manufacturing, services, and agriculture. In addition, AGFCF also as percentage of GDP is our proxy for infrastructure development. GFCF is a good representation for the level of infrastructure development, as it includes construction of roads, railways, schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings; land improvements (drainage etc.); and plant, machinery and equipment purchases. However, since FDI is included in GFCF (when it results in the purchase of new assets—it is not included when it used to buy shares of an existing company, to cover a deficit or pay off a loan,

or for brownfield FDI), we subtract FDI from GFCF so to use adjusted GFCF in our estimations.[3] This is a safe conservative estimate and it prevents multicollinearity and double counting issues.[4]

The other control variables added in equation (1) are those found in the previous literature to play a significant role on inclusive growth. They include the log of GDP per capita, which controls for a country's level of economic development, total government expenditure as percentage of GDP controlling for government size, tax revenue as percentage of GDP controlling for tax effort, and percentage change in the inflation rate controlling for macroeconomic stability. In addition, unemployment is included as an important factor affecting poverty levels; and lastly, corruption and trade openness (measured as total of exports and imports as percentage of GDP) are additional macroeconomic and political factors that have been found to potentially influence inclusive growth.

As discussed above, the variable of interest in our model is the three-way interaction of FDI, manufacturing, and AGFCF, which will show how FDI affects inclusive growth under different levels of manufacturing and AGFCF. As with all equations that include a three-way interaction, we also add these three variables separately, as well as the two-way interactions of FDI, manufacturing, and AGFCF. Finally, we also add the two-way interaction of $FDI * Agr$. This will account for the fact that an increase in manufacturing as percentage of GDP would generally mean a decrease in agriculture as percentage of GDP, and vice-versa. This is explained in further detail below as we look into the marginal effect analysis.

For the estimation of our model in equation (1), we use a two-way (country and time

[3] The adjustment can be quite significant depending on the country. For example, among EU members, Slovakia received more than one-third of GFCF via FDI between 2000 and 2007; Bulgaria received more than 50% of GFCF via FDI between 2003 and 2008; in Russia, FDI represented more than 10% GFCF after 2003(Estrin, 2017); FDI also constitutes a large share of GFCF in several African countries. The share of FDI in GFCF was at least one-third in Congo, DRC, Ghana, Madagascar, and Nigeria (World Bank 2014).

[4]. We eliminate the cases where AGFCF becomes negative. It must be noted also that our measurement of FDI still include FDI for paying off loans, covering a deficit, and brownfield FDI.

effects) fixed effects regression. Fixed effects will deal with omitted variable bias and control for cross-country heterogeneity in addition to period-specific factors. The unobserved country-specific effects may capture the differences in initial levels of efficiency, while the period-specific intercepts capture changes that happen across all countries, such as productivity. All explanatory variables are lagged one year to reflect the time needed for FDI to impact the local economy.

5. Empirical Results

The results of the fixed effects regression are shown in Table 2.

Table 2. Fixed Effects Regression

	Ln(Average Income of Bottom 20% Quantile) (t+1)	Standard Error
Manufacturing	0.0296**	(0.0127)
Agriculture	0.000411	(0.0136)
Services	0.00160	(0.00859)
FDI	0.0326*	(0.0166)
AGFCF	0.0363***	(0.0118)
FDI*Manufacturing	-0.000867	(0.000758)
FDI*Agriculture	-0.00376***	(0.00134)
FDI*AGFCF	-0.000791	(0.00105)
Manufacturing*AGFCF	-0.00156***	(0.000478)
FDI*Manufacturing*AGFCF	0.0000654	(0.0000441)
Ln(GDPPC)	0.946***	(0.265)
Δ(Inflation)	0.000935*	(0.000548)
Corruption	-0.00927	(0.0135)
Trade Openness	-0.000892	(0.000696)
Unemployment	-0.00372	(0.00632)
Tax Revenue	0.00941	(0.00650)
Government Expense	-0.00216	(0.00941)
Observations	528	
R-squared	0.763	
Number of countries	67	

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Our main variable of interest is the three-way interaction term that includes FDI, the extent of manufacturing in the host country, and adjusted gross fixed capital formation (AGFCF) also in the host country. In order to interpret the results of this three-way interaction variable, we employ the marginal effect analysis (Dawson & Richter, 2006), which will show how the effect of FDI on inclusive growth is changing according to varying levels of manufacturing and

AGFCF.[5] In this approach, we compute the different slopes representing the effect of FDI on inclusive growth when the moderating variables, manufacturing and AGFCF, are held constant at different combinations of high or low values. To get started with the analysis, it is helpful to reorder the model in equation (1) into those that contain FDI and those that do not as the following:

$$\ln(Incb20\%_{i,t+1}) = (\beta_1 + \beta_6 Agr_{it} + \beta_7 Man_{it} + \beta_8 AGFCF_{it} + \beta_{10} Man * AGFCF_{it}) FDI_{it} + (\beta_0 + \beta_2 Agr_{it} + \beta_3 Man_{it} + \beta_4 Ser_{it} + \beta_5 AGFCF_{it} + \beta_9 Man * AGFCF_{it} + X_{it}\beta) \quad (2)$$

The first group is what will define the different slopes of FDI; by combining high or low values of manufacturing, AGFCF, and agriculture, the slope representing the effect of FDI on inclusive growth will differ. In the analysis, high values of manufacturing, AGFCF, and agriculture are defined as one standard deviation above their respective means and low values as one standard deviation below their respective means; where the mean values (recall, presented as percent of GDP) are 16.721, 18.793, and , 6.425 respectively, and the standard deviations are 5.507, 5.981, and 4.776, respectively. The four cases that the analysis will show are listed in Table 3.

Table 3. Levels of Manufacturing, Agriculture, AGFCF in Each Scenario

		Level
1	High Manufacturing	22.228
	High AGFCF	24.774
	Low Agriculture	1.649
2	High Manufacturing	22.228
	Low AGFCF	12.812
	Low Agriculture	1.649
3	Low Manufacturing	11.214
	High AGFCF	24.774
	High Agriculture	11.201
4	Low Manufacturing	11.214
	Low AGFCF	12.812
	High Agriculture	11.201

There are a couple of reasons why we only look at the combinations of either high level of manufacturing and low level of agriculture, or low level of agriculture and high level of manufacturing, and exclude the cases of both high levels of manufacturing and agriculture or

[5] Also see UCLA: Statistical Consulting Group (accessed September 15th, 2019).

low levels of manufacturing and agriculture. First, again, these variables are expressed in terms of percent of GDP, and thus if a share of one sector increases, there will be a decrease in the share of the other sector. Also, an economy that goes through structural change usually transitions from having a large agriculture sector and a small manufacturing sector to developing a larger manufacturing sector while the agriculture sector relatively decreases, and so the cases will represent either of these states. For the same reasons, our marginal effects analysis consists of three moderating variables — manufacturing, agriculture, AGFCF — and not two as in the general case, making it a more holistic analysis.[7]

Table 4 and Figure 1 show the differing slopes in each scenario listed in Table 3. In the first scenario where there is a high level of manufacturing, a high level of infrastructure, and a low level of agriculture, a 1 percent increase in FDI as percentage of GDP leads to an approximately 2.4 percent increase in the average income of the bottom 20 percent. In the second scenario, where there is high manufacturing, low infrastructure, and low agriculture, a 1 percent increase in FDI as percentage of GDP leads to a 1.6 percent increase in the average income of the bottom 20 percent. In the third and fourth scenario with low manufacturing, either high or low infrastructure, and high agriculture, the effects are both approximately a 2 percent decline in the average income of the bottom 20 percent income decile.

Thus, the effect of FDI on inclusive growth is most positive when there are both high levels of manufacturing and infrastructure. These results strongly support the prediction that FDI will have the most positive effect on inclusive growth when the host country has a large manufacturing and infrastructure base. This may be explained by the degree of spillover effects and linkages created based on the different characteristics of the host country. As we reviewed in the previous literature, technological and knowledge spillovers and linkages with the local economy are maximized when there is a smaller technological or knowledge gap between the

[7] We do not include the service sector, as adding the manufacturing, agriculture, and service sector variables that are in percentage of GDP would introduce linear dependence among the variables.

home and host country due to increased absorptive capacity. This will ultimately lead to business and job creations and benefit the lowest-income groups.

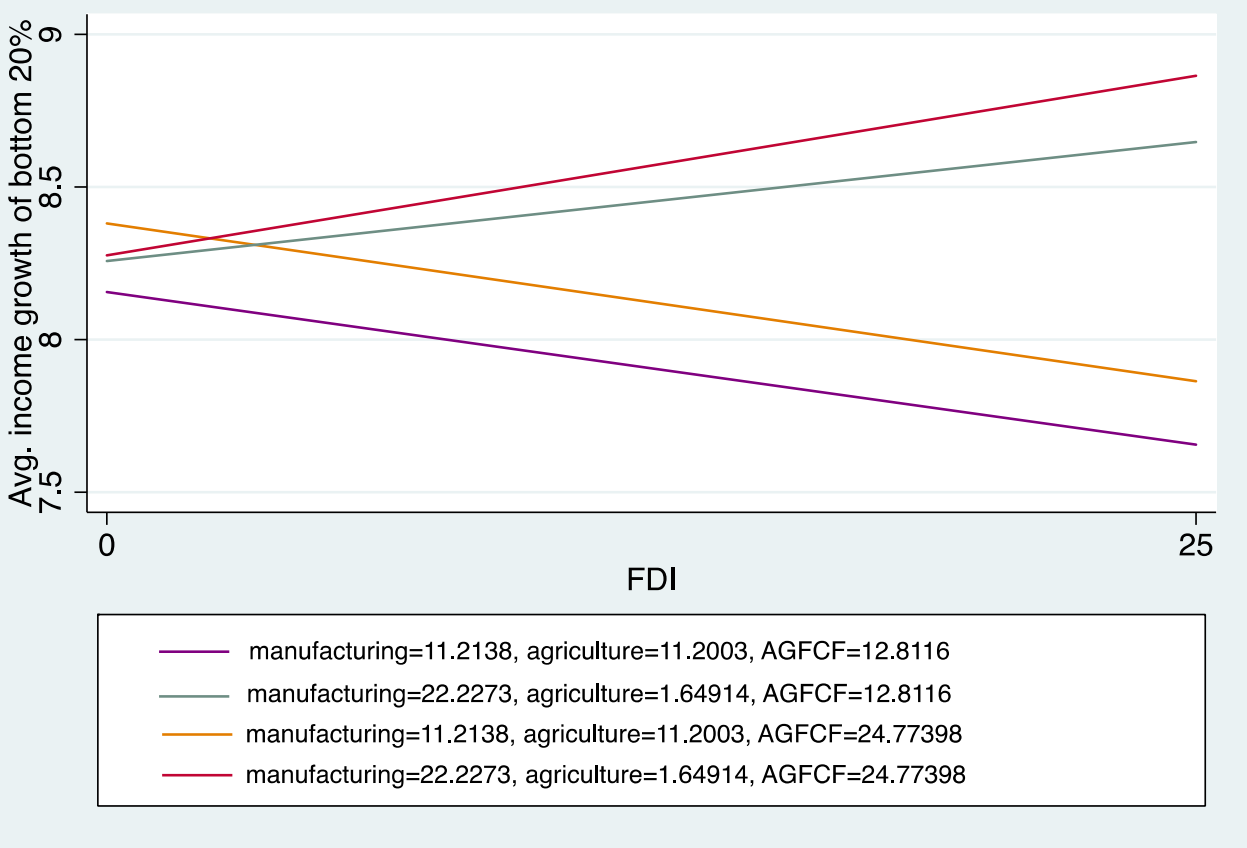
The negative effect of FDI on inclusive growth when there are low levels of manufacturing and high levels of agriculture may be explained by a couple of factors. First, as Agosin and Mayer (2000) show, higher total FDI stocks can be associated with lower subsequent growth in countries with unfavorable characteristics. This is because FDI crowds out domestic investment, due to reasons such as overall weak investment, and has less stimulation on creating forward and backward linkages. A second reason could be that countries with high levels of agriculture and low levels of manufacturing tend to attract resource-seeking FDI, which are commonly concentrated in foreign-dominated enclaves that have few linkages to the local product and labor markets. In addition, in this case, economic benefits can also be easily embezzled by corrupt local elites, and thus resource-seeking FDI in the primary sector may lead the country into some form of "Dutch Disease" (Nunnenkamp and Spatz, 2003). Thus, the benefits may not be as easily transferred to the local economy, especially to the low income groups. However, our data do not allow us to differentiate among different types of FDI, and so those possible explanations have to remain just conjectures.

Table 4. Average Marginal Effects of FDI on Average Income of Bottom 20%

	dy/dx	Std. Err.	P>z
1	0.0235305	0.0083552	0.005
2	0.015607	0.005705	0.006
3	-0.0206773	0.0091602	0.024
4	-0.0199871	0.0107601	0.063

*y denotes average income of bottom 20% income group, x denotes FDI.

Figure 1. Marginal Effect of FDI on Average Income of Bottom 20%



Regarding the results for the control variables, the log of GDP per capita has a significant and the strongest effect on inclusive growth. For a 1 percent increase in GDP per capita, the average income of the bottom 20 percent increases by 0.95 percent. When we compare the results with Table 6 where we conduct robustness check by excluding different control variables, the results are consistently strongly significant and of similar magnitudes. This confirms the results in the previous literature that (general) growth generates inclusive growth and suggests that there is almost a one-to-one transfer of wealth to the lowest income group. Percentage change in the inflation rate shows a positive and significant effect on inclusive growth, which conflicts with several previous findings in the literature (Aoyagi and Ganelli, 2015). The result shows that there is a 9.35 percent increase in the average income of the bottom 20 percent in

response to 1 percent change in the percentage change of inflation rate.[8] The results in Table 6 consistently show a positive effect with a similar magnitude; however, in some of the models it loses statistical significance. Oluseye and Gabriel (2017) found a similar result, with inflation having a positive effect on inclusive growth in the short-run but a negative effect in the long-run. While our results reflect the effect of inflation in the short run based on the one-year time lag between the independent and dependent variable, inflation, which proxies for macroeconomic stability, may have a negative effect in the longer run as in Oluseye and Gabriel (2017).

Corruption shows a negative effect, which is unexpected—higher value means less corruption in the ICRG index—but it is insignificant, and the coefficient changes to a positive effect in some of the models in Table 6. Trade openness shows a negative effect on inclusive growth but it is also not statistically significant. It consistently stays negative in the results in Table 6, and turns significant in one of the models; a 1 percent change in trade openness as a percentage of GDP leads to a 0.16% decrease in the average income of the bottom 20% in model 3. While the general notion is that international trade leads to economic progress and poverty alleviation, there are conflicting studies that show otherwise. Onakoya et al. (2019) show that trade openness negatively impacts economic growth and poverty levels when there is high dependency on imports, which deters the development of domestic production. Similarly, George (2010) provides an example of unbridled liberalization in agriculture in developing countries could lead to increased dependence on food imports and thus a rise in poverty. Some studies also show that the gains from trade may not be equitably distributed (Stewart and Berry, 2000; Yusuf et al., 2013).

Unemployment has the expected negative effect in the main model and all the models in Table 6 but is not significant. Tax revenue, which proxies for tax effort, also has the expected positive effect in all models, but it is not significant. Government expense, which proxies for

[8] The percentage change in inflation rate was calculated as the following: $\frac{Inflation_{t+1}-Inflation_t}{Inflation_t}$. Since we did not multiply the data by 100, the multiplication should be applied when interpreting the coefficient.

government size, shows a negative effect in the main model, and turns positive in one of the models in Table 6, but is not significant. This insignificancy result may be due to the variety of ways governments allocate their budgets, which include areas that may not necessarily lead to increasing the average income of the bottom 20%, such as national defense and security.

6. Robustness Checks

Table A-2 in the Appendix shows the correlation matrix of some of the main variables. The low correlation of the variables counters the possibilities of high correlation that may be potentially present between some of the variables; those of FDI and Ln(GDPPC), manufacturing and Ln(GDPPC), AGFCF and Ln(GDPPC), Avg Inc Bottom 20% and FDI, Avg Inc Bottom 20% and manufacturing, and Avg Inc Bottom 20% and AGFCF are all very low. This implies a low possibility for multicollinearity issues in our model.

Table 5 shows results of a robustness check where we conduct fixed effects regression on six models that exclude one of the control variables: corruption, trade openness, unemployment, tax revenue, government expense, and inflation. While significance is reduced, all the models confirm the results of our original model by showing similar results, especially in terms of the three-way interaction, as seen in Figure 2.

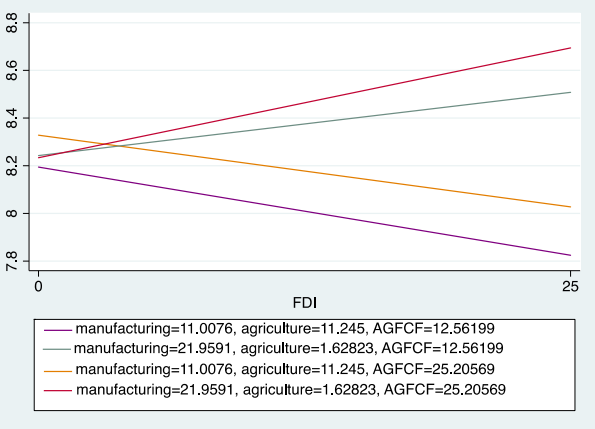
Table 5. Robustness Check: Excluding Different Control Variables

	1	2	3	4	5	6
Manu-facturing	0.016993 (0.01327)	0.030485* (0.01287)	0.002546 (0.01668)	0.009593 (0.01539)	0.032866** (0.01224)	0.023985 (0.01259)
Agriculture	-0.000452 (0.01365)	0.001209 (0.01361)	-0.011845 (0.00864)	-0.005774 (0.00949)	-0.005091 (0.01288)	-0.000012 (0.01199)
Services	0.001718 (0.00853)	0.002038 (0.00876)	-0.00976 (0.00737)	-0.004166 (0.00773)	-0.000028 (0.00870)	-0.003168 (0.00843)
FDI	0.017594 (0.01682)	0.034002* (0.01681)	0.019261 (0.01966)	0.033672 (0.01905)	0.041808** (0.01400)	0.029085 (0.01638)
AGFCF	0.021967 (0.01162)	0.037816** (0.01210)	0.013042 (0.01319)	0.026554* (0.01088)	0.037432*** (0.01078)	0.031749** (0.01190)
FDI* Manu-facturing	-0.000475 (0.00078)	-0.000863 (0.00076)	-0.000855 (0.00097)	-0.001121 (0.00095)	-0.001644** (0.00061)	-0.000819 (0.00074)
FDI* Agriculture	-0.002658* (0.00131)	-0.003787** (0.00137)	-0.002076 (0.00107)	-0.003595** (0.00134)	-0.002079 (0.00121)	-0.003741** (0.00129)
FDI* AGFCF	-0.000185 (0.00109)	-0.000851 (0.00107)	-0.000383 (0.00109)	-0.001176 (0.00106)	-0.00105 (0.00064)	-0.000681 (0.00107)
Manu-	-0.001033*	-0.001601**	-0.000715	-0.001200*	-0.001579**	-0.001422**

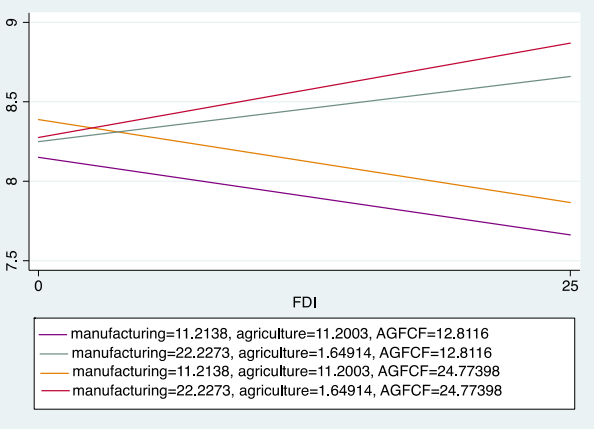
facturing* AGFCF	(0.00048)	(0.00049)	(0.00060)	(0.00050)	(0.00047)	(0.00048)
FDI* Manu-facturing* AGFCF	0.000037	0.000066	0.000038	0.000084	0.000065	0.000064
	(0.00005)	(0.00004)	(0.00005)	(0.00005)	(0.00004)	(0.00004)
Ln (GDPPC)	0.950921***	0.914965***	0.990179***	0.753311***	0.922121***	0.952652***
	(0.27153)	(0.25680)	(0.19227)	(0.19900)	(0.25620)	(0.27077)
Corruption		-0.012249	0.003389	-0.005201	-0.006578	0.000796
		(0.01407)	(0.01239)	(0.01444)	(0.01367)	(0.01417)
Trade Openness	-0.001002		-0.001582*	-0.000936	-0.000899	-0.001339
	(0.00070)		(0.00075)	(0.00065)	(0.00079)	(0.00084)
Unemploy-ment	-0.00714	-0.003919		-0.009454	-0.003396	-0.004769
	(0.00596)	(0.00630)		(0.00531)	(0.00638)	(0.00617)
Tax Revenue	0.009392	0.009281	0.002506		0.010044	0.009562
	(0.00598)	(0.00646)	(0.00524)		(0.00634)	(0.00654)
Government Expense	-0.000117	-0.003031	-0.003492	0.001153		-0.003893
	(0.00902)	(0.00954)	(0.00845)	(0.00608)		(0.00915)
Δ(Inflation)	0.001113*	0.000852	0.000868	0.000636	0.001047*	
	(0.00052)	(0.00052)	(0.00045)	(0.00054)	(0.00045)	
Observations	566	528	673	630	545	538
R-squared	0.758915	0.762001	0.731144	0.784937	0.754896	0.75934
No. countries	77	67	78	76	69	68

Figure 2. Robustness Check: Excluding Different Control Variables

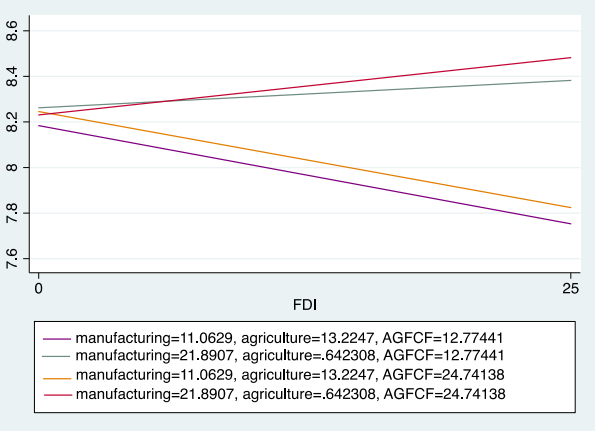
Model 1



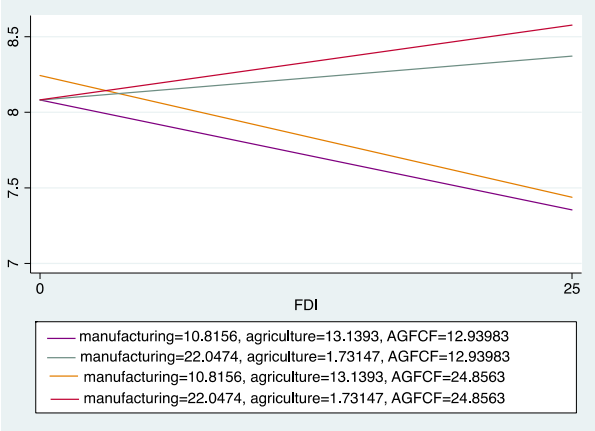
Model 2



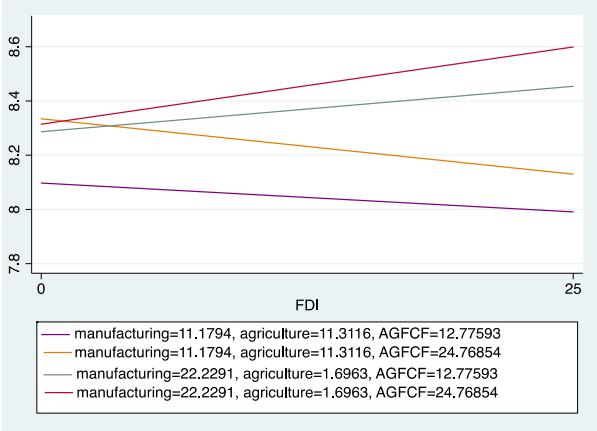
Model 3



Model 4



Model 5



Model 6

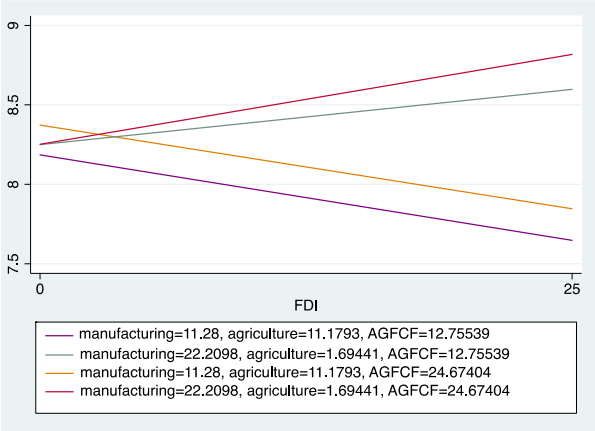


Table 6 shows the results of another robustness check that uses lagged GDPPC instead of GDPPC to account for potential multicollinearity issues with FDI, and the results are again similar.

Table 6. Robustness Check: Using Lagged GDPPC & Lagged AGFCF

	Ln(Average income of bottom 20% quantile) (t+1)	Standard Error
Manufacturing	0.0327**	(0.0134)
Agriculture	-0.0014	(0.0127)
Services	-0.000436	(0.00818)
FDI	0.0348*	(0.0178)
AGFCF	0.0399***	(0.0127)
FDI*Manufacturing	-0.000744	(0.00079)
FDI*Agriculture	-0.00385***	(0.00138)
FDI* AGFCF	-0.000782	(0.00111)
Manufacturing* AGFCF	-0.00157***	(0.000515)
FDI*Manufacturing* AGFCF	0.0000638	(0.0000463)
Lagged Ln(GDPPC)	0.811***	(0.238)
Δ(Inflation)	0.00102	(0.000618)
Corruption	-0.0107	(0.0131)
Trade Openness	-0.000763	(0.000687)

Unemployment	-0.00556	(0.0061)
Tax Revenue	0.009	(0.00633)
Government Expense	-0.00262	(0.0093)
Observations	527	
Number of countries	67	
R-squared	0.755	

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

To check the robustness of the marginal effect analysis, we did a pairwise comparison of the average marginal effects; table 7 shows the results of testing the differences in the simple slopes. The results show that all the pairwise comparisons are strongly significant except for one, which adds validation to the results of our marginal effect analysis.

Table 7. Pairwise Comparison of Average Marginal Effects

FDI	dy/dx	Std. Err.	z	P>|z|
4 vs 3	0.0006902	0.007237	0.10	0.924
1 vs 3	0.0442079	0.0140214	3.15	0.002
2 vs 3	0.0362843	0.0119615	3.03	0.002
1 vs 4	0.0435177	0.0169047	2.57	0.010
2 vs 4	0.0355942	0.0140616	2.53	0.011
2 vs 1	-0.0079235	0.0039795	-1.99	0.046

*y denotes average income of bottom 20% income group; x denotes FDI.

7. Conclusion

The main question researched in this paper is to identify the conditions under which FDI can lead to inclusive economic growth. By using a fixed effects regression with annual data for 68 countries from 1990 to 2015, our empirical results indicate that the effect of FDI on inclusive growth is most positive when the host country has as a large manufacturing sector and a developed infrastructure base. This finding is shown through the results of the marginal effects analysis, where the effect of FDI on inclusive growth becomes most positive with high levels of manufacturing and infrastructure.

From a policy viewpoint, these are not very optimistic results. Relying on FDI to reduce poverty and lift the lowest income groups in society will only work when the host country has sufficient absorptive capacity already in place. Many of the countries most in need of inclusive growth do not have such capacity currently. Nevertheless, FDI can still indirectly contribute to these outcomes on inclusive growth by having a positive impact on general overall growth, as

well as on developing the manufacturing sector and the gross capital formation of the host country. In hindsight, our results may help explain why many African countries that have had an exponential influx of FDI over the last few decades have not yet been able to fully benefit from said investment, from the perspective of inclusive growth, and are still struggling with severe poverty problems. The development of the manufacturing sector and building quality infrastructure need to be part of the policy agenda for FDI to contribute to poverty alleviation more effectively.

Further research is needed to overcome some limitations of the current study. First, it would be very desirable to overcome current data limitations so to be able to enlarge the sample of countries, especially to include more low-income countries. Second, better disaggregated data are needed to be able to decompose different types and modalities of FDIs (mode of entry, kind of investment, sectoral spread, etc.) and so to be able to discern how the different types of FDI affect inclusive growth.

Appendix

Table A-1. Countries in Final Sample

	Obs.	Manufac.	Ag.	AGFCF	FDI	GDPPC
High income		15.1416	2.4912	17.4942	5.0339	35,184.3868
Croatia	8	13.9485	4.7108	18.4219	5.2942	18,070.8250
Estonia	8	13.7396	2.8743	18.7827	8.7009	25,239.0625
Finland	4	18.0348	2.3202	16.9379	5.9235	40,993.0750
Greece	13	8.4099	3.5442	19.0054	0.8108	28,182.5308
Hungary	6	19.0143	3.8626	13.2154	8.8422	22,815.8000
Iceland	11	11.0225	5.8828	14.2655	6.9631	40,368.4545
Ireland	9	20.4700	1.1317	8.0351	16.0265	46,433.5444
Japan	1	22.0760	1.0609	23.6387	0.4791	36,697.2000
Korea, Rep.	4	26.3767	2.4797	29.7046	1.0296	28,350.4500
Latvia	11	11.3229	3.5488	22.7889	4.5096	19,379.7364
Lithuania	12	17.1894	3.6283	18.4950	2.8611	21,445.1667
Luxembourg	3	6.6066	0.3067	6.2108	13.3058	91,838.5333
Malta	3	10.8000	1.2726	9.8424	7.7757	29,806.3000
Norway	12	7.7864	1.3474	18.2472	3.1641	62,570.0917
Poland	19	16.5376	3.0824	17.2103	3.5386	18,462.0789
Portugal	13	12.1970	2.1671	16.6913	4.0479	26,600.7769
Slovak Republic	12	19.9575	3.4934	20.5655	3.9522	22,390.6917
Slovenia	11	19.7903	1.9569	22.2796	1.7274	28,093.1636
Spain	6	12.2804	2.3419	18.7576	2.3564	31,701.9000
Sweden	9	17.3192	1.3746	18.5115	3.9393	41,794.0556
United States	4	12.0483	1.0427	18.5470	1.9038	50,725.5000
Uruguay	21	14.8201	7.8573	13.1869	3.7686	14,524.0667
Austria	5	16.5439	1.2705	20.5134	2.1336	44,041.8400
Belgium	6	14.5756	0.8460	9.9342	12.4495	40,440.1667
Canada	6	13.7406	1.7024	19.2065	2.5567	38,539.8833
Chile	11	15.1321	5.2999	17.0617	6.7225	15,735.2264
Cyprus	4	5.6823	2.0956	15.7603	9.5534	35,157.0500
Czech Republic	6	22.0948	2.0895	22.5443	3.5416	28,496.7167
Denmark	4	11.4471	1.2076	17.3416	1.7942	44,351.9000
Germany	4	19.6834	0.7211	18.0431	1.6327	41,425.5250
Switzerland	5	18.7413	0.7060	18.5743	4.7474	56,044.6800
Upper middle income		16.9205	8.4696	21.1365	3.4950	11,421.1539
Dominican Republic	8	15.2608	5.8277	20.5687	4.1529	11,446.6000
Guatemala	1	19.0785	10.6330	11.7417	2.5127	7,005.2100
Iran, Islamic Rep.	3	14.5708	6.5046	29.4521	1.1206	16,193.4333
Jamaica	4	9.9564	6.7757	19.7980	5.0048	8,178.0775
Jordan	4	14.8562	2.6179	18.1461	8.5903	8,107.1100
Malaysia	7	25.8437	9.7629	22.2048	3.9442	20,035.0429
Mexico	9	17.6813	4.0910	18.2267	2.3369	15,384.7778
Namibia	1	10.0249	6.6893	29.9284	3.4881	10,030.1000
Paraguay	5	18.9293	12.0553	18.0514	0.7099	8,563.5500
Peru	5	15.1569	8.2177	17.8210	3.7976	6,362.1380
Romania	16	21.4059	9.2187	20.7205	4.1560	14,805.8750
Russian Federation	13	13.6679	4.0121	17.6439	2.6894	21,797.8692
South Africa	5	14.6882	2.6912	17.3393	1.6858	11,217.6640
Sri Lanka	6	16.6952	14.3758	23.5805	1.2970	7,349.1550
Thailand	16	28.7747	9.7584	23.8656	3.3125	11,389.9238
Albania	2	4.9197	19.3822	27.1406	6.4403	8,604.4250
Armenia	2	9.5537	18.1738	18.5113	3.8943	7,611.0900
Belarus	18	25.6506	9.2760	26.6771	2.3771	12,125.3211
Brazil	10	13.5892	4.9207	15.1846	2.9222	12,521.2200
Bulgaria	5	12.9078	4.4328	18.3493	4.3426	15,531.0000

China	7	31.4802	9.3023	41.0280	3.3025	10,214.8529
Colombia	12	13.6599	7.5921	16.5287	3.3228	10,707.3683
Costa Rica	22	17.7568	10.0436	15.5641	4.7482	10,172.3645
Dominican Republic	6	19.9827	6.9168	19.2027	3.7321	8,753.5250
Lower middle income		16.7867	13.4951	20.0611	3.6086	5,598.9416
Egypt, Arab Rep.	5	16.2503	13.7513	14.9509	3.3282	8,524.8000
El Salvador	13	17.2189	6.2833	14.5098	2.2954	6,191.6438
Ghana	1	11.3670	20.2472	22.7555	6.4909	3,786.9600
Honduras	13	17.9140	12.2555	19.1613	6.2208	3,900.9877
India	1	17.0299	17.0265	31.5950	1.6350	4,451.2300
Indonesia	12	24.2565	14.7535	27.3264	1.7838	8,069.9375
Moldova	13	11.8132	12.4907	19.4965	5.5755	4,646.5654
Philippines	8	22.9049	15.0674	19.2987	1.6351	4,834.5975
Tunisia	3	16.3394	9.6020	21.2945	2.3112	8,687.9700
Ukraine	15	14.6177	9.3709	15.1931	4.0611	7,504.4720
Bangladesh	1	16.4802	17.1046	25.3266	0.8795	2,412.5000
Bolivia	4	15.2478	13.9877	9.8244	7.0869	4,175.6350
Low income		5.5667	41.1782	22.1310	1.1808	1,423.5500
Togo	1	5.5667	41.1782	22.1310	1.1808	1,423.5500
Grand Total	528	16.7205	6.4247	18.7928	4.1435	20,091.1467

Table A-2. Correlation Matrix

	Avg Inc Bottom 20%	FDI	Manufac.	Ag.	Ser.	Ln (GDPPC)	AGFCF	Unemp.
Avg Inc Bottom 20%	1							
FDI	0.1353	1						
Manuf.	-0.1795	-0.2239	1					
Ag.	-0.6731	-0.0962	0.1079	1				
Services	0.5019	0.1374	-0.3878	-0.6524	1			
Ln (GDPPC)	0.8681	0.1043	-0.1247	-0.8261	0.5522	1		
AGFCF	-0.0796	-0.4292	0.2915	0.0975	-0.2954	-0.0922	1	
Unemp.	-0.0716	0.0164	-0.2912	-0.0809	0.1516	-0.054	-0.2009	1

Table A-3. Description of Variables

Variable	Description
Foreign direct investment as percentage of GDP	Foreign direct investment is measured as a percentage of GDP and obtained from World Bank WDI (World Development Indicators). It is the net inflows of investment that acquires a long-term management interest (10 percent or more of the voting stock) in an enterprise operating in a country other than that of the investor. It is the total of equity capital, reinvestment of earnings, other long-term capital, and short-term capital. This indicator reflects net inflows (new investment inflows less disinvestment) from foreign investors in the reporting country and is divided by GDP.

Agriculture as percentage of GDP	Agriculture refers to ISIC divisions 1-5 that include forestry, hunting, and fishing, as well as cultivation of crops and livestock production.
Service as percentage of GDP	Services refer to ISIC divisions 50-99, which include value added in wholesale and retail trade (including hotel and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. It also includes imputed bank service charges and import duties.
Manufacturing as percentage of GDP	Manufacturing refers to industries that belong to ISIC divisions 15-37. The measurement is in terms of value added, which is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is measured without taking deductions for depreciation of fabricated assets or depletion and degradation of natural resources.
Gross fixed capital formation as percentage of GDP	It includes land improvements (fences, ditches, drains etc.); plant, machinery, and equipment purchases; and the construction of roads, railways, schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Net acquisitions of valuables are also considered capital formation according to the 1993 SNA.
Trade openness as percentage of GDP	This is calculated as the total of exports and imports divided by GDP. Imports of goods and services reflect the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments. Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. The specifics are the same as above.
Tax revenue as percentage of GDP	Tax revenue refers to compulsory transfers to the central government for public purposes. Certain compulsory transfers such as fines, penalties, and most social security contributions are excluded. Refunds and corrections of erroneously collected tax revenue are treated as negative revenue.
General government final consumption expenditure as percentage of GDP	This indicator includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security but excludes government military expenditures that are part of government capital formation.
Percentage change in inflation rate	This is calculated as the following: $\frac{Inflation_{t+1}-Inflation_t}{Inflation_t}$, and reflects the annual percentage change in inflation. Inflation here is based on the consumer price index and reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.

Log of GDP per capita in constant 2011 PPP $	GDP is converted to international dollars using purchasing power parity rates. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.
Unemployment as percentage of total labor force	This refers to the share of the labor force that is without work but available for and seeking employment.
Corruption	The corruption indicator is based on the perception of foreign investors of how corrupt a country is. It ranges from numbers 1 to 6, where higher numbers mean a country is less corrupt.

*Corruption is from International Country Risk Guide (ICRG), all other indicators are from World Bank's World Development Indicators (WDI).

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